SHORT PAPER 26

Rock Material Resources
of
Umatilla County, Oregon

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STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
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DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
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OF UMATILLA COUNTY, OREGON

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Conducted in compliance with ORS 516.030

In cooperation with
Umatilla County
Board of County Commissioners
Pendleton, Oregon
and the U. S. Forest Service

1976

COVER PHOTO - Indian quarry (quarry 171), located in sec. 20, T. 1 N., R. 35 E., produced aggregate used in construction of I-80.

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OF

UMATILLA COUNTY, OREGON

INTRODUCTION

Purpose

This report, prepared jointly for Umatilla County and the U. S. Forest Service, provides information concerning the locations of gravel pits and rock quarries, the quantity and quality of material available, and the future requirement. The study was financed by the Oregon Department of Geology and Mineral Industries, the U. S. Forest Service, and Umatilla County. A table listing the locations of all known rock material sites, their ownership, and the available laboratory data for each site is given in Appendix 4. All of the sites are indicated on a four-part County map in the pocket.

Umatilla County's population is expected to expand at a rapid rate as a result of increased agricultural and industrial development brought about by the available low-cost water and electric power. The availability of land and electric power coupled with a transportation net that includes highway, rails, and barge facilities has spawned growth in the heavy and light industries in addition to the agribusiness industry. While creating an increasing need for construction aggregate, this growth simultaneously restricts the use of existing sources because of zoning and incompatible development encroachments and eliminates rock-material deposits by simply building over them.

This report includes data relating the available rock material resources to future needs of Umatilla County and the Umatilla National Forest. With proper planning, a continued supply of this needed resource will be available in a manner most compatible with the environment and long-range land use plans.

This study is not concerned with environmental or geological hazards nor engineering-geology type problems. For a proper planning base, each of these also will need to be examined and studied in detail. However, a section on secondary and tertiary uses of surface mined land is included. The authors feel that the locating and mapping of rock-material sources is only the first step in wise planning; it should be followed by land use planning and reclamation processes. The role of the State, County, and operator in these procedures is briefly discussed, and information an where to seek reclamation assistance is given.

A glossary defining the terms used in this report is given in Appendix 1.

Extent of Area

Umatilla County (Figure 1) covers 3,241 square miles, of which about 1,000 is dissected plateau, while the remaining 2,240 is mountainous. Forest lands occupy about 717 square miles. The National Forest controls 441 square miles; State Forest, 42; forest industry, 77; and miscellaneous private, 158. The Umatilla Indian Reservation contains 133 square miles, and the Umatilla Ordnance Depot covers about 10 square miles; U. S. Fish and Wildlife, 5 square miles; Bureau of Land Management, 15 square miles. Private non-forest land occupies about 2,233 square miles.

Method of Study

Locations of quarries and gravel pits and available laboratory test data were obtained from the Umatilla National Forest, the Oregon Highway Department, and Umatilla County Road Department.

Figure 1

Index map of Oregon showing location of Umatilla County.

Locations of additional rock quarries and gravel pits were obtained from U. S. Geological Survey topographic and geologic maps.

Inspection was made from light aircraft and automobile to verify the presence of these materials sites and to detect sites not previously listed.

It should be noted that the plotted locations of quarries on Umatilla National Forest maps (scale 1 inch = 8 miles) may not agree with the locations shown on U. S. Geological Survey 7½ minute quadrangle maps (scale 1 inch = 2,000 feet) based on aerial photographs. In this report, locations of quarries within the boundaries of the Umatilla National Forest correspond to the National Forest maps rather than to the U.S.G.S. topographic maps.

Sand and gravel and quarry-rock production records from County, State, and Federal agencies, principally the U. S. Bureau of Mines, were compiled for the years 1950 to 1974 to determine the past rates of consumption of these materials. The rock materials needed in the future were determined by extrapolating the consumption trends.

Previous Work

There have been a number of topical geologic studies in or adjacent to Umatilla County beginning in the 1930's. The area adjacent to the Columbia River affected by the "Spokane flood" was described by Bretz and others (1956), Bretz (1969) and Flint (1938). Olcott (1965) discussed aggregate resources along the Columbia River industrial area. Geologic maps and ground-water studies of specific parts of the County were made by Wagner (1949), Hogenson (1964), and Hampton and Brown (1964). Newcomb 1966, 1967, 1969) discussed the structure and stratigraphy of the area.

The geologic map of the Pendleton AMS quadrangle, included with this report (in pocket) covers most of the County. The map was compiled by George Walker (1973) from mapping by Greene (1968), Hampton and Brown (1964), Hogenson (1964), Newcomb (1965, 1969), Taubeneck (1957), and Walker (1973).

Acknowledgments

The writers wish to express their appreciation for the help and cooperation of many individuals in both governmental agencies and the aggregate industry who gave of their time and expertise.

Milvoy Suchy, minerals management branch, U. S. Forest Service, together with Umatilla County Commission Chairman Forrest Starrett and Commissioners Raymond Bevans and Barbara Lynch, helped finance the study and provided help and information during the course of the study. The following persons provided data and gave freely of their time and experience to make the report as complete and accurate as passible:

Bob Haye, Reed Miller, and Roger Minnich, U. S. Forest Service; Harry Ludowise, Federal Highway Administration; Carlos Van Ellsberg and Ivan Pointer, Umatilla County Road Department; Fred Yarbrough, Clarence Gregg, Vernal Moore, Carl Nelson, and Gordon Olcott of the Oregon Department of Transportation, Oregon State Highway Division.

The writers are grateful to those who helped prepare the report for publication. Susie Kozlik typed the manuscript; Ruthie Pavlat typed the camera copy; Margaret Steere and Ainslie Bricker edited the report; Barbara Priest drafted the charts and plotted the materials sites; and Steve Renoud prepared the mineral resource locality maps.

POPULATION AND INDUSTRIAL GROWTH

The demand for rock materials is closely related to economic and population growth. Economic growth in Umatilla County began during World War II with the construction of the Ordnance military installation, Hinkle railroad yard, and the Boardman bombing range. Later hydroelectric power generating facilities constructed at the McNary and John Day Dams added to and, to a large extent, accelerated the County's growth by providing low-cost water and electric power. From 1940 to 1950 the population growth averaged 4.8 percent per year; but since that time population growth has averaged about 0.52 percent per year (Table 1). More recently the expansion of existing agriculture and food-processing industries and new developments in thermal energy generation facilities promise an employment and total population increase of up to 20,000 persons in the Columbia Basin counties through 1985, an increase of 37 percent (Obermiller, 1975) (Table 2). Of this 20,000 population increase, over 14,000 will be absorbed by the cities of Umatilla, Stanfield, Hermiston, Echo, Pendleton, and Milton-Freewater.

Table 1. Population of Umatilla County and cities

	1974	1970	1960	1950	1940
Umatilla County	47,250	44,923	44,352	41,703	26,030
Stanfield	815	679	617	833	370
Hermiston	5,865	4,893	4,402	3,804	803
Echo	490	479	456	457	280
Pendleton	14,010	13,197	14,434	11,774	8,847
Milton-Freewater	4,265	4,105	4,110	- - -	- - -

(Oregon Bluebook, 1975-1976)

Table 2. Population projection 1975-2000 for Umatilla County

1975	48,100
1980	50,700
1985	53,900
1990	56,200
1995	58,400
2000	59,700

(Population Bulletin Feb. 1976, CPRC Series P-2-2
Portland State University Center for Population, Research and Census)

ROCK MATERIAL RESOURCES

Umatilla County has three main types of rock material resources: 1) Columbia River Basalt, 2) stream alluvium and fluvioglacial gravels, 3) and a group of other rock types. Their relative importance, ownership, and sources are discussed here. The characteristics of these materials are described in the section "Geology and Engineering Properties of Mapped Units."

Types of Rock Materials

Columbia River Basalt, a thick series of lava flows covering most of Umatilla County (see accompanying geologic map), contains 73 percent of the materials sites (Table 3). Most of these sites represent small, remote quarries producing rock for local use. Chief exceptions are the several large quarries that produce basalt rock for construction of I-80 (photo 1). However, little, if any, of this production will be sold commercially. The basalt in the Blue Mountain region is particularly important as a resource for road construction by the Oregon Highway Division (photo 2), the Umatilla National Forest (photo 3), and Umatilla County. Quarry rock (basalt) will become more important for the urban areas in time, as nearby gravel sources become depleted.

Stream alluvium (photo 4) and fluvioglacial gravels (photo 5), collectively covering about 17 percent of Umatilla County, represent important sources of commercial low-cost concrete aggregate (Table 3). About 23 percent of the rock material sites in the County are in these alluvial and glaciofluvial materials, and six large gravel pits produced 68 percent of the gravel used in the County.

Other rock types overlie about 25 percent of the surface area within the County. Those rock types utilized as materials resources ore chiefly quartz diorite, rhyolite, and welded tuff occurring in patches in the southern part of the County. Most of the quarries are small, and the rock is used where gravel and Columbia River Basalt are lacking. Only 4.4 percent of the rock sources listed in Appendix 4 are located in these minor rock types (Table 3).

Table 3. Materials sources in relation to geologic rock types

Rock type	Percent of area	Number of sources	Percent totol sources
Columbia River Basalt	68.0	197	73
Fluvioglociol gravel	16.2	41	15
Alluvium	0.8	21	7.5
Other	25.0	12	4.4
Total	100.0	271	99.9

Most of the commercial aggregate produced in Umatillo County comes from the northwest port, the area where agriculture, industry, and population are predicted to expand at an accelerated rate in the near future. Alluvial gravel from the Umatilla River from Pendleton eastward to about Million provides most of the commercial concrete aggregate used in the Pendleton area (photo 6). The gravels are partly replenished by periodic floods; however, as the demand for rock increases in the Pendleton area, the Umatilla River gravel supply may not be sufficient, and additional rock from quarries will be needed. Insofar as possible, river gravel should be reserved for concrete aggregate, and crushed and broken quarry rock should be used for base rock and embankments.

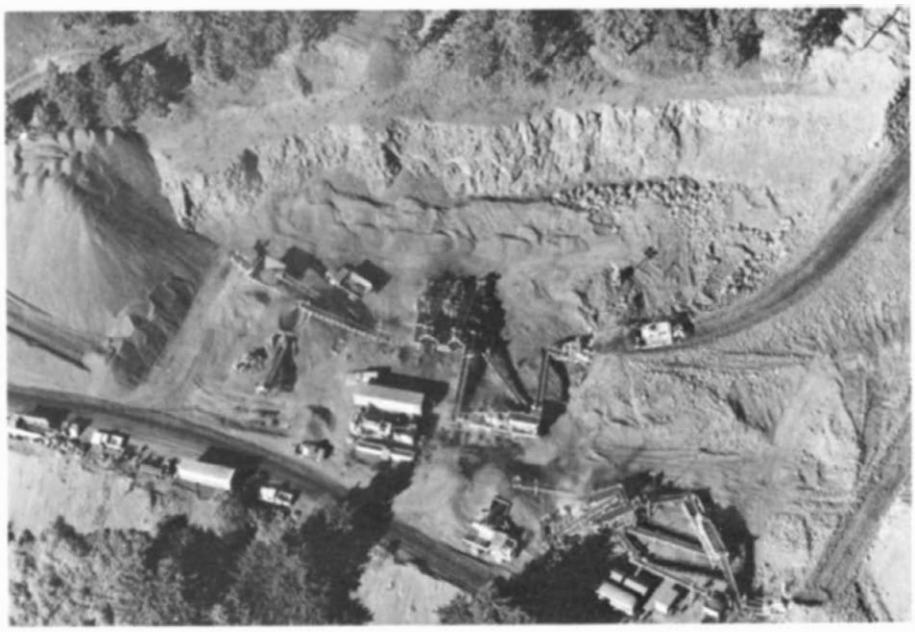

Photo 1. This Indian quarry (No. 171) produced rock materials for construction of Highway I-80.

Photo 2. Columbia River Basalt from quarries and roadcut was used for construction of Highway I-80 at Cabbage Hill east of Pendleton.

Tabulation of Rock Material Sources

Appendix 4 tabulates location and other pertinent information on 271 sources of rock materials in Umatilla County. The list comprises gravel pits, rock quarries, and prospects for which there is laboratory data. Information sources include: U. S. Bureau of Mines; Umatilla County Road Department; Oregon State Highway Division; Oregon Department of Geology and Mineral Industries; U. S. Forest Service and USGS $7\frac{1}{2}$ minute topographic maps. Observations made from auto and light aircraft provided additional information.

All sites listed are located on the map of Umatilla County (in the pocket) and numbered consecutively right to left beginning with the township at the NE corner. Although additional sites may exist, the locations shown are considered by the contributing agencies and the authors to be the most significant.

Owners and names of the listed properties are given when known. The type of rock is given for the bedrock quarries, and the geologic formations listed correspond to the mapping units designated on the geologic map (in pocket).

Laboratory test results indicate the overall quality of the material with regard to its performance in construction. The Los Angeles Rattler (L. A. R.) is a measure of resistance to abrasion.

Generally good-quality rock values range from 9 to 20 percent loss to maximums of 30 to 45 percent for subbase and base rock. The sodium sulphate test (Na_2SO_4) given as percent loss indicates the response of the material to weathering by simulating a controlled freeze and thaw procedure. While rock loss of 12 percent is the maximum allowable for portland cement concrete, most values of rock tested (as shown in Appendix 4) ranged between 1 and 15 percent.

The Oregon Air Degradation test is designed to measure the quantity and quality of material produced by attrition, simulating actual usage as roadway surfacing material and bose rock. If 30 percent of the material produced passes through the No. 20 sieve (pass No. 20) or has a setting height (after 20 minutes of undisturbed settlement) of greater than 3 inches, it is considered unsuitable.

Collectively these tests and additional data suggest a relative classification of the resources as good, fair, or poor. The quantity of material available is reported as small (50,000 cu.yd.), medium (50,000 to 150,000 cu yd), and large (greater than 150,000 cu.yd.).

Comments concerning suitable uses for the material and general information related to present status or availability and additional location notes are included in the final column of the tabulation.

Ownership of Rock Material Sources

Of the 271 rock-material sources listed in Appendix 4, the U. S. Forest Service, primarily the Umatilla National Forest, has title to 25 percent; the State Highway, 10 percent; Umatilla County, 3 percent; the Ordnance Depot, 2 percent; and the Bureau of Indian Affairs, 2 percent. The remaining 58 percent of the sources are on private property. Active sites, including those temporarily active at the time of this study, make up 70 percent of the total; while 17 percent were inactive and 13 percent were abandoned.

ROCK MATERIAL REQUIREMENTS

This section of the report discusses production and consumption of rock materials for Umatilla County, per capita-use statistics, projections for the future, and the possibilities for export.

County Requirements

Part of the rock material in Umatilla County is used for the construction of new homes, streets, sewers, churches, business and municipal buildings, and many other facilities and can be directly related to population growth. Another portion of the rock used in Umatilla County is related to large Federal and State construction projects bearing little relation to local population. Since 1950 the Oregon Highway Department has been building the I-80 freeway, which traverses Umatilla County east-west. During certain

Photo 3. Small quarry (No. 233) in Umatilla National Forest. Sloping walls are safety feature to protect animals and vehicles.

Photo 4. Pendleton Readymix Company plant located on the Umatilla River just east of Pendleton (No. 146).

periods, the construction of this major freeway involved mainly earthwork and preparation of the roadbed, requiring very little rock from outside of the highway right-of-way. During other periods, much quarry rock (photo 2) -- sometimes seven or eight times the amount used locally in the County in o specific year (1967, Figure 2) -- were taken for fill, subbase, base, and paving rock. Between 1950 and 1975, construction of the McNary Dam required enormous amounts of gravel and rock. For these reasons the total annual gravel and rock production in Umatilla County has fluctuated enormously (see Table 4 and Figure 2).

Table 4. Annual production of sand and grovel and quarry rock in Umotilla County

Year	Commercial Production	Noncommerciol Production	Total
1950	152,981	28,000	180,981
51	585,556	5,077	590,633
52	385,313	0	385,313
53	289,865	17,550	307,415
54	341,010	99,943	440,953
55	237,332	343,222	580,554
56	112,488	656,941	769,429
57	123,909	518,809	642,718
58	94,913	971,645	1,066,558
59	419,783	542,542	962,325
60	285,769	640,110	925,879
61	269,330	220,859	490,189
62	518,345	521,276	1,039,621
63	346,591	698,114	1,044,705
64	309,699	74,205	383,904
65	351,901	115,848	467,749
66	255,465	659,175	914,640
67	412,254	2,182,650	2,594,904
68	110,000	258,249	368,249
69	81,000	268,947	349,947
70	126,752	217,683	344,435
71	266,352	457,431	723,783
72	167,977	288,482	456,459
73	244,557	420,001	664,558
74	484,900	832,762	1,317,662

Analysis of materials used in the County is complicated by the fact that there ore two separate products: 1) rock which is quarried from in-place lavas; and 2) grovel which is dug from alluvial deposits. To give o clearer picture of long-term County needs, production statistics for both materials were combined on Table 4. Another complication is that each product is produced both commercially for the private sector and noncommercially for County, State, and Federal agencies. In addition, some of the commercial gravel and stone is produced for the noncommercial sector. Figure 2 gives a visual picture of commercial vs. noncommercial production.

Per Capito Requirements

In order to determine the normal rock consumption of the County, the rock used for construction of special projects not dependent upon the local population growth was de-emphasized.

Table 5 gives the total annual per capita use of rock materials in the County. During the period 1960-1969, per capita use averaged 19.5 tons, of which quarry rock accounted for 11.22 tons and gravel

Photo 5. Jones-Scott Company produces gravel commercially at Umatilla from this pit (No. 46) just southeast of the city. Fluvioglacial deposits vary from cross-bedded sand to gravel.

Photo 6. Commercial gravel for use at Pendleton is produced on the Indian Reservation at Mission (site No. 145). The gravels are replenished by occasional floods where stream gradient is decreased.

8.28 tons. The total annual per capita use of commercial rock material was 7.18 tons and of noncommercial, 12.32 tons. Table 6 expresses the average annual consumption of rock materials in percentage values.

From 1970 to 1974 the total annual per capita use of rock materials (commercial and noncommercial combined) dropped from 19.5 to 16.04 tons, probably as a result of winding down or completion of the large State and Federal construction projects (Table 5).

Table 5. Average annual consumption of rock materials in Umatilla County

	1950-1959		1960-1969		1970-1974	
Product	Av. Annual Tons	Av. Annual Per Capito	Tons	Per Capita Use	Tons	Per Capita Use
Stone						
Commercial	160,663	3.73	187,545	4.20	121,304	2.63
Noncommercial	212,128	4.93	313,350	7.02	304,031	6.60
Total	372,791	8.67	500,895	11.22	425,335	9.23
Gravel						
Commercial	159,453	3.71	132,805	2.98	150,721	3.27
Noncommercial	115,660	2.69	236,779	5.30	163,111	3.54
Total	275,113	6.40	369,584	8.28	313,832	6.81
Total						
Commercial	320,116	7.44	320,350	7.18	272,025	5.90
Noncommercial	327,788	7.62	550,129	12.32	467,142	10.14
Total	647,904	15.06	870,479	19.50	739,168	16.04
Average Population		43,027		44,637		46,089

Table 6. Percent average annual consumption of rock materials in Umatilla County

	1950-1959		1960-1969		1970-1974	
Product	Percent of Total	Percent of Product	Percent of Total	Percent of Product	Percent of Total	Percent of Product
Stone	57.5	100.0	57.5	100.0	57.5	100.0
Commercial	24.8	43.1	21.5	37.4	16.4	28.5
Noncommercial	32.7	56.9	36.0	62.6	41.1	71.5
Sand & Gravel	42.5	100.0	42.5	100.0	42.5	100.0
Commercial	24.6	58.0	15.3	36.0	20.4	48.0
Noncommercial	17.9	42.0	27.2	64.0	22.1	52.0
Total com'l	49.8		36.8		36.8	
Total noncom'l	50.2		63.2		63.2	

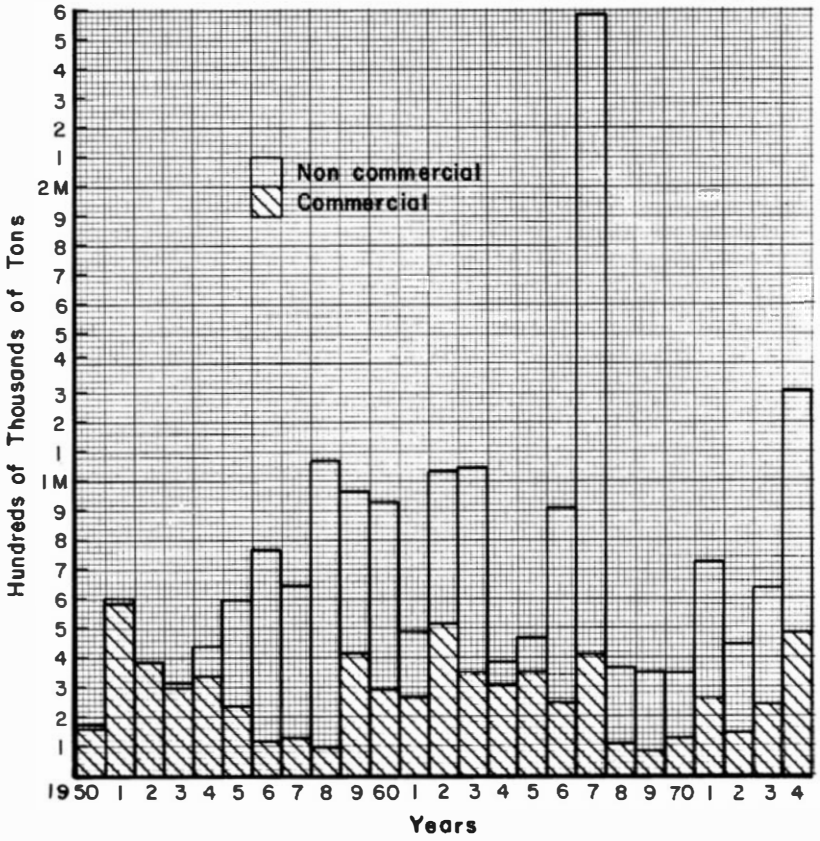

Figure 2. Commercial and noncommercial quarry rock and sand and gravel production in Umatilla County.

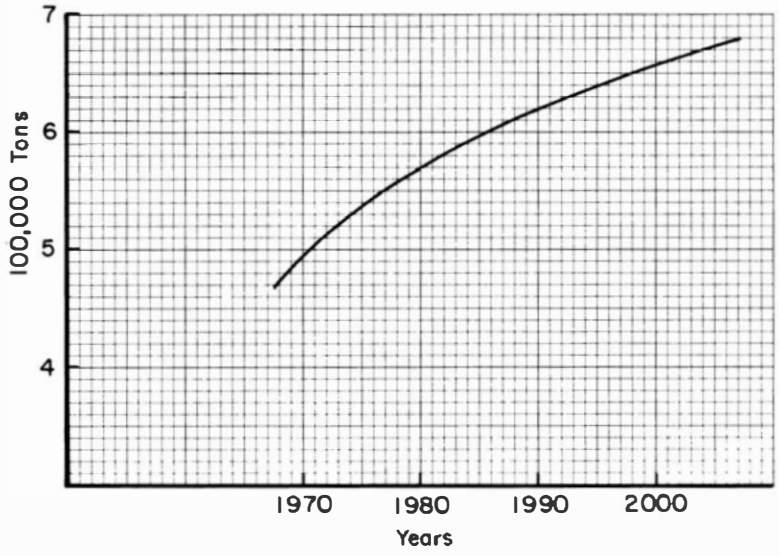

Figure 3. Projected annual rock material production in Umatilla County, based on 11 tons per capita annually.

From the foregoing information and the detail shown in Table 5, it appears that the State and Federal construction projects dominated the rock-materials industry from the early 1950's to the present. It is logical, therefore, to assume that in the future, commercial production will continue ot the present rate, whereas noncommercial production will be reduced by at least 50 percent. Using the figures from Table 5 for the period 1970-1974, 5.9 tons per capita annual commercial consumption plus 5.07 (half of 10.14) tons per capita annual noncommercial consumption gives about 11.0 tons of aggregate used per person per year, a figure which corresponds with that of Josephine County at 11.3 tons per capita per year (Schlicker and others, 1975) and that of Jackson County at 10.2 tons per capita per year (for grovel only) (Schlicker and Deacon, 1970). Figure 3 gives a graphic picture of projected annual rock material production to the year 2000. At the rote of 11 tons per capita, the County should consume a total of 15 million tons of rock materials between 1975 and 2000 (Figure 4) if the projected population as shown in Table 2 is reached. The assumed 11-ton per capita figure is reasonable or slightly conservative because the per capita use of aggregate is greater for a growing population than for one that is stable.

The cumulative effect of rock materials production is shown on Table 7, column 1.

Export Potential

In addition to fulfilling the need for rock in Umatilla County, sand and grovel may be exported in lorge amounts to communities down river from Umatilla. The Portland-Vancouver metropolitan area hos o scarcity of future reserves. Most of the areas containing grovel and stone in the Portland area hove been built over, and it is becoming increasingly difficult to get zone changes which would allow the development of outlying sites. Therefore, as the present grovel sources in the Portland area ore mined out, a greater amount will hove to be imported.

Because of the availability of grovel adjacent to the Columbia River in Umatilla County, together with economical barge transportation to Portland, up to 5 million tons per year could conceivably be exported annually, as shown on Table 7, column 2 and by Figure 4. By the year 2000 about 120 million tons could hove been exported, 7.7 times more than the 15 million tons which will be used locally. The combination of export and local usage of rock could total as much as 136 million tons by the year 2000 (Figure 4).

GEOLOGY AND ENGINEERING PROPERTIES OF MAPPED UNITS

Geologic Summary

Geologic units in Umatilla County range in age from late Paleozoic to Pleistocene (see geologic mop in pocket). The older (Paleozoic ond Mesozoic) undifferentiated metasedimentary, metavolcanic, and intrusive rocks ore exposed in the southeast and south-central ports of the County. Pre-Tertiary fold trends ore northeast dominated by the Blue Mountain anticline. Faulting in the south and southeast ports of the County is northwesterly; however, much of the Mesozoic-Cenozoic structure is covered by extensive Miocene Columbia River Basalt flows. Sedimentary rocks, ondesitic flows, tuffs, and tuffaceous sedimentary rocks of Eocene to Pliocene age ore of minor occurrence.

Quaternary deposits consist of alluvium deposited by existing streams and older fluvioglociol material in the Columbia River drainage system in the northwest corner of the County.

Pre-Tertiary Rocks (Mz-Pzu), (KJi)

The oldest bedrock units of Umatilla County ore undifferentiated metasedimentary-metavolcanic, metamorphic, and igneous rocks (Mz-Pzu) of Permian to Triassic age and intrusive rocks (KJi) of Late Jurassic or Cretaceous age.

Both groups ore exposed in two areas within the County. The largest area lies along the core of on eroded anticline in a discontinuous northeast-trending bond approximately 30 miles long which posses

Table 7. Projected cumulative tons of gravel used by Umatilla County and including export beginning in 1980

Year	Cumulative tons of gravel used by County	Cumulative tons of gravel used by County including export *
1975	0	
76	548,099	
77	1,086,065	
78	1,614,165	
79	2,147,199	
80	2,741,500	7,741,500
81	3,400,000	13,400,000
82	4,000,000	19,000,000
83	4,500,000	24,500,000
84	5,100,000	30,100,000
85	5,591,000	35,591,000
86	6,100,000	41,100,000
87	6,600,000	46,600,000
88	7,300,000	52,300,000
89	7,900,000	57,400,000
90	8,618,750	63,618,750
91	9,100,000	69,100,000
92	9,600,000	74,600,000
93	10,200,000	80,200,000
94	10,900,000	85,900,000
95	11,770,250	91,770,250
96	12,100,000	97,100,000
97	12,900,000	102,900,000
98	13,400,000	108,400,000
99	13,900,000	113,900,000
2000	15,018,000	120,018,000

* Assuming 5 million tons exported annually by the year 1980

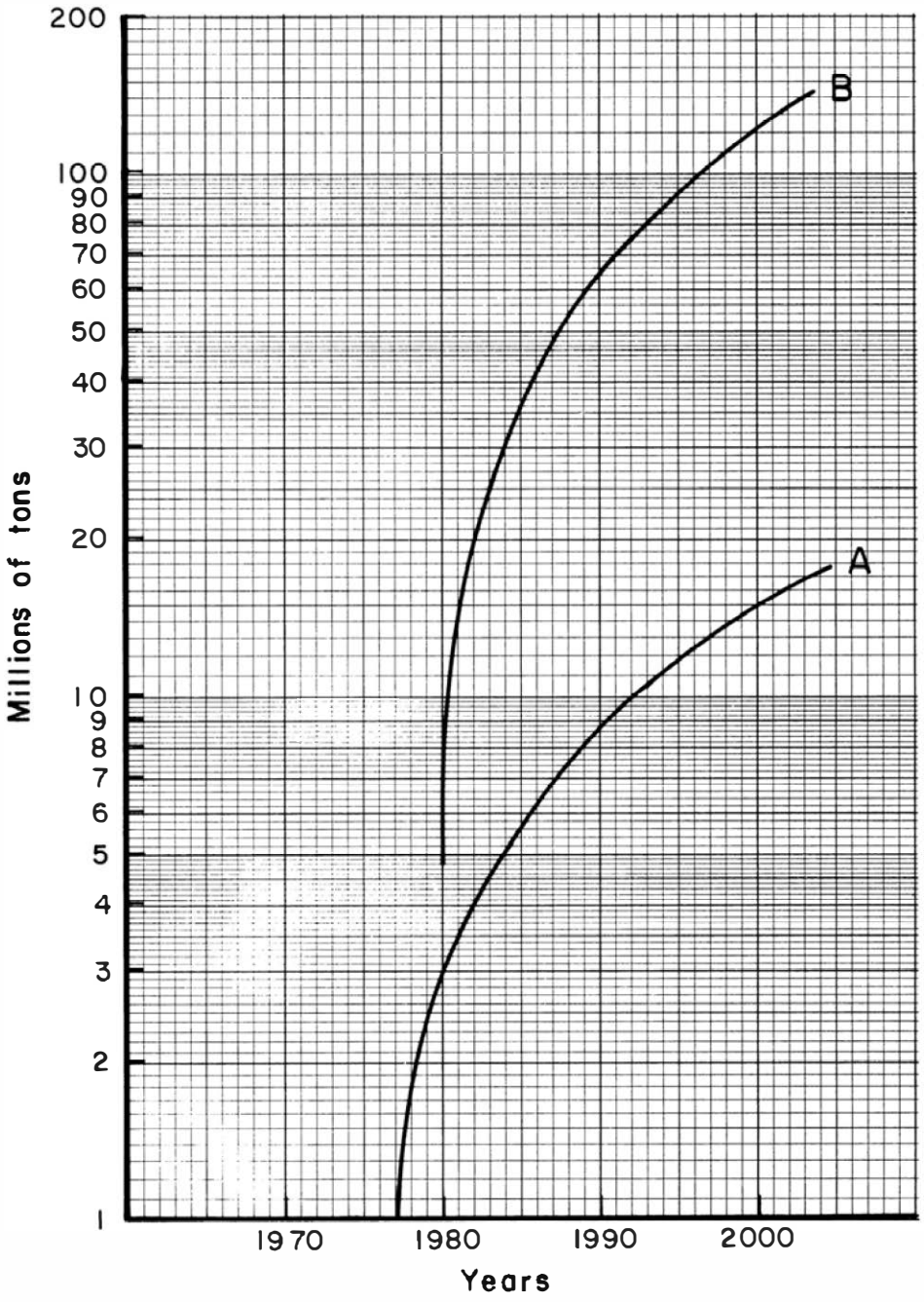

Figure 4. Cumulative consumption projections for rock material produced in Umatilla County: A. Used within County at 11 tons per capita annually beginning in 1975. B. Includes 5 million tons exported annually beginning in 1980.

Photo 7. Granite quarry (No. 218) near Battle Mountain. The granite has disintegrated to individual grains.

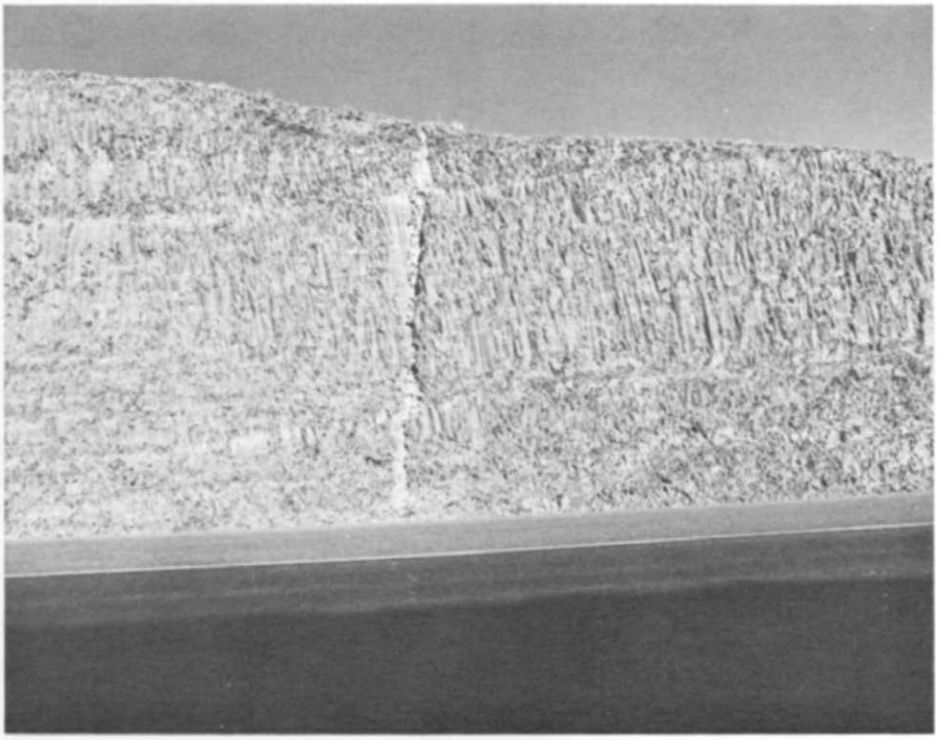

Photo 8. Columbia River Basalt exposed in roadcut on Highway I-80 at Cabbage Hill. Note the fine columnar joint pattern. This rock makes excellent crushed aggregate for base course and surfacing.

through Battle Mountain. The smaller outcrop area is in southeastern Umatilla County.

Argillite, chert, limestone, greenstone, phyllite, schists (Permian and Triassic), and coarsely crystalline intrusive gabbros, metagabbros, and serpentinized peridotites (Triassic) characterize the older, undifferentiated series (Mz-Pzu).

Only one quarry has been located in a quartz diorite intrusive within the metavolcanic-metasedimentary (Mz-Pzu) rocks and it has been abandoned.

Jurassic or Cretaceous quartz diorite and granodiorites (KJi) associated with batholiths and adjacent plutonic bodies intrude the older metavolcanic and metasedimentary rocks. These rocks are relatively unimportant as sources of aggregate. Three quarries in intrusive rocks (KJi) were used by the Forest Service. However, test results show that abrasion losses range from 39 to 59 percent and sodium sulfate test losses vary from 17 to 25 percent. Both tests indicate a quality marginally acceptable for base rock and unacceptable for crushed aggregate surfacing according to U.S.D.A. Forest Service specifications.

The older coarsely crystalline intrusives and metamorphics ore more commonly deeply weathered and have widely spaced joint patterns. Blocks produced in blasting are frequently too large for the crusher and must be set aside, thereby making the cost of crushed rock production excessive. Generally the side-hill gouge type of mining started in granite will leave a steep and high quarry face because of the original steep terrain and the normal shape of the rock body usually associated with large granitic intrusives. Granitic rocks which have been partly disintegrated to individual mineral grains and partly altered to clay can be used for construction of dry-weather roads (photo 7).

Sedimentary Rocks and Flows (Eocene and Oligocene) (Tsf, Tss, Tf)

Lower Tertiary continental sedimentary rocks and andesitic flows (Tsf) are exposed along the flanks of the Paleozoic and Mesozoic units of the eroded northeast-trending anticline. The sedimentary unit (Tss) consists of quartzose and feldspathic sandstone, micaceous and coal-bearing carbonaceous siltstone and shale.

No quarries or gravel pits have been developed in these units. Although some of the rock would make fill material, the abundance of adjacent higher quality rock for aggregate and embankment material precludes consideration of these rocks for most construction purposes.

Tuffs, Tuffaceous Sedimentary Rocks, and Minor Flows (Tts) (Ta)

Thin-bedded white to grayish-yellow tuff, lapilli tuff, welded ash-flow tuff, and fine-grained ashy sedimentary rocks dominate the Oligocene and Miocene unit (Tts). Locally porphyritic rhyolite or rhyodacite and andesite flows (Ta) are characteristic.

Products from quarries in rhyolite and welded tuffs (Tts) have been used with satisfactory results. Tests indicate that the rock is generally sound. Adversely, the lavas and welded tuffs normally are thin bedded and crudely interlayered with ash and breccia. Normally only small quantities of material can be extracted, and excavations must be shallow to prevent mixing with the less competent tuffs and volcanic ash. With the exception of the small areas underlain by pre-Tertiary rocks and Tertiary tuffs, there should be no shortage of quarry rock in the mountainous areas within the County in the foreseeable future.

Columbia River Group (Tcr)

The Columbia River Group consists of individual basaltic lava flows ranging from 10 to 100 feet thick. They usually display columnar jointing ond may be interbedded locally with tuffaceous sediment or rarely with conglomerate. Photo 8 shows a flow of Columbia River Basalt exposed in a roadcut on Highway I-80 east of Pendleton. Total thickness of the formation in places may exceed 5,000 feet. Along the flanks of anticlines and adjacent to older rocks, the Columbia River lavas thin and pinch out.

The Columbia River Basalt covers more than 68 percent of the County. Plateau area near Ukiah underlain by Columbia River Basalt exhibits a typical stone pattern, as shown on photo 9. In the northwest

Photo 9. Rock patterns on surface indicate very thin soil cover over basalt bedrock. Good rock quarries can be located where access and topography are favorable for a crushing plant.

Photo 10. Platy basalt quarried by U.S. Forest Service (No.223) in sec. 36, T. 45 S., R. 33 1/2 E. Pit-run rock (uncrushed) is suitable for base rock. A small crusher is adequate to produce crushed rock from this material.

part of the County, where the basalt is overlain by thick fanglomerate, loess and fluvioglociol deposits, it is generally exposed in stream canyons.

Not only is the Columbia River Group the most widespread unit in the County, but it also produces the best quarry rock. A minimum of 195 quarries or 73 percent of all rock sources in the County ore located in this unit.

The rock is finely crystalline, dense, usually unweathered, and may have a close joint or fracture pattern which causes the rock to break in sizes suitable for crushing (photo 10). Weathered vesicular lava, flow breccia, and soft interbedded sedimentary material need not be used because high-quality rock can usually be found nearby.

Sedimentary Rocks (Pliocene) (Ts)

Sedimentary rocks of Pliocene age overlie the north-dipping Columbia River Basalt Group in three areas. Two areas, of about 10 square miles each, ore located about 8 miles south of Hinkle; and the other area, of about 50 square miles, is centered on McKay Creek.

This unit is a fanglomerate composed of silty basalt grovel eroded from the higher elevations and deposited at the footslopes. The grovels ore crudely cross bedded, indicating torrential deposition (Hogenson, 1964). The gravels ore tightly packed with silt and clay particles and cemented with calcite. They contain lorge siltstone and sandstone lenses. The particle sizes in the McKoy Creek area range from well-rounded grit near Pendleton to 3-inch pebbles at Pilot Rock (Hogenson, 1964). The maximum thickness, according to Hogenson, is about 100 feet.

This unit is not satisfactory for concrete aggregate because of the carbonate cementation and the abundant silt and clay, but it con be used for embankment.

Grovel pit excavations in younger overlying grovel deposits may encounter these calcite-cemented gravels at depth. The authors located only one site within this unit, and this was abandoned.

Glacial Lake Sediments (Qgls)

Lacustrine deposits of a late glacial stage crop out in a semicircular pattern in the northwest part of the County. They overlie either the fanglomerate or Columbia River Basalt between 750 feet and 1,150 feet elevation (Hogenson, 1964).

The deposits are composed of silt and sand with local lenses of small grovel and o few scattered ice-rafted boulders weighing up to several tons. The thickness of the unit varies but is generally less than 80 feet.

This unit contains excessive silt and is unsuitable for concrete aggregate, but may hove some value as embankment material.

Fluvioglacial Deposits (Qfg)

This unit is present in the 10- to 12-mile wide "scabland" strip between the Glacial Lake Sediments (Qgls) and the Columbia River, generally below the 750-foot contour line (Hogenson, 1964). It extends northeast and southwest of Stanfield into Morrow County.

The deposits consist of clean sand and fine grovel with o few large boulders and local silt lenses (see photos 11 and 12). The outwash is crudely stratified with torrential cross-bedding. The thickness of the unit is variable up to 200 feet. It overlies the Columbia River Basalt in most instances but locally rests on older grovel mopped as Ts.

The gravel and sand generally make good aggregate. To produce a graded product, screening and remixing will be required because of the abundance of sand-sized particles.

A total of 41 grovel pits hove been located in this unit, including most of the commercial rock sources. Agriculture, industry, housing, and rock production ore all competing for the areas mapped as Qfg. Careful planning and implementation will be necessary to make the best use of this land. Some acreage should be set aside for the gravel industry, with appropriate reclamation plans for later use. Areas not well suited for extraction of rock materials should be zoned for other uses such as agriculture, industry, and housing.

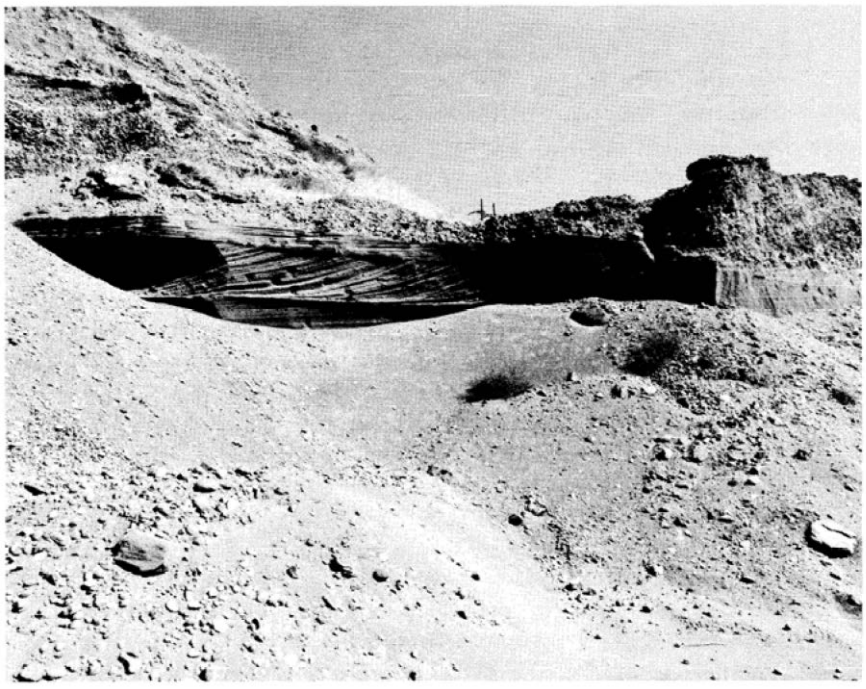

Photo 11. Lens of torrential, cross-bedded fluvioglacial sand overlain by crudely stratified gravel in Jones-Scott pit (No. 46) at Umatilla.

Photo 12. Close-up view of fluvioglacial gravel at Umatilla (No. 48). The gravel is composed of rounded to subangular stones ranging in size from sand to cobbles and composed of dense to vesicular basalt. Selective excavation is used to produce the desired gravel gradation.

Alluvial Deposits (Qol)

Alluvial deposits refer to Quaternary alluvium (Qol) found in the channels and flood plains of present-day streams. Quaternary alluvium containing grovel in sufficient quantity to be utilized commercially occurs only in certain geologic settings. The upper reaches of the stream must flow through on area underloin by hard but jointed rock. Steep narrow canyons allow the eroded rock to reach the stream in lorge volumes, while a moderate to steep stream gradient will transport a lorge bedload of coarse grovel. Where the stream enters a broad volley, its velocity decreases abruptly and the coarse material is deposited. As the stream migrates within its flood plain, it leaves deposits of cross-bedded gravel and sand.

Winter floods increase the capacity of the stream to carry large gravel. As a result, grovel scoured from the channel and eroded from the banks of the stream is moved downstream and deposited where the current is less, as, for example, in the Mission area east of Pendleton (photo 6). In such areas, grovels tend to be replenished where they were previously extracted unless the channel is modified so that stream velocities are increased (photo 13). Where channel modifications increase the stream gradient, the stream will tend to erode and transport gravel rather than deposit it. [For additional information on the dynamics of stream flow and channel management, see Bowman (1975).]

Twenty sites of alluvial grovels ore being used in the County. The most important ore along the Umatilla River east of Pendleton, mainly on the Indian Reservation west of Mission. Several commercial gravel producers hove made arrangements with the Bureau of Indian Affairs to extract grovel.

Although the Mission area grovels ore not replenished completely each year, occasional floods bring sufficient quontities for periodic cropping of gravel bars, provided that a meandering channel and low gradient ore maintained so that the grovel is deposited rather than swept downstream.

RECLAMATION OF MINED LAND

Planning for Secondary and Tertiary Uses

When the planner or the land-use decision maker tries to occomodote surface mining to a comprehensive lond-use plan, he has conflicts with other objectives of the plan. If the mineral resource is in a residential area, the planner must protect the area from noise, dust, vibration, traffic, and unsightliness of pits and quarries. At the some time, he must ensure that the mineral resource con be mined in order to supply the area with low-cost construction materials. Because transportation is a major cost foctor, the surface mine needs to be near the market, even though it lies in or near the residential area. The two extreme answers to the conflict ore: 1) prohibit mining or 2) exempt mining from regulations.

The State 1971 Legislative Assembly provided a compromise by passing a mined-land reclamation low having two purposes:

(1) To provide that the usefulness, productivity, and scenic values of all lands and water resources affected by surfoce mining operations within this state shall receive the greatest practical degree of protection and reclamation necessary for their intended subsequent use.

(2) To provide for cooperation between private and govenmentol entities in carrying out the purposes of the Mined Land Reclamation Low.

Judicious planning con result in wise land use and conservation of our mineral resources. The diverse use of land for ogriculture, recreation, residential and commercial-industrial development, and mining con be integrated with foresight and determination to serve everyone's purpose. Photo 14 illustrates the effects of poor planning and lock of control. Here, the site was mined to the property lines leaving a hazardous vertical high wall that poses a danger to adjacent use of the land for ogriculture. Since the topsoil was not saved for reclaiming the land for agricultural use, an unsightly pit remains to downgrade the quality of the rurol landscape. The trend for the future should be for governmental agencies ot various levels to pre-plan sequentiol land use in cooperation with the mining operator, whether the operator is a governmental agency or a private party.

The Oregon Deportment of Geology and Mineral Industries has been charged by low to corry out the purposes of the Mined Land Reclamation Low. To discharge the duty under that law, a Division of Mined

Photo 13. County-owned Hurst pit (No. 13) at Milton-Freewater in left foreground of photo. Readymix Sand and Gravel Co. pit (No. 12) at top center of photo. The stream has been channeled, preventing normal accumulation of gravel.

Photo 14. Jellum quarry (No. 151) in Columbia River Basalt just southeast of Pendleton Airport. Steep quarry faces adjacent to property lines will make reclamation difficult.

Land Reclamation was established in Albany, Oregon. The address is Department of Geology and Mineral Industries, Mined Land Reclamation Division, P. O. Box 1028, Albany, Oregon 97321. Although not directly charged by State law, Umatilla County, through its zoning laws, also is involved with carrying out the purposes of the Mined Land Reclamation Low. Within their respective roles both agencies have the right to modify or veto a reclamation plan submitted by a mining operator (an operator can be a private party, a corporation entity, or a city, county, State, or Federal agency that operates a stone quarry or a gravel pit). The two roles are complementary: the Department has a lorge range of expertise in mining geology, mining techniques, and reclamation processes; the County has the knowledge of the local needs.

The Department's role should include acquainting planning bodies with the ideo of preserving mineral lands. The need for preserving other natural resources, such as farmland, is recognized by the progressive planners, but the idea of preserving mineral land is relatively new. The land should be zoned for open-space uses which would allow it to be maintained as recreation or wildlife preserves or used for other purposes such as farming, timber, or grazing until the need for the underlying minerals becomes more pressing. Urban expansion can kill mineral resources or odd to the operation costs. The U. S. Bureau of Mines report discusses the effect of urbanization on mineral aggregate (Bishko and others, 1969; French and others, 1970).

Reclaimed use should be a major consideration in zoning resource areas. For example, a gravel resource area could be kept for open-space use, such as farming, and urban development allowed to encircle it. After the resource has been mined, a secondary use might be for sanitary landfill, and a tertiary use might be for residential development or for a community park. The County Planning Department must set guidelines which take into account these secondary and tertiary uses. The guideline plans should be firm enough to ensure that on area reserved for rock-material extraction could be mined when the need arises even though surrounded by urban development.

The operator's role should not be as adversary to the two agencies. The operator has as much stake in carrying out the purposes of the Reclamation Low as any agency. Reclamation is not something added to a mining operation to increase the operator's cost but rather a process that allows the operator to maximize his total profits through optimal utilization of the mined-out land.

Reclamation Procedures

The Division of Mined Land Reclamation procedures were designed to allow as much input into the reclamation plan as possible, to minimize conflict with other land uses, and to ensure that the planned reclamation is performed. Only a list of the procedural steps is given below; the Division office con supply more detailed information. The steps ore, briefly, as follows:

(1) A potential mining operator files with the Division an application and a reclamation plan (a copy of the application is reproduced as Appendix 2).
(2) The application and plan are copied and submitted for review to eleven (11) State agencies and to Umatilla County. If the operation is to be on Federal land, it also will be sent to the particular Federal land manager. The County planners have the opportunity and duty to provide input to an operator reclamation plan during the review cycle.
(3) Division specialists collect and evaluate review comments.
(4) An on-site inspection is arranged with the operator and a Division specialist. If the review of the reclamation plan has drown some strong conflict or concerns, the reviewing agencies may be requested to meet on-site to resolve the conflicts.
(5) The on-site inspection determines if the reclamation plan is feasible, resolves the conflicts, and determines the amount of bond the operator shall post.
(6) The operator accepts the modified reclamation plan and posts the bond.
(7) The Department issues an operating permit. The permit may or may not have conditions attached to it.

Reclamation Assistance

Umatilla County planners and zoning decision makers probably do not have a tax base which would allow them to hire all the expertise needed for making rational decisions concerning the acceptability and/or feasibility of a particular reclamation plan or the integrating of surface mining within a comprehensive land-use plan. The Oregon Department of Geology and Mineral Industries, which regulates surface mining, can be used as a consultant. A copy of the Department Reclamation Division's reclamation plan guideline is included as Appendix 3. This guideline was prepared as a checklist for the Division specialists and is to be used by the operator in preparing a standard reclamation plan. The questions asked reveal what the Division looks for in a reclamation plan.

Monetary assistance has been provided to recloim surface mines for recreation under the U. S. Department of the Interior, Bureau of Outdoor Recreation, Program of Reclamation for Recreation. The Bureau's report, "Sources of Assistance in Reclaiming Surface Mined Lands for Outdoor Recreation," lists sources of assistance for all types of recreation (U. S. Department of Interior, 1974).

The National Sand and Grovel Association has published on outstanding series of reports (Bauer, 1965, 1970; Baxter, 1969; Jensen, 1967; Johnson, 1966; N.S.G. A., 1960; and Shellie and Rogier, 1964) on all phases of reclaiming sand and gravel and rock quarries. The Reclamation Division has a set on loan, which anyone can study at the Division's Albany office. Any Umatilla County aggregate producer belonging to the Oregon Concrete Aggregate Producers Association, Inc., might be willing to lend a set.

A major way that Umatilla County could help the planning process involving surface mining would be to establish a reclamation library. A major value of the library's availability at the County level would be that the operator, the planner, and the public could study what has been and what could be done to afford secondary and tertiary uses of mined-out areas. A partial list of what mined-out areas could be used for includes: residential, both single family and high-rise; open space, such as regional parks, golf courses, and country clubs; water impoundments, such as municipal water reservoir, water sources for fire protection (photo 15), water-based park, or sewage lagoons; commercial-industrial sites; sanitary or demolition fills; or agriculture, such as truck forms, tree farms, or fish-pond farms.

Reclamation Economics

The Reclamation Division's administration budget is obtained from operator fees. A $150.00 fee for the initial application is charged, along with $100.00 inspection fee. The renewal application fee is $50.00, and o $100.00 inspection charge is also made. The County makes zoning change charges. The operator also may have to post a bond with both the County and the Division. When mining is over, the reclamation must be performed. That cost can range from zero to several thousand dollars per acre for old unplanned mining sites.

At this point two questions can be asked: (1) Is the cost of reclamation worth it?, and (2) Who shall pay for the reclamation? In the post many operators practiced the mine-out-and-run procedure with adverse publicity. With comprehensive planning, however, that type of action cannot be allowed. Reclamation is imperative, and mining must be planned to minimize reclamation cost. What would be the cost of reclamation from a farm, to a mine, to a demolition fill, to a residential development? None, since a profit was realized at each step of the way and the land value was higher at the end of the tertiary use because of urbanization. In answer to the first question, reclamation is worth the cost. The land base must be kept usable.

The answer to the question, "Who shall pay for the reclamation?" initially appears to be, "The operator." The operator is on the site and can use the equipment for reclamation at any time it is not in use for mining. The cost of this work is passed on to the consumer as increase in price of the delivered material. In the long run, the operator stands to recover his original costs in the increased value of the land when he sells the property for other use, and consumers in the immediate vicinity enjoy increased property value and a cleaner environment in which to live.

Too often planners and decision makers with pressures from the local citizens view only the detrimental aspects of mining, overlooking the economic and potential re-use benefits of the mineral areas. Local governmental agencies should undertake studies to evaluate both the beneficial and detrimental aspects of

mining as an integral part of the development of the local land use programs. This section is not intended to give final answers but to show where to look for answers, recognizing that most planning-zoning decisions are consummated finally in the political arena.

Photo 15. Spring Mountain quarry (No. 189), located in sec. 30, T. 1 S., R. 37 E., is a rock source for U.S. Forest Service. This excellent rock is available for crushing at a later time; meanwhile, the quarry serves as a water source for fire-protection equipment.

SUMMARY

Rock materials in Umatilla County are used primarily by the Oregon Highway Department, U. S. Forest Service, Umatillo County, commercial enterprises, and private individuals. Good rock material sources are presently available throughout the County. Road construction and maintenance by governmental agencies will continually require large quantities of this product. However, the commercial sector will become increasingly important as a user of rock materials in the future because of increasing population and industry. Commercial producers may also wish to take advantage of the potential market predicted in the Portland municipal area.

From 1970 through 1974 the ratio of commercial to noncommercial sand and gravel production ran 48 to 52 percent respectively. During the same period, commercial to noncommercial quarry rock was 28.5 to 71.6 percent respectively. The larger quantity of noncommercial quarry rock is attributable to the I-80 freeway construction in the Blue Mountains (Figure 2). From 1960 to 1969 sand and gravel amounted to 41.5 percent of the total aggregate produced, but from 1970 to 1974 it increased to 55.4 percent.

The fact that commercial gravel producers numbered only 4 percent of the total sources but produced 48 percent (Table 6) of the sand and gravel illustrates the relative importance of sand and gravel.

Certain of the areas near Umatilla, Milton-Freewater, and Mission underlain by gravel should be reserved for future rock production. This can be accomplished by implementing planning and zoning ordinances based on knowledge of the availability of the resource and the future needs. Since population and industry are responsible for the aggregate consumed, the predicted future growth should dictate the amount of rock materials which will be needed.

Benefits from planning, zoning, and reclaiming a rock-material site can be distributed three ways: to the operator through sale of the depleted property and slightly higher product sales prices; to the local customer by eliminating the cost of a long haul; and to the County and the people who live there by providing a more pleasing environment.

CONCLUSIONS

Gravel and stone seem to be relatively abundant in Umatilla County; but since long truck haul of this resource is costly, local sources must remain available. The establishment of sources close to their market becomes increasingly difficult because the need for rock products, especially aggregate, is based upon growth and development, which in turn prohibits expansion and forces closure of extraction and processing plants. Although the resource may seem to be abundant, it con become prematurely scarce.

Commercial rock requirements average about 11 tons per capita annually in Umatilla County. Based upon population studies nearly 15 million tons will be used in the next 24 years. In addition, grovel in and adjacent to the Columbia River may be exported to the Portland-Vancouver area in amounts ranging up to 5 million tons annually. By the year 2000, the total amount could exceed 100 million tons.

It is important that long-range zoning plans be implemented to assure the availability of this resource with a minimum adverse environmental impact.

Quarries in Columbia River Basalt ore needed to supplement commercial gravel used in urban areas and for road construction in rural and mountainous areas lacking in large gravel deposits. In urban areas gravel is needed and should be reserved for concrete aggregate, but available quarry rock con be used for fill, base rock, and riprop.

Reclamation of mined-out quarries and gravel pits should be required, with the ultimate use of the land compatible with the County's long-range plans.

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APPENDIXES

APPENDIX I. EXPLANATION OF TERMS

Aggregate: Uncrushed or crushed gravel, crushed stone, sand, or artificially produced inorganic material used to form the major part of portland cement concrete or asphaltic concrete.

Alluvium: Earth, sand, gravel, or other rock materials transported and laid down by flowing water.

Base rock or base course: A layer of specified or selected material of planned thickness constructed on the subgrade or subbase of a road. Size is usually 3½ inch minus for base course; can be larger for subgrade or subbase.

Bedrock: Any more or less solid, undisturbed rock in place at the surface of the Earth. May be exposed or may be hidden beneath unconsolidated surficial material.

Commercial materials: Rock materials produced for sale to the public.

Crushed gravel: Oversize water-rounded stones from a gravel pit that have been crushed and screened to certain maximum and minimum dimensions. Individual fragments have at least one broken face.

Crushed rock: Quarry rock (bedrock) which has been crushed and screened to a certain dimension.

Diced rock: Closely jointed and/or naturally fractured outcrop of rock. Can usually be excavated from a quarry with little or no blasting.

Gravel: Small stones and pebbles worn by action of air and water; larger than sand and smaller than cobbles; or the size of material that passes a 3-inch sieve and is retained on a 3/8-inch sieve. Cobble gravel may have sizes up to 10 inches.

Gravel bed: A deposit of stream-transported stones and sand. The stones are water worn and round to subrounded. May represent the deposit of a prehistoric stream.

Gravel pit: An excavation in an alluvial area from which sand and gravel have been or are being mined.

Materials source: Gravel pit or rock quarry.

Noncommercial materials: That rock material produced under contract for construction projects such as Federal dams, State and Federal highways, and U. S. Forest Service roads rather than for public consumption.

Outcrop: That part of a rock formation or stratigraphic unit exposed at the surface of the ground, or would be exposed if surficial materials were removed.

Pit or quarry run: Raw rock material taken from a pit or quarry; not crushed, screened, or dried.

Quarry: A bedrock outcrop or talus area from which rock material is being dug or mined.

Road metal: Gravel or stone suitable for surfacing roads.

Rock material: Any natural occurrence of consolidated or unconsolidated mineral matter and products dug or mined from it. Includes clay, shale, pumicite (volcanic ash), volcanic cinders, and scoria; sand and gravel; and stone. Also includes the above material mined as pit or quarry run that has

been crushed, screened, or dried. Does not include material colcined or otherwise processed to alter physical characteristics.

Sand: Any hard, granular rock material resulting from the natural disintegration of bedrock and finer than gravel and coarser than dust; the size of material that passes a 3/8-inch sieve but is retained on a 200-mesh sieve.

Sand and gravel deposit: An alluvial deposit composed of a mixture of sand, gravel, cobbles, and boulders.

Stone: Individual blocks, masses, fragments or crushed sizes of same taken from bedrock in a quarry or natural outcrop.

Talus: Loose, unsorted and incoherent rock fragments and cliff debris transported downslope chiefly by gravity.

APPENDIX 2. APPLICATION FORM FOR OPERATING PERMIT

STATE DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

P.O. Box 1028
Albany, Oregon 97321
Tel. (503) 928-5386

Identification No._____

Office Use Only _____

APPLICATION FOR OPERATING PERMIT OR GRANT OF EXEMPTION UNDER ORS 517.750 - 990

1. Responsible Parties

A. Operator

Name_____

Street or Box No._____

City_____State_____

Zip_____Telephone_____

B. Landowner (if other than operator)

Name_____

Street or Box No._____

City_____State_____

Zip_____Telephone_____

3. MINERAL DEPOSIT CHARACTERISTICS

A. Description

Type of overburden_____

Approximate depth of overburden_____

Approximate depth of mine_____

Primary mineral to be removed_____

Estimated quantity of mineral (yards)_____

B. Size

Size in acres of any areas presently affected by surface mining_____

How much of the above was affected
before 7/1/72_____

before 7/1/75_____

Has any of the above area been reclaimed?_____

If yes, how much and when?_____

Approximate acreage to be affected by surface mining during the ensuing 12 months_____

C. Volume

Total cubic yards excavated 7/1/72 to date_____

During ensuing permit year, what is the scheduled total cubic yards to be excavated_____

D. Statue

☐ Active Date mining began _____

☐ Inactive Date mining will begin _____

☐ New

2. Identification of Site

A. ¼Sec. Section Township Range County

Distance in miles | Direction from | Nearest Community

Type of site: (Check all that apply)

☐ 1. Pit ☐ 5. Prospect
☐ 2. Stockpile ☐ 6. Refuse Disposal
☐ 3. Plant ☐ 7. Other
☐ 4. Quarry

4. Application is hereby made for: (complete only one - see instructions)

A. Operating permit - operator claims no exemptions_____

I apply for a surface mining operating permit under ORS 517.800_____date_____
(signature) Title_____

B. Grant of limited exemption based on: (check one or both)

☐ Prior mined

☐ Valid contract

I apply for a grant of limited exemption from the requirement for a reclamation plan and bond, but not the fees Signature _____
Date_____ Title _____

C. Grant of total exemption.

I apply for a grant of total exemption from the requirements of a reclamation plan, bond, and the fees under ORS 517.750 (11) and 517.770 (2) because:

☐ 1. All mining activity takes place between the banks of a stream. (The vegetation line defines the bank).

☐ 2. Access road's borrow pit or quarry.

☐ 3. On-site construction.

☐ 4. The site is less than one acre, and

☐ 5. a total of less than 2,500 cubic yards of material have been, or will be, removed.

☐ 6. The site is inactive.

☐ 7. Other

_____date_____
(signature) Title_____

D. Even though entitled to exemptions as shown above, a reclamation plan is submitted voluntarily.

Yes. No.

NOTICE

If more than 50 cubic yards of material are to be removed or placed in fill within the bed and banks of a natural waterway, a permit from the Division of State Lands, 1445 State Street, Salem, Oregon 97310, telephone: 378-3805, is required.

SMLR-1 071476

INSTRUCTIONS FOR COMPLETING FORM SMLR-1

Complete parts 1 & 2

Complete part 3

3B. Include all acres of any area affected by surface mining including overburden or spoils storage, stripped or cleared areas, and working area.

3C. Estimated volumes are accepted.

3D. "New status" means a site on which no mining has occurred as of the date of this application.

Complete either 4A or 4B or 4C

4A. An operating permit is required for any surface mining operation which involves more than 1 acre of land or more than 2,500 cubic yards of material during any 12 month period, EXCEPT if your mining operation is conducted entirely on land that was mined before July 1, 1972, OR you are a partner of a contract to surface mine the area, signed before January 1, 1971. If so, DO NOT SIGN 4A but COMPLETE 4B.

4B. Sign this section ONLY if your surface mining operation involves more than 1 acre of land or more than 2,500 cubic yards of material during any 12 month period, AND ALSO is conducted entirely on land that was surface mined before July 1, 1972, OR IF you are a party to an unexpired contract to surface mine, signed before January 1, 1971. (See ORS 517.770 - 1a and 1c)

4C. Complete this section only if your surface mining operation is less than one acre in size and involves less than 2,500 cubic yards per 12 month period OR fits one of the other qualifications listed. (See ORS 517.750 (11) and ORS 517.770 (2))

4D. Submission of a voluntary reclamation plan does not obligate the operator if otherwise entitled to exemptions indicated in 4B or 4C.

DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
MINED LAND RECLAMATION DIVISION

RECLAMATION PLAN GUIDELINE

A. NAME, ADDRESS AND TELEPHONE NUMBER OF THE OPERATOR OR HIS AGENT:

B. NAME AND ADDRESS OF LANDOWNER:

C. LIST OF KNOWN MATERIALS FOR WHICH THE OPERATION IS TO BE CONDUCTED:

1. PROPOSED STARTING DATE:
2. PROPOSED ENDING DATE (IF KNOWN):

D. OPERATIONAL PLAN:

1. METHOD TO BE EMPLOYED:

   a. SINGLE BENCH
   b. MULTIPLE BENCH
   c. DREDGE
   d. OTHER_____

2. TYPES OF EQUIPMENT TO BE USED:

3. DISPOSITION OF OVERBURDEN:

E. WHAT WILL BE THE PLANNED SUBSEQUENT "BENEFICIAL USE" OF THE PERMIT AREA? THIS CAN INCLUDE, BUT IS NOT LIMITED TO, CONSTRUCTION SITE, SANITARY LAND FILL, PARK, WATER IMPOUNDMENT, AGRICULTURAL USE (BE SPECIFIC, EXAMPLE: GRAZING LAND, CROP TO BE PLANTED, ETC.), FOREST LAND.

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F.1. (a) Reclamation will begin _____ days following completion of mining.
(b) Reclamation will be concurrent with mining. _____ yes _____ no

F. 2. PROVISION FOR RECLAIMING MINED LANDS ON A CONTINUING BASIS WHERE FEASIBLE.

G. RECLAMATION PROCEDURES

1. WHAT WILL YOU DO TO INSURE GROUND STABILITY?

2. PROVISION FOR REVEGETATION. (Minimal survival rate is 75% uniformly distributed.)

(a) HOW WILL YOU SAVE AND STORE TOPSOIL?

(b) WHAT MEASURES WILL YOU TAKE TO PREVENT EITHER WIND OR WATER EROSION OF TOPSOIL DURING STORAGE?

(c) WHAT WILL BE THE AVERAGE DEPTH OF TOPSOIL REPLACED ON THE AREA TO BE RECLAIMED.

(d) HOW WILL YOU PREPARE SEED BED PRIOR TO PLANTING?

(e) WHAT TYPES AND AMOUNTS OF GRASS SEED WILL YOU USE PER ACRE AND HOW WILL THIS BE PLANTED?

(f) WHAT TYPES AND AMOUNTS OF FERTILIZER, MULCH, AND LIME WILL YOU USE?

(g) WHAT TYPES AND AMOUNTS OF SEEDLINGS AND SHRUBS WILL YOU PLANT?

(h) WHEN WILL SEEDING AND PLANTING TAKE PLACE? (SEASON OF YEAR)

H. WATER AND DRAINAGE

(a) WHAT PROVISION WILL YOU TAKE TO INSURE PROPER DRAINAGE?

(b) WHAT PROVISION HAS BEEN TAKEN FOR SILT CONTROL?

(c) IF WATER IMPOUNDMENT IS TO BE LEFT, SEE PAGE 6.

I. VISUAL SCREENING

(a) WILL YOU EMPLOY VISUAL SCREENING? (IF NO, EXPLAIN)

(b) WHAT TYPES AND AMOUNTS OF PLANTS WILL YOU USE?

(c) WHAT WILL BE THE SPACING BETWEEN PLANTS?

J. PROVISION FOR REMOVING STRUCTURES, EQUIPMENT, AND REFUSE FROM THE PERMIT AREA IN ACCORDANCE WITH THE RECLAMATION PLAN.

K. MAP OF AERIAL PHOTO REQUIREMENTS

(a) WILL AREA PHOTO BE SUBMITTED? YES _____ NO _____

SCALE_____

(b) MAP(S) REQUIREMENTS. THE MAP SHOULD SHOW, BUT IS NOT LIMITED TO:

(1) SCALE: (1" = 400' to 600')

(2) NORTH SHALL BE INDICATED

(3) QUARTER SECTION, SECTION, TOWNSHIP AND RANGE

(4) DISTANCE AND DIRECTION TO NEAREST MUNICIPALITY

(5) LOCATIONS AND NAMES OF ALL STREAMS, ROADS, RAILROADS, UTILITIES

(6) LOCATION AND NAMES OF ADJACENT LANDOWNERS

(7) ALL OCCUPIED HOUSES WITHIN 500 FEET

(8) LOCATION OF ALL PROPOSED ACCESS ROADS

(9) LOCATION OF PLANT, OFFICE AND MAINTENANCE FACILITIES

(10) SHOW BOUNDARIES OF AREA TO BE PERMITTED

(11) TYPICAL CROSS-SECTION OF PRESENT GROUND LINE AND PROJECTED GROUND LINE AFTER RECLAMATION

(12) CONTOUR INTERVAL, DATE OF MAP PREPARATION, NAME OF PERSON PREPARING MAP.

(13) AREA FOR TOPSOIL STORAGE, WASTE DISPOSAL

(14) A SEPARATE MAP SHOWING GENERAL LOCATION OF THE OPERATING AREA (NOT LARGER THAN 8½" x 11")

(c) A REVISED MAP MAY BE REQUIRED ANNUALLY

L. IF APPLICABLE, WHAT PROVISIONS HAVE BEEN MADE FOR STREAM CHANNEL, BANK STABILIZATION AND REHABILITATION?

M. EVIDENCE, IN WRITTEN FORM, STATING THAT ALL OWNERS OF A LEGAL, EQUITABLE, FIDUCIARY OR POSSESSORY INTEREST IN THE LAND CONCUR WITH THE PROPOSED SUBSEQUENT USE FOR ANY MINING OPERATION COMMENCING SUBSEQUENT TO JULY 1, 1972.

N. OTHER PERMITS IF APPLICABLE:

DIVISION OF STATE LANDS	NO._____	DATE _____
DEPARTMENT OF ENVIRONMENTAL QUALITY	NO._____	DATE _____
COUNTY USE PERMIT	NO._____	DATE _____
OTHER (IDENTIFY)		

O. OTHER COMMENTS:

_____

(SIGNATURE OF APPLICANT)

TITLE _____ DATE _____

WATER IMPOUNDMENTS

(1) HOW LARGE WILL THE SURFACE AREA BE, IN ACRES? _____

(2) WHAT PROVISIONS HAVE BEEN MADE FOR PUBLIC SAFETY?

(3) WHAT PROVISIONS HAVE YOU MADE TO PREVENT WATER STAGNATION?

(4) WHAT IS THE WATER SOURCE FOR THE IMPOUNDMENT?

(5) WILL THERE BE PUBLIC ACCESS FOR FISHING?

INSTRUCTIONS FOR CROSS-SECTION

1. THE TWO EXAMPLES SHOWN ARE "TYPICAL" CROSS-SECTIONS OF A WATER IMPOUNDMENT LEFT AFTER EXCAVATION IS COMPLETE.

2. IF ONE OF THE PLANS SHOWN IS TO BE USED, PLEASE INDICATE WHICH ONE AND PROVIDE THE FOLLOWING INFORMATION ON THE PLAN SELECTED. YOU DO NOT HAVE TO RE-DRAW THE CROSS-SECTION.

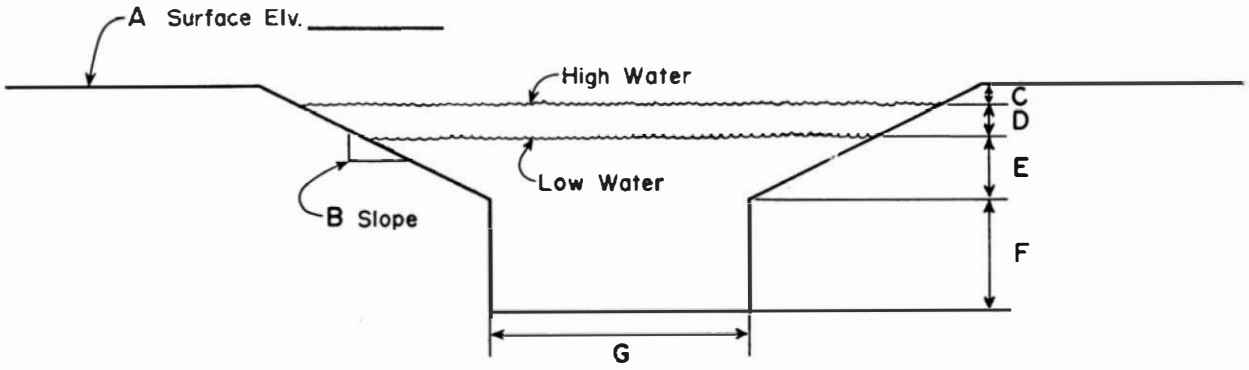
   A. SURFACE ELEVATION TO THE NEAREST 5 FEET.

   B. SLOPE OF THE BANK (MAXIMUM IS 2:1 OR 27°).

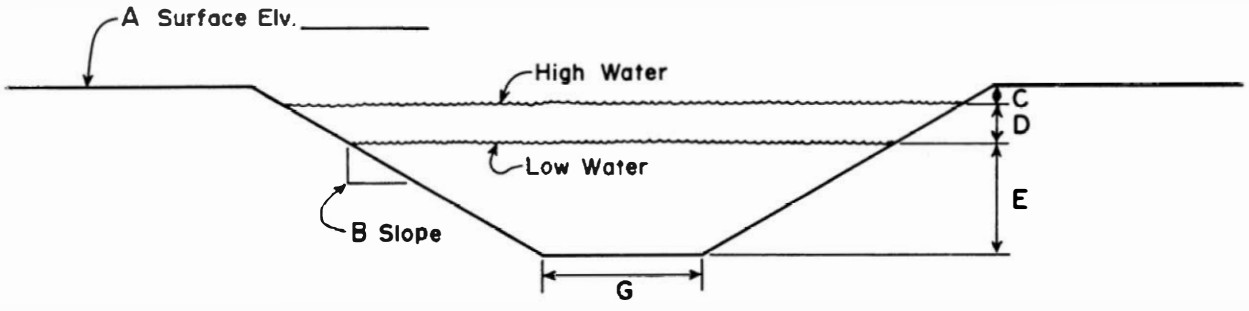
   C - G. THE DIMENSIONS IN FEET.

Typical Cross - Section(s) of Water Impound

TYPE I



TYPE II



APPENDIX 4. LIST OF ROCK MATERIAL SOURCES IN UMATILLA COUNTY

MAP NO.	LOCATION (SEC.)	OWNER	NAME	TYPE OF DEPOSIT	FM	LAR	Na_2SO_4 (% loss)
T6N, R38E							
1	22 SW/NW	USFS	Indian Ridge Rd.	Basalt Q	Tcr		
2	23 SE/SW	USFS	Indian Ridge Rd.	Basalt Q	Tcr		
T6N, R37E							
3	28 NE 1/4			Basalt Q	Tcr		
4	30 NW/NE	County	Lynch Site	Basalt Q	Tcr		
T6N, R36E							
5	27 NW/NE		Birch Creek	Gravel	Qal		
6	34 NE/SE			Gravel	Qal		
T6N, R35E							
7	24 SW/SE	Spencer & Son		Gravel	Qal		
8	25 NE/SW			Gravel	Qal		
9	29 NE/NW	OSHD		Gravel	Qal		
10	33 SE/NE			Gravel	Qal		
11	34 SW/SE			Gravel	Qal		
12	36 NW/NW	Readymix Sand & Gravel Co., Inc.		Gravel	Qal		
13	36 NW/NW	County	Hurst Pit	Gravel	Qal		
T6N, R34E							
14	35 NW/NW	Private	Cockburn Quarry	Basalt Q	Tcr		
T6N, R33E							
15	23 NE/SW	Private	Harris Quarry	Basalt Q	Tcr		
16	33 NE/SE	County		Basalt Q	Tcr		
T6N, R31E							
17	35 NW/SE	Private	Pearson Quarry	Basalt Q	Tcr		
T5N, R38E							
18	1 NE/NE	USFS	Upper Tiger Cr	Basalt Q	Tcr	15.5-28.9	2.9-17.9 ?
19	1 SE/SW	USFS	Tiger Saddle	Basalt prosp	Tcr	19.6	
20	23 NW 1/4	USFS	Tiger Saddle	Basalt prosp	Tcr	49.3	
T5N, R36E							
21	5 SE/NE	Private		Grand	Qfg		
22	7 SW/SW			Basalt Q	Tcr		
23	7 NW/SW			Basalt Q	Tcr		
24	18 SE/NW			Basalt Q	Tcr		
25	22 SE/NW	Private	Graham	Basalt Q (?)	Tcr(?)		
26	30 NW/NW	Private	Couse Creek Q	Basalt Q	Tcr		
T5N, R35E							
27	4 SW/NW	Private	Knosp Site	Basalt Q	Tcr		
28	9 SE/SE	Private	Harder Q Site	Basalt Q	Tcr		
29	13 NW/NE	Private		Basalt Q	Tcr		
30	35 NW/NE	OSHD		Basalt Q	Tcr	15.1	
31	35 NE/SE	OSHD		Basalt Q	Tcr		

APPENDIX 4. (Cont.)

PI	LL	SPECIFIC GRAVITY	O A D Pass #20 Ht.	DURA. coarse/fine	QUALITY	QUANTITY	REMARKS
					good	Small	Located on road
					good	Small	Located on road
							Inactive
						Small	County; inactive
							Inactive
							Inactive
						Small	Commercial source
						Small	Abandoned - dump
						Small	1R-1-1630; abandoned
						Small	Abandoned
						Small	Abandoned
						Large	Commercial source
						Small	Walla Walla River
						Small	Inactive
						Small	Inactive
						Small	
						Small	Active
NP						Small	In roadway
				67/55			Not used
				50/37			Not used
							Inactive
						Small	Inactive
						Small	Abandoned
						Small	Inactive
						Small	
						Large	
						Small	Inactive
						Small	Inactive
						Small	Abandoned
3	31	2.76				Medium	Inactive
						Large	MP 25.0 Hwy. 8

MAP NO.	LOCATION (SEC.)	OWNER	NAME	TYPE OF DEPOSIT	FM	LAR	Na_2SO_4 (% loss)
T5N, R34E							
32	1 NE/NW	Private	Schubert Quarry	Basalt Q	Tcr		
33	9 SW/SW	Private	Rice Quarry	Basalt prosp	Tcr		
34	17 NW/NE	Private	Holt Quarry	Basalt Q	Tcr		
35	29 SE 1/4	Private	Walker Quarry	Basalt Q	Tcr		
36	31 SW/SE	Private	Rush Quarry	Basalt Q	Tcr		
37	35 SE/SE	OSHD		Basalt Q	Tcr		
T5N, R33E							
38	6 SE/NE	Private	Van Sickle Q	Basalt Q	Tcr		
39	9 SW/NE	Private	Butler lease	Basalt Q (?)	Tcr		
40	15 SW/SE	Private	Raymond Site	Basalt Q	Tcr		
T5N, R32E							
41	8 SW/SE	Private	Gordon Site	Basalt Q (?)	Tcr		
42	9 NE/NE	Private		Basalt Q (?)	Tcr		
43	33 SW/SE	County	Engdahl	Basalt Q	Tcr		
T5N, R29E							
44	22 SE/NW	OSHD		Basalt Q	Tcr	15.1	
44A	20 SW 1/4	OSHD		Gravel			
T5N, R28E							
45	16 SW/NE	OSHD	Umatilla	Gravel	Qfg	12.7, 16.3	.3, 3.3
46	16 NW/SW	Jones-Scott Co.		Gravel	Qfg	18.1	
47	16 NE/SW	Jones-Scott Co.		Gravel	Qfg		
48	16 SE/SW	Riverbend Construction		Gravel	Qfg		
49	17 SW/NE	Umatilla Ready Mix Inc. Rohde Sand & Gravel Columbia Sand & Gravel Jones-Scott Co.		Gravel	Qfg		
50	17 NE/NE			Gravel	Qfg		
51	20 NW/NW			Gravel	Qfg		
52	21 NW/NE	Riverbend Quarry		Basalt Q	Tcr		
53	22 SE/SW			Gravel	Qfg		
54	27 NW/NW			Gravel	Qfg		
55	27 SE/SW	OSHD		Basalt Q	Tcr		
56	28 NE/SE		Umatilla Butte	Basalt Q	Tcr	13.3-14.2	
57	29 NW/NW			Gravel	Qfg		
58	30 NE/NE			Gravel	Qfg		
59	32 SW/SW			Sand Pit	Qfg		
60	33 NE/NE			Basalt Q	Tcr		
T4N, R38E							
61	23 NE/NE	USFS	Gabriel Spring	Basalt Q	Tcr	31	
T4N, R37E							
62	28 SW/SW			Basalt Q	Tcr		
63	30 SW/SW	OSHD		Basalt Q	Tcr		
64	36 NE/NW			Basalt Q	Tcr	21.8, 24.5	1.4, .5
T4N, R36E							
65	22 NW/SW		Big Rayborn Can	Basalt Q	Tcr		

PI	LL	SPECIFIC GRAVITY	O A D Pass #20 Ht.	DURA. coarse/fine	QUALITY	QUANTITY	REMARKS
						Medium	Inactive
						Small	Inactive
						Small	Inactive
						Small	Loc. approx.; inactive
						Large	Inactive
						Small	Inactive
						Small	Inactive
						Small	Inactive
						Small	Inactive
						Small	Inactive
						Small	Inactive
		2.97	23.04 @ .4		Good	Large	1R-1-675
						Large	Unused
NP	26	2.75-2.85	16.7 @ .5		Good	Medium	1R-2-1686
		2.80			Good	Large	Commercial
						Large	Commercial
					Good	Large	Commercial
					Good	Large	Commercial
						Large	Commercial
							1R-1-1475
						Large	Inactive
					Good	Large	
		2.94,2.96	15.6 @ .2				1R-1-1476; inactive
						Medium	Inactive
						Medium	Inactive
							Inactive
							Inactive
				93/71			Located in Union Co.
							Exhausted
3,NP	27,22	2.78,2.91			Good	Large	

MAP NO.	LOCATION (SEC.)	OWNER	NAME	TYPE OF DEPOSIT	FM	LAR	Na_2SO_4 (% loss)
T4N, R35E							
66	16 SE/NW	OSHD		Basalt Q	Tcr		
67	23 SE/NW		Weston Quarry	Basalt Q	Tcr	20.9	
68	24 NW/SW	OSHD		Basalt Q	Tcr	14.5	
T4N, R34E							
69	10 NE/SW			Basalt Q	Tcr		
70	22 NE/SW	OSHD	Catron Quarry	Basalt Q	Tcr		
71	31 NE/NW			Basalt Q	Tcr		
72	35 SW/SW			Basalt Q	Tcr		
T4N, R32E							
73	23 NW 1/4	OSHD	Struve Quarry	Basalt Q	Tcr		
74	29 SW/NW			Basalt Q	Tcr		
T4N, R31E							
75	2 SE/NW	OSHD		Basalt Q	Tcr	12.7	
76	5 NW/NW			Basalt Q	Tcr		
77	30 SE/NW		Simpson Quarry	Basalt Q	Tcr		
T4N, R30E							
78	7 SE/NW			Basalt Q	Tcr		
79	36 NW/SE			Basalt Q	Tcr		
T4N, R29E							
80	7 SE/NE	County	Christley Pit	Gravel	Qfg		
81	31 SW/NW			Gravel	Qfg		
T4N, R28E							
82	1 NW/SE			Gravel	Qfg		
83	3 NW/NW			Gravel	Qfg		
84	9 NE/NE	City of Hermiston	Schell Pit	Gravel	Qfg	13.9	
85	11 SW/NE			Sand Pit	Qfg		
86	14 NE/NE	OSHD	Airport Pit	Gravel	Qfg	17.2-12.7	.8-7.1
87	15 SE/SE			Gravel	Qfg		
88	16 NE/NW			Gravel	Qfg		
89	17 NW/SW		Westland Pit	Gravel	Qfg	13.2	
90	17 SW/SW			Gravel	Qfg		
91	20 SW/NW			Gravel	Qfg	12.6	
92	21 NW/SE	OSHD		Gravel	Qfg		
93	21 SW/SE	OSHD		Gravel	Qfg		
94	22 NE/NW	OSHD		Basalt Q	Tcr		
95	22 NE/NE			Gravel	Qfg		
96	31 NW/NE	Private		Gravel	Qfg		
T4N, R27E							
97	2 SE/SE	U.S. Govt.		Gravel	Qfg		
98	2 NW/SW	U.S. Govt.		Gravel	Qfg		
99	3 SE/SE	U.S. Govt.		Gravel	Qfg		
100	10 NE/SW	U.S. Govt.		Gravel	Qfg		
101	10 SE/SW	U.S. Govt.		Gravel	Qfg		
102	15 NE/SW	U.S. Govt.		Gravel	Qfg		
103	22 NW/NW	U.S. Govt.		Gravel	Qfg		
104	24 SE 1/4			Gravel	Qfg		
105	26 SE 1/4		Ordnance Pit	Gravel	Qfg	10.9-14.9	
106	27 SW/SW			Gravel	Qfg		

PI	LL	SPECIFIC GRAVITY	O A D Pass #20 Ht.	DURA. coarse/fine	QUALITY	QUANTITY	REMARKS
							Inactive
		2.79					Inactive
		2.91	15.4 @ .8		Good	Medium	
						Large	Inactive
					Good	Large	Active
						Small	Inactive
						Small	Inactive
					Good	Large	1R-2-1722
						Large	Exhausted
		2.86	10.8 @ .4		Good	Medium	1R-1-1388
						Medium	Inactive
					Good	Large	Active
						Small	Inactive
					Good	Large	Active
							1R-1-536; inactive
NP-20		2.76	16.2 @ .5		Good	Large	Active
							Abandoned
NP	22-23	2.75-2.85	19.4 @ 1.4		Good	Large	1R-1-1477
							Abandoned; filled
							Abandoned
NP	NP	2.82	21 @ 1.0		Good	Large	Active
							Abandoned
NP	NP	2.78	18.5 @ .5		Good		Abandoned; filled
					Good	Small	1R-2-2523
					Good	Small	1R-5-1416
					Good	Medium	Unused
							Abandoned
							Abandoned
							Ordnance Depot
							Ordnance Depot
							Ordnance Depot
							Ordnance Depot
							Ordnance Depot
							Ordnance Depot
							Ordnance Depot
							Abandoned
NP	18-23	2.79-2.84	20.8 @ .8		Good	Large	1R-2-1176
							Sewage lagoon

MAP NO.	LOCATION (SEC.)	OWNER	NAME	TYPE OF DEPOSIT	FM	LAR	Na_2SO_4 (% loss)
T3N, R38E							
107	9 NW/NE	USFS	Woodward	Basalt Q	Tcr	19.7	
108	32 SE/NE	USFS	Summit	Basalt Q	Tcr	24.1	15.1
T3N, R36E							
109	11 NE/NW		Brogotti Quarry	Basalt Q	Tcr		
110	29 NE/NE	BIA		Basalt Q	Tcr		
111	29 SE/NW	BIA		Basalt Q	Tcr		
T3N, R35E							
112	3 NW/SE			Basalt Q	Tcr		
113	3 SE/SE			Basalt Q	Tcr		
114	32 NE/SE		Thornhollow	Basalt Q	Tcr		
115	36 SE/NW	City of Pendleton	Squaw Creek	Basalt Q	Tcr		
T3N, R34E							
116	11 NE/NE			Basalt Q	Tcr	16.3	
117	35 NE/SW	BIA	Cayuse Pit	Basalt Q	Tcr		
T3N, R33E							
118	20 SE 1/4		Elgin Quarry	Basalt Q	Tcr		
119	23 Center	OSHD	Havana Quarries	Basalt Q	Tcr	14.5	
T3N, R32E							
120	15 SW/NW			Basalt Q	Tcr		
121	18 NE/NW			Basalt Q	Tcr		
122	31 NW/SW	Pendleton	Airport Quarry	Basalt	Tcr	13.6-14.5	
T3N, R31E							
123	6 NW/SE			Basalt Q	Tcr		
124	22 NE/SE	Private	Lorenzen	Basalt Q	Tcr		
125	30 SE/NE	Roy Rew	Rew Prospect	Basalt Q	Tcr	14.5-19.0	15.9
T3N, R30E							
126	6 NW/NE	County	Ransier Quarry	Basalt Q	Tcr		
127	9 NE/SW	Vollendorf	Vollendorf Pr.	Basalt Q	Tcr	13.6-26.8	
127A	9 NE/SW	OSHD	Barth Quarry	Basalt Q	Tcr		
T3N, R29E							
128	5 NE/SW			Gravel	Qal		
129	6 NW/NE			Basalt Q	Tcr		
T3N, R28E							
130	3 NW/NE	Irwin Mann	Emigrant Butte Q	Basalt Q	Tcr	12.7-22.7	
131	5 NE/NE			Sand Pit	Qal Qfg		
132	5 NW Corner			Sand Pit	Qal Qfg		
133	6 NE/SE			Sand Pit	Qal Qfg		
134	22 NE/SW	OSHD		Gravel	Qfg		
T2N, R38E							
135	7 SW/NE	USFS	Portuguese Spr.	Basalt Q	Tcr	15.6	12.37

PI	LL	SPECIFIC GRAVITY	O A D Pass #20 Ht.	DURA. coarse/fine	QUALITY	QUANTITY	REMARKS
9	34			73/65	Fair	Large	In Union Co. Inactive
						Small	Inactive
						Small	Rip rap
						Small	Rip rap
						Small	Inactive
						Small	Inactive
						Small	Inactive
					Good	Large	County; active
		2.79			Good	Small	Inactive
					Good	Large	Active
					Good	Large	Inactive
		2.88			Good	Medium	1R-2-926
						Small	Inactive
						Small	Inactive
		2.93-2.89	16.4 @ .6		Good	Large	Active
						Small	Inactive
						Medium	Inactive
NP	23	2.80,2.85	15.75 @ 1.8		Good		Never used
					Good	Large	Active
NP-3	1-28	2.93-2.96	12.4 @ .5		Good	Large	Never used Water filled
					Good	Large	Inactive Reclaimed
NP	21-27	2.84-2.94	13.6 @ 1.3		Good		1R-2-1255
						Small	
						Small	
						Small	
					Good	Small	Not used
7	37				Good	Large	In Union Co.

MAP NO.	LOCATION (SEC.)	OWNER	NAME	TYPE OF DEPOSIT	FM	LAR	Na_2SO_4 (% loss)
T2N, R37E							
136	24 NE/NE	USFS		Basalt Q	Tcr		
137	24 NW/SW	USFS	Prospect	Basalt Q	Tcr		
138	25 NW/NW	USFS	Ruckel Jct.	Basalt Q	Tcr	15	6
139	25 NE/SW	USFS	Ruckel Spring	Basalt Q	Tcr		
140	27 SW/SE	USFS	Shimmiehorn Q	Basalt Q	Tcr		
141	31 SW/SW	USFS	Black Mt. Q	Basalt Q	Tcr		
T2N, R36E							
142	5 SE/NW			Basalt	Tcr		
T2N, R34E							
143	22 SW/NW			Basalt Q	Tcr		
144	31 SE/SW	County		Basalt Q	Tcr		
T2N, R33E							
145	3 NW/SW			Basalt Q	Tcr		
146	7 SW/NE	Pendleton Ready Mix		Gravel	Qal	17.2-17.9	.2-1.1
147	7 SW/NW	Fletcher	Cent. Cement Prod.	Gravel	Qal		
148	16 SW/SW			Gravel	Ts	9.1-14.5	
149	25 NW/SE	County	Sampson Quarry	Basalt Q	Tcr		
T2N, R32E							
150	4 NE/NE	OSHD		Basalt Q	Tcr		
151	5 SE/SE	P. E. Jellum	Jellum Quarry	Basalt Q	Tcr	13.6,16.1	1.2,1.0
152	8 NW/NW	OSHD		Basalt Q	Tcr		
153	8 SE/NW			Gravel	Qal	14.5-17.4	.2-.9
154	12 NE/NE			Gravel	Qal		
155	16 NE/SW			Basalt Q	Tcr		
156	27 SE/NW			Basalt Q	Tcr		
157	28 SE/NE			Gravel	Qal		
T2N, R31E							
158	12 SW 1/4	Lewis Co.	Pendleton Rdy. Mix	Gravel	Qal		
159	9,10,16-15	Morrison-Knudsen	Barnhart	Basalt Q	Tcr		
160	15 SE/NW	M.-K. & County	Barnhart	Basalt Q	Tcr		
161	16 SW/NW	Morrison-Knudsen		Basalt Q	Tcr		
162	17 NE 1/4	Lewis Co.	Pendleton Rdy. Mix	Gravel	Qal		
T2N, R30E							
163	1 SE/SE		Filler Pit	Basalt Q	Tcr		
164	7 NE/SE	Cunningham		Basalt Q	Tcr		
T2N, R29E							
165	18 NW/SW	Roseamond-Monese		Basalt Q	Tcr		
T2N, R27E							
166	34 NW/SE	OSHD	Butter Creek Jct.	Basalt Q	Tcr		
T1N, R37E							
167	7 SE/NW	USFS		Basalt Q	Tcr		
T1N, R36E							
168	12 NE/SW	USFS	Junction Quarry	Basalt Q	Tcr		
169	16 NE/NW		Prospect	Gravel	Qal		
170	21 SE/NW		Prospect	Gravel	Qal		

PI	LL	SPECIFIC GRAVITY	O A D Pass #20 Ht.	DURA. coarse/fine	QUALITY	QUANTITY	REMARKS
							Inactive
					Good	Large	Diced rock
							Pit run
							Pit run
						Medium	Inactive
						Large	Inactive
						Large	Abandoned
		2.85	16.6 @ .7		Good	Large	Commercial; plant only
NP-6	46-50		21.43 @ 2.4				Abandoned
					Good	Large	Inactive
						Small	Abandoned - dump
NP-18	NP-20	2.86	21.5 @ 1.1		Good	Medium	Depleted
					Good	Large	Active
		2.88	21.2 @ .8				Abandoned
							Abandoned
							Exhausted
							Abandoned
						Small	Abandoned
						Small	
					Good	Large	Active; commercial
					Good	Large	Active; commercial
					Good	Large	Active; commercial
					Good	Small	Inactive
						Small	Inactive
						Medium	Active
							Inactive
					Good	Medium	
							Pit run

MAP NO.	LOCATION (SEC.)	OWNER	NAME	TYPE OF DEPOSIT	FM	LAR	Na_2SO_4 (% loss)
T1N, R35E							
171	6 SE/SE	Arthur Parr	Indian Quarry	Basalt Q	Tcr		
172	20 NE/SW	OSHD	Emigrant Park Q	Basalt Q	Tcr		
173	27 SW/SE	Private	Horse Q	Basalt Q	Tcr		
174	29 SE/NE	OSHD	Borrow Pit	Basalt Q	Tcr		
174A	34 SE 1/4	OSHD	Meecham Quarry	Basalt Q	Tcr		
T1N, R34E							
175	6	Orval McCormmach Q		Basalt Q	Tcr		
T1N, R33E							
176	2 SE/NE	BIA		Basalt Q	Tcr		
177	2 NW/SE	OSHD		Basalt Q	Tcr	15.0	2.0
178	12 SW/SE	Orval McCormmach Q		Basalt Q	Tcr		
T1N, R32E							
179	17 SE/SW	Private	Schuening Q	Basalt Q	Tcr		
180	23 SW/NE	OSHD		Basalt Q	Tcr		
T1N, R31E							
181	18 SE/SW	Private		Basalt Q	Tcr		
T1N, R30E							
182	8 SW/NE	Private	Alkali Canyon Q	Basalt Q	Tcr		
183	12 SW/NE	County	Four Corners Q	Basalt Q	Tcr		
T1S, R37E							
184	8 NE/SW	USFS	Hoskin Springs Q	Basalt Q	Tcr		
185	10 NE/SW	USFS	Summit "D"	Basalt Q	Tcr	17	
186	15 NW/SE	USFS	Green Mt.	Basalt Q	Tcr		
187	20 SE/NE	USFS	Drumhill Ridge	Basalt P	Tcr		
188	20 NE/SW	USFS	Prospect	Basalt P	Tcr		
189	30 NW/SW	USFS	Spring Mt.	Basalt Q	Tcr	22.5	4.8
T1S, R36E							
190	22 SE/SW	USFS		Basalt Q	Tcr		
191	34 SW/SW	USFS	Boundary Pit	Basalt Q	Tcr	13.6	
T1S, R35E							
192	14 SE/NW	OSHD		Basalt Q	Tcr		
193	24 SE/SW	OSHD		Basalt Q	Tcr	15.2	
T1S, R32E							
194	5 NW/NE	OSHD		Basalt Q	Tcr		
195	13 NW/NE	County	Hoeft Pit	Basalt Q	Tcr		
196	17 SE/SW	OSHD		Basalt Q	Tcr		
197	19 NW/SW	OSHD		Basalt Q	Tcr		
198	30 NE/NW	OSHD	West Birch Cr.	Basalt Q	Tcr		
T1S, R31E							
199	19 SE/SW	OSHD	Nye Quarry	Basalt Q	Tcr		
200	22 SW/NE	OSHD	Jack Canyon Q	Basalt Q	Tcr		
201	22 SE/NE	OSHD		Basalt Q	Tcr		
202	24 NE/SW	OSHD		Basalt Q	Tcr	15.3, 15.6	

PI	LL	SPECIFIC GRAVITY	O A D Pass #20 Ht.	DURA. coarse/fine	QUALITY	QUANTITY	REMARKS
					Good Fair	Large Small	1R-1-1341
				54/79			Roadcut
					Good	Large	Active
						Large	Location approximate
							Freeway construction
		2.82	15.1 @ 1.2		Good	Medium	Freeway construction
						Large	Inactive
							Inactive
						Medium	Inactive
							Inactive
							Inactive
					Good	Large	Active
				72/62			Wallowa-Whitman
							Roadcut
1	31	2.49	28.75 @ 1.5	/75			Water filled
				76/93		Large	
		2.91	17.2 @ 1.0			Small	Inactive; future use
							Inactive
					Good	Large	Active
							Inactive
							1R-5-899
					Good	Medium	Inactive
					Fair	Small	1R-1-1201
					Good	Medium	
					Good		
		2.84,2.86	15.0 @ .7		Good	Medium	1R-2-573

MAP NO.	LOCATION (SEC.)	OWNER	NAME	TYPE OF DEPOSIT	FM	LAR	Na_2SO_4 (% loss)
T1S, R30E							
203	2 NE/NE	Roumagoux	Victor	Basalt Q	Tcr		
204	22 SE/SE	OSHD		Basalt Q	Tcr		
205	26 NW/NE	OSHD		Basalt Q	Tcr		
206	31 NW/SW	OSHD	Burl Stuart Q	Basalt Q	Tcr	17.7	
T2S, R35E							
207	29 SW/NE	USFS		Basalt Q	Tcr		
T2S, R33E							
208	18 NW/NE	Private	Hunter Quarry	Basalt Q	Tcr		
T2S, R32E							
209	10 NW/NE	Private	East Birch Cr.	Basalt Q	Tcr	15.7, 14.6	
T2S, R31E							
210	7 SE/NW		Whittaker Flats	Basalt Q	Tcr	18.1	
T3S, R33E							
211	4 NW/SE	USFS	Low'r Pearson Cr.	Basalt Q	Tcr		
212	7 SW/NW	USFS	Prospect	Basalt Q	Tcr	32	
213	9 NW/NE	USFS		Qtz. Diorite Q	MzPzu		
214	31 NE/NE	USFS		Basalt Q	Tcr		
215	32 SW/NW	USFS	Bear Wallow	Basalt Q	Tcr		
T3S, R32E							
216	23 NE/SE	USFS	Pearson Creek	Basalt Q	Tcr	21-23	
217	36 NE/NE	USFS		Basalt Q	Tcr		
T3S, R31E							
218	20 NW/NW	OSHD		Granitic Q	KJi		
219	29 SE/NW		Battle Mt. Q	Basalt Q	Tcr		
T3S, R30 1/2E							
220	1 NE/NW	OSHD		Basalt Q	Tcr		
221	12 SW/SE	OSHD		Basalt Q	Tcr	14.4	
T3S, R30E							
222	27 NE/NE			Basalt Q	Tcr		
T4S, R34E							
223	31 NW/SW	USFS		Basalt Q	Tcr		
224	32 SW/SE	USFS		Basalt Q	Tcr		
T4S, R33 1/2E							
225	35 SW/NE	USFS		Basalt Q	Tcr		
226	36 SE 1/4	USFS		Basalt Q	Tcr		
T4S, R33E							
227	6 SE/SE	USFS		Basalt Q	Tcr		
T4S, R31E							
228	34 NW/NE	OSHD		Basalt Q	Tcr		
229	34 NW/NE	OSHD		Basalt Q	Tcr		

PI	LL	SPECIFIC GRAVITY	O A D Pass #20 Ht.	DURA. coarse/fine	QUALITY	QUANTITY	REMARKS
							Inactive 1R-5-224
		2.69	15.4 @ 1.4				1R -1-498
							Inactive
		2.84,2.82	13.6 @ 7.3				Inactive
		2.89	24.86 @ 2.2		Good	Small	
				60/51	Good		Inactive Inactive Borrow Borrow
				54-70/37-62		Large	Active Borrow
						Small	Borrow Borrow
		2.82	15.3 @ .9		Good	Medium	Inactive Inactive
							Inactive
							Pit run Inactive
					Good	Medium	Inactive Inactive
							Inactive
						Small Small	Inactive Inactive

MAP NO.	LOCATION (SEC.)	OWNER	NAME	TYPE OF DEPOSIT	FM	LAR	Na_2SO_4 (% loss)
T4S, R30E							
230	5 NW/SE		Gurdane Quarry	Basalt Q	Tcr		
231	16 NW/SW			Basalt Trench	Tcr		
232	27 NE/SW	USFS		Basalt Trench	Tcr		
233	31 SW/SE	USFS	Five Mile Cr. Q	Basalt Q	Tcr	13	1.0
234	33 NE/SW	USFS	Prospect	Basalt			
T5S, R33E							
235	3 NW/NW	USFS		Basalt Q	Tcr		
236	10 SW/NW	USFS	Butcherknife Spr.	Basalt Q	Tcr	23.91	
237	10 SE/NE	USFS		Basalt Q	Tcr		
238	28 SE/NW	USFS		Basalt Q	Tcr		
239	34 NW/SW	USFS	Cable Creek	Basalt Q	Tcr	20-23	
T5S, R32E							
240	4 NE/SE	OSHD		Basalt Q	Tcr		
T5S, R31E							
241	14 NW/NW	Private	Ukiah Gravel Pit	Gravel	Qal		
242	14 SE/SW	Private		Gravel	Qal		
243	16 NE/SW			Basalt Q	Tcr		
244	21 NE/NW			Basalt Q	Tcr		
245	21 NW/NE	OSHD		Basalt Q	Tcr		
246	21 NW/SE	OSHD		Basalt Q	Tcr		
247	28 NE/NW	OSHD		Basalt Q	Tcr		
T5S, R30E							
248	2 NE/NE	USFS		Basalt Q	Tcr		
249	3 SE/NE	USFS		Basalt Q	Tcr		
250	4 NE/NW	USFS		Basalt Q	Tcr		
251	5 SW/SE	USFS		Basalt Q	Tcr		
252	7 SE/NW	USFS	Gillman Ranch	Basalt Q	Tcr		
253	9 NW/SE	USFS	Sugar Bowl	Basalt Q	Tcr		
254	11 SW/SW	USFS	Wolf Springs	Basalt Q	Tcr	22	
255	18 SE/NE	USFS		Basalt Q	Tcr		
256	21 SE/SW	USFS	Dry 5-Mile Cr. #1	Basalt Q	Tcr	32.1	
257	31 NW/NW	USFS	Divide Well	Basalt Q	Tcr		
T6S, R35E							
258	19 NW/NE	USFS	Big Creek	Welded Tuff Q	Tts	23	
T6S, R34E							
259	28 SW/SW	USFS	Winom Meadows	Rhyodacite Q	Tts	26.7-28.9	.49
T6S, R33E							
260	17 NE/SW	USFS		Basalt Q	Tcr	17.6	3.0
261	25 NW/SE	USFS	Oriental	Q	Tts	28.2	9.5
262	28 NE/SE	USFS	Oriental	Rhyolite Q	Tts	35	14.0
263	30 NE/NE	USFS	Texas Bar	Welded Tuff Q	Tts	22-24	
264	35 NW/NW	USFS	Oriental	Granitic Q	KJi	39	19.0
265	35 NW/NW	USFS		Granitic Q	KJi	43	17.0
266	36 SW/SW	USFS		Granitic Q	KJi	59	25

PI	LL	SPECIFIC GRAVITY	O A D Pass #20 Ht.	DURA. coarse/fine	QUALITY	QUANTITY	REMARKS
NP	NP			93/76		Large	Active Borrow Platy rock
				70/77		Small	Borrow Trench
				43-57/18-27		Small	
					Good	Large	1R-5-945
						Small	Inactive Exhausted
NP	25				Good	Small Large	Talus slope Active
				82/81		Small Small Small	Borrow Borrow Borrow
				80/73			
				68/64			Inactive
				78/80			
NP NP NP	NP NP			82/69-74		Large	Inactive

MAP NO.	LOCATION (SEC.)	OWNER	NAME	TYPE OF DEPOSIT	FM	LAR	Na_2SO_4 (% loss)
T6S, R32E							
267	4 NW/SW	USFS	Ross Springs	Basalt Q	Tcr		
268	24 SE/SE	USFS	Prospect	Basalt Q	Tcr		
269	27 SW/NW	Private	N. Fk. John Day	Welded Tuff Q	Tts	17.9	.72
270	30 NE/SE	USFS		Basalt Q	Tcr		
T6S, R31E							
271	15 NE/NW	OSHD		Basalt Q	Tcr		

PI	LL	SPECIFIC GRAVITY	O A D Pass #20 Ht.	DURA. coarse/fine	QUALITY	QUANTITY	REMARKS
							Water filled
						Small	
							Rip Rap

UMATILLA COUNTY
OREGON

SHEET 1

GEOLOGIC EXPLANATION (SEE SHEET 4)

SCALE 0 6 KILOMETERS

ARRANGEMENT OF SHEETS FOR UMATILLA COUNTY

KEY TO COUNTIES

Population of Umatilla County, 1972 Census
45,450

N

PRIVATE ROAD
NATIONAL FOREST HIGHWAY, NATIONAL FOREST DEVELOPMENT RD, STATE FOREST ROAD, BUREAU LAND MANAGEMENT ROAD
PRIMITIVE ROAD - IMPASSABLE
UNIMPROVED ROAD
GRADED AND DRAINED ROAD
GRAVEL, GRADED AND DRAINED ROAD
PAVED ROAD
MULTIPLE LANE — DIVIDED ROAD
ONE WAY ROAD
FEDERAL AID INTERSTATE HIGHWAY WITH FULL CONTROL OF ACCESS
FEDERAL AID PRIMARY HIGHWAY
FEDERAL AID SECONDARY HIGHWAY
ORE ROUTE — US ROUTE — INTERSTATE ROUTE
FEDERAL AID AND ROUTE TERMINATION
DISTANCE BETWEEN POINTS

MINOR STRUCTURE
BRIDGE — GRADE SEPARATION
BRIDGE, COVERED
FERRY; F.F.-FREE T.F.-TOLL
TUNNEL
CATTLE UNDERPASS
FENCE WITH GATE
DAM
INTERMITTENT STREAM
STREAM WITH FALLS
SPRING — WELL
RIVER WITH RAPIDS
RIVER WITH DOCK, N-NAVIGABLE
LAKE, POND, OR RESERVOIR
INTERMITTENT LAKE
IRRIGATION OR DRAINAGE DITCH

COUNTY
PROMINENT MOUNTAIN, BUTTE, OR PEAK
RAILROAD AND STATION
RAILROAD GRADE CROSSING — TUNNEL
RAILROAD GRADE SEPARATIONS
TRANSMISSION LINES (200 K. V. +)
PIPE LINE—GAS, PETROLEUM
AIRPORT — AIRSTRIP
AIRWAYS BEACON — LIGHTHOUSE
STATE CAPITOL
COUNTY SEAT
CITY OR COMMUNITY CENTER
INCORPORATED CITY
ENLARGEMENT OR INSET BOUNDARY
FARM UNIT

DWELLING, OTHER THAN FARM
PUBLIC BUILDING, C-COMMUNITY HALL, G-GRANGE
SCHOOL
CHURCH
BUSINESS ESTABLISHMENT
FACTORY OR INDUSTRIAL PLANT
SAWMILL
CEMETERY
HOSPITAL OR REST HOME
RADIO OR TELEVISION STATION
ATOP ANY BUILDING — POST OFFICE
GRAIN ELEVATOR — DRYER
WAREHOUSE
STOCK LOADING PEN OR CORRAL
POWER PLANT — SUBSTATION — PUMP HOUSE
WATER TANK — OIL TANK — GAS TANK
DISPOSAL: INCINERATOR, M-SCRAP METAL, B-SCRAP BLDG. MATERIAL, D-DUMP, S-SEWAGE, P-SANITARY FILL, A-AUTO GRAVEYARD

ROAD MATERIAL STOCK PILE SITE
GRAVEL PIT — QUARRY
MINE — CAVE
HOTEL OR RESORT
CAMP
RECREATIONAL FACILITIES, A-ARCHERY, B-BOATING, E-EQUESTRIAN, G-GOLF, M-MARINA OR YACHT, R-RIFLE OR GUN, S-SKIING, FAIRGROUNDS, RACE TRACK, RODEO
DRIVE-IN THEATER
FOREST RANGER STATION — FOREST SERVICE STATION
FISH HATCHERY
TRIANGULATION STATION
LOOKOUT — TRIANGULATED LOOKOUT

UMATILLA COUNTY
OREGON

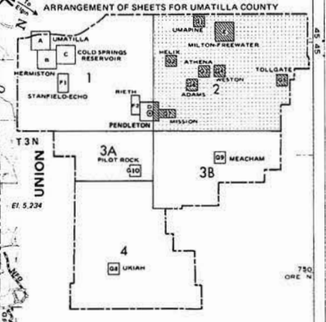
STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
R. E. CORCORAN, STATE GEOLOGIST

SHEET 2

GEOLOGIC EXPLANATION
(SEE SHEET 4)

SCALE
1 0 1 2 3 4 MILES
1 0 1 2 3 4 5 6 KILOMETERS

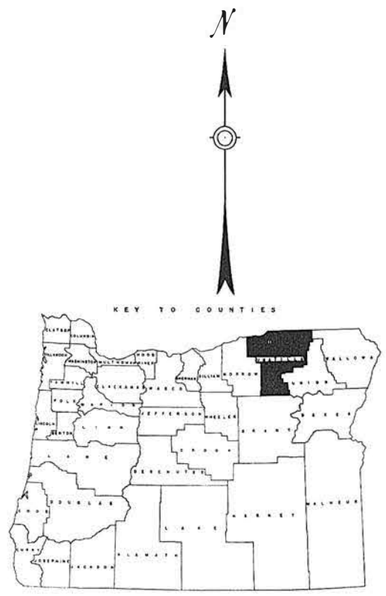
ARRANGEMENT OF SHEETS FOR UMATILLA COUNTY



SHEET 2

STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
R. E. CORCORAN, STATE GEOLOGIST

GEOLOGIC EXPLANATION
(SEE SHEET 4)



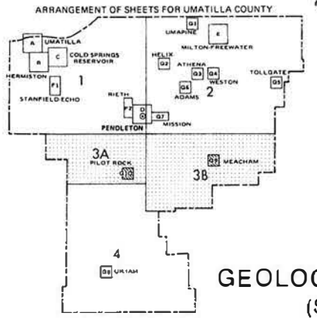
SHEET 3A

SHEET 3A

SHEET 3B
UMATILLA COUNTY
OREGON

STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
R. E. CORCORAN, STATE GEOLOGIST

ARRANGEMENT OF SHEETS FOR UMATILLA COUNTY



GEOLOGIC EXPLANATION
(SEE SHEET 4)

SCALE
0 1 2 3 4 MILES
0 1 2 3 4 5 6 KILOMETERS

Polyconic Projection
Plane Coordinate on Lambert Projection
Oregon North Zone in Thousands of Feet

SHEET 3B

SHEET 4
UMATILLA COUNTY
OREGON

STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
R. E. CORCORAN, STATE GEOLOGIST

SCALE
0 1 2 3 4 MILES
0 1 2 3 4 5 6 KILOMETERS

1976

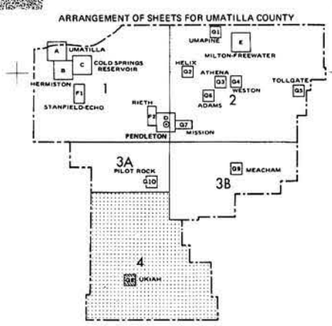
GEOLOGIC EXPLANATION

⚒ QUARRY

⚒ SAND & GRAVEL

× PROSPECTS

ARRANGEMENT OF SHEETS FOR UMATILLA COUNTY



SHEET 4