

PROJECT CONTROL SHEET

Project: TUREL MOLDING SAND, Date: 3-1957

Owner: T.W. TUREL, 224 CROCKER LANE, EUGENE

Location: T. 18 S. R. 4 W.

Reason for project: SAMPLE SUBMITTED FOR TESTING
FOR POSSIBLE MOLDING SAND.

Log of project: SAND SAMPLE ORIGINALLY SUBMITTED
TO U.O.P.O. REFERRED TO GMI 3-1-57.

SEE LETTER TO T.W.T. ()

THREE SAMPLES RECD ()

P-20982 (#1) LIGHT YELLOW, SAND & CLAY

P-20983 (#2) ORANGE SAND & CLAY

(A THIRD SAMPLE WAS ALSO RECD BUT THERE WAS
TOO MUCH CLAY TO PERMIT WASHING)

SAMPLES #1 & #2 WERE THOROUGHLY WASHED TO REMOVE
EXCESS CLAY AND DRIED.

SAMPLE #1 SAND WAS PURE WHITE 90% (PTL 10% PET)

SAMPLE #2 " " LIGHT ORANGE " " " "

LETTER TO T.W.T. 4-2-57 ASKING FOR EXACT LOCATION.

PROJECT CONTROL SHEET

Project: OAK GROVE FELDSPAR, Date: MAY 1955

Owner: U.S.F.S. SUBMITTED BY F.V. TOMLINSON
RT. 1 BOX 551
OREGON CITY

Location: SEC 2 T 6 S R 6 E, CLACKAMAS COUNTY.

Reason for project: TO IDENTIFY ^{MINERAL} ANY DETERMINE ANY
POSSIBLE USE

Log of project: (P-18152)
SAMPLE SUBMITTED (4-25-1955) BY F.V. TOMLINSON

ORIGINAL SAMPLE ASSAYED 48.28% SiO₂ FE 1.65%

HAND PICKED GRAINS " 43.42% " (P-18153)

SPEC. ANALYSIS OF SIMILAR GRAINS (P-18153) Si, Al +10%
(SEE ATTACHED SHEET) CA, NA 1-10
K 1+

SIEVE ANALYSIS (SEE ATTACHED SHEET)

PETROGRAPHIC EXAMINATION INDICATED MTL. TO BE FELDSPAR

CHEMICAL AND SPECTROGRAPHIC ANALYSES INDICATE THAT
FELDSPAR IS PROBABLY ANORTHITE

OAK GROVE FELDSPAR



STATE DEPARTMENT OF GEOLOGY
AND MINERAL INDUSTRIES

1069 STATE OFFICE BUILDING
PORTLAND 1, OREGON

General Laboratory Number P-18153

Date May 17, 1955

Spectrographic Laboratory Number _____

Sample received from _____

Ralph Mason

QUALITATIVE SPECTROGRAPHIC ANALYSIS
(Quantities estimated to nearest power of ten)

1. Elements present in concentrations over 10%.

Sr Al Ca

2. Elements present in concentrations 10% - 1%.

Ca Na K (low)

3. Elements present in concentrations 1% - 0.1%.

4. Elements present in concentrations 0.1% - .01%.

Ba Sr

5. Elements present in concentrations .01% - .001%.

Fe

6. Elements present in concentrations below .001%.

Cu Cr

Small crystals

~~CELESTIAN $BA Al_2 Si_2 O_8$~~

MOSTLY ANORTHITE?

Thomas C. Matthews, Spectroscopist

TM

SIEVE TESTS
MADE WITH

Tyler Standard Screen Scale Sieves

Name OK GROVE FELSOPAN Date 4-25-55 Test Number TP-18182

Address RT 1 Box 551 OREGON CITY Made by TS Mason

Material SAND Description Moisture

SCREEN SCALE RATIO $\sqrt{2}$ or 1.414										(A)		(B)		(C)		(D)		(E)		(F)	
Openings		Diameter Wire Inches	Time:.....Minutes		Cum. % (Total % on Each Sieve)	Time:.....Minutes		Cum. % (Total % on Each Sieve)	Time:.....Minutes		Cum. % (Total % on Each Sieve)	Time:.....Minutes		Cum. % (Total % on Each Sieve)	Time:.....Minutes		Cum. % (Total % on Each Sieve)	Time:.....Minutes		Cum. % (Total % on Each Sieve)	
Inches	Milli- meters		Mesh	Weight Between Sieves		% Between Sieves	Weight Between Sieves		% Between Sieves	Weight Between Sieves		% Between Sieves	Weight Between Sieves		% Between Sieves	Weight Between Sieves		% Between Sieves	Weight Between Sieves		% Between Sieves
1.050	26.67		.149																		
.742	18.85		.135																		
.525	13.33		.105																		
.371	9.423		.092																		
.263	6.680	3	.070																		
.185	4.699	4	.065																		
.131	3.327	6	.036																		
.093	2.362	8	.032																		
.065	1.651	10	.035	27.6																	
.046	1.168	14	.025	67.1																	
.0328	.833	20	.0172	71.0																	
.0232	.589	28	.0125	79.3																	
.0164	.417	35	.0122	72.5																	
.0116	.295	48	.0092	45																	
.0082	.208	65	.0072	25.5																	
.0058	.147	100	.0042																		
.0041	.104	150	.0026																		
.0029	.074	200	.0021																		
.0009	.000	Pan		15																	
			Totals	460																	

REMARKS

By TS Mason

PROJECT CONTROL SHEET

Project: Harper radioactive samples

Date: March 31, 1954

Owner: Samples submitted by N.S. Wagner; Paul Ewing, The Oregonian; Jack Floch, Dayton, Oregon.

(From Hall property, Blue Moon claim)
Location: Wagner samples - Sec. 29, T. 20 S., R. 42 E., Malheur County. (P-16234-5-6)
Ewing sample - 4½ miles south of Harper, Malheur County. (P-16237)
Floch sample - 15 miles south of Harper, Malheur County. (P-16241)
Reason for project: (Blue Star claim)

Log of project:

All samples were tested on radioassayer, and petrographic and spectrographic analyses made (3-31-54). Radioassayer results in radioactive binder, petrographic and spectrographic analyses filed with SIR's; all pet and spec reports filed with Hall's SIR.

PROJECT CONTROL SHEET

Project: Peyton clay

Date: September 1953

Owner: C. P. Peyton (Brandenburg claim)
4100 Summers Lane
Klamath Falls, Oregon

Location: Sec. 25, T. 34 S., R. 15 E., Klamath County

Reason for project: Investigation of possible uses.

Log of project: Samples received 9-3-53 (P-15153, P-14154).

Thermal analysis (9-10-53) (G.M.I.), Petrographic notebook #28.

- #1 - Indicates halloysite
- #2 - Indicates hydrohalloysite

Letter to Hal Kelly (9-11-53).

Reply (9-17-53 and 11-5-53).

- #1 - P.C.E. 26+ Samples good for low or medium heat duty only.
- #2 - P.C.E. 16

Letter to U.S.B.M., Albany (9-11-53).

Reply (10-2-53) x-ray - T.A. - micro.:

- #1 - Kaolinite, montmorillonite, illite
- #2 - Partially altered volcanic ash, kaolinite plus minor montmorillonite, illite and altered feldspar.

Letter to Peyton (11-19-53).

Poor firing characteristics probably limit use to common brick and tile use.

PROJECT CONTROL SHEET

Project: Ferguson halloysite

Date: December 1952

Owner: A. C. Ferguson and George Gilbert, Box 569 Hillcrest Drive, John Day, Oregon.

Location: SE $\frac{1}{4}$ sec. 19, T. 17 S., R. 29 E., 1 mile from Izee stage road, Grant County.

Reason for project: Check on ceramic possibilities.

Log of project:

Sample (P-13802) received (12-6-52).

Petrographic analysis (12-19-52) - halloysite with few unaltered feldspars. Some organic material, limonite, possibly gibbsite.

Thermal analysis (12-18-52) - halloysite with gibbsite.

PROJECT CONTROL SHEET

Project: Knorr kaolinite

Date: May 15, 1952

Owner: Floyd D. Knorr, Harold Christenson, Route 1, Redmond, Oregon.

Location: Sec. 11, T. 16 S., R. 14 E, Crook County.

Reason for project: Material as submitted appeared to have possibilities as white firing clay.

Log of project:

Sample submitted by Knorr (5-15-52) (P-12728)

Chemical analysis: SiO_2 - 80.52%, Fe_2O_3 - 1.26%, Al_2O_3 - 12.70%, CaO - 0.20%.

Petrographic analysis: Fine grained aggregate of quartz and kaolin.

Sample to Albany Bureau of Mines (5-29-52) for thermal analysis and x-ray: mixture of kaolinite and quartz with small amount of calcite on fracture surfaces and trace amounts of fine grained rutile and siderite.

Letter and sample to Pifer, University of Washington (5-52). Reply (6-2-52): Cone 23, light firing, possible use in flue line shapes.

See also report in SIR file ("K-1952") by Pittsburgh Testing Lab (discusses mineral composition.)

PROJECT CONTROL SHEET

Project: Expandable Shale

Date: December 1950

Owner: - - -

Location: Washington and Yamhill counties

Reason for project: Search for deposits of expandable shale near railroad within 50 miles of Portland.

Log of project:

Several areas of Keasey shale visited near Forest Grove (12-12-1950).
Keasey-Vernonia area visited (12-13-1950) by White and Mason. Legal descriptions of deposits sampled;

Washington County	-	sec. 35, T. 2 N., R. 4 W.
Yamhill County	-	sec. 14?, T. 2 S., R. 4 W.
		sec. 24?, T. 2 S., R. 4 W.

Samples tested for expansion but results rather uniformly poor.

PROJECT CONTROL SHEET

Project: Merritt Ash

Date: 1950

Owner: Mineral rights - Northern Pacific Railway
Surface rights - H. L. Hoag, Arlington
Mineral rights leased to W. L. Merritt

Location: Gilliam County, 10 miles south of Arlington in Sec. 36, T. 2 N.,
R. 20 E. and Sec. 31, T. 2 N., R. 21 E.

Reason for project: Investigation of ceramic possibilities.

Log of project:

Sample P-9980 (KB-107), 6-19-50 (petrographic notebook #22) D. J. White.
Samples P-10005, P-10006, 6-23-50
Report by N. S. Wagner "Volcanic Ash Occurrence Near Arlington" 8-4-50.
Rough screen analysis shows 70% 80 +150 mesh.
Small sample stored in ceramic laboratory.
Spectrographic analysis P-10006 (6-14-50)

PROJECT CONTROL SHEET

Project: Neal Knighten Clay

Date: 7-1-49

Owner: Neal Knighten, 13 & S. Washington Street, Kennewick, Washington

Location: Sec. 32, 33, T. 6 S., R. 26 E., Morrow County

Reason for project: Sample submitted by Raw Materials Survey.

Log of project:

Chemical analyses (Hoagland) (6-27-49) - P-8743, 4, 5.

C-237 (Clay test by Jacobs 7-1-49).

Property visited by Wagner (6-22-49).

Property visited by Wagner and Mason (11-12-49). 50# sample obtained and stored at 426 S.E. Oak Street.

Report (6-22-49) By N. S. Wagner in mine report file (includes report by Jacobs (5-6-49)).

Supplemental report (11-12-49) by N. S. Wagner in mine report file.
(Pictures of deposit included).

Summary: Deposit very small. Clay is flint type fire clay, having refractory possibilities. Not good for aluminous cements.

PROJECT CONTROL SHEET

Project: Neal Knighten Clay

Date: 7-1-49

Owner: Neal Knighten, 13 & S. Washington Street, Kennewick, Washington

Location: Sec. 32, 33, T. 6 S., R. 26 E., Morrow County

Reason for project: Sample submitted by Raw Materials Survey.

Log of project:

Chemical analyses (Hoagland) (6-27-49) - P-8743, 4, 5.

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Property visited by Wagner (6-22-49)

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Supplemental report (11-12-49) by N. S. Wagner in mine report file. (Pictures of deposit included).

Summary: Deposit very small. Clay is flint type fire clay, having refractory possibilities. Not good for aluminous cements.

PROJECT CONTROL SHEET

Project: Ceramic Glazes

Date: 1950

Owner: - - -

Location: - - -

Reason for project: Investigation of suitability of Oregon volcanic glasses.

Log of project:

Work carried out by C. W. F. Jacobs in 1948-50. Results published in G.M.I. Short Paper 20. Glazed samples stored in box in ceramic lab.

PROJECT CONTROL SHEET

Project: Compton halloysite

6-2-49
Date: 6-13-51

Owner: C. G. Compton, Hamilton Hotel, 1024 S.W. 3rd Avenue, Portland
(E. D. Hazlett, Sunset Drive, Forest Grove)

Location: Crook County, sec. 6, T. ¹⁶~~34~~ S., R. ²⁰~~23~~ E., on Lost Creek

Reason for project: Submitted by C. G. Compton, 6-2-49 for ceramic testing.
Initial tests revealed 90% halloysite(?) so further tests run and new samples
obtained 12-7-49 by F.W.L. from sec. 9-16, T. 16 S., R. 20 E.

Log of project:

Petrographic examination (P-8626) H. Dole - halloysite.
Ceramic examination (P-8626 and C-236-2) 6-29-49.
 (White firing @ Cone 04 through Cone 3) C.W.F. Jacobs
 (Poor plasticity - low-grade fire clay)
Paper coating clay tests (circa 7-49) by Jacobs. Included conference with
 Crown Willamette officials at plant by C.W.F. and F.W.L., all discouraging.
Chemical analysis (P-9499, 9500, 9501) 12-7-49 - Hoagland.
Differential thermal analysis (by G.M.I.) Halloysite(?) 8-27-51, also 6-49.
Sample to U.S. Bureau of Mines, Northwest Electrodevelopment Lab., Albany
 (9-1-51) for x-ray and thermal analysis.
Reply (9-13-51) kaolinite with minor quartz and carbonate.
Sample to Houdry Process Corp. c/o H. A. Shabaker (10-16-51).
Reply (10-24-51).
Letter to Shabaker (11-1-51)
Letter to Shabaker (1-21-52) re catalytic clay specifications.
Reply (1-29-52) giving general specifications
Project shelved January 1952 and 35# sample stored at warehouse @ ⁴²⁶~~408~~ S.E. Oak.

Foundry SAND Hauser

November 26, 1975

Mr. A. E. Freeman, President
Freeman-Howard, Inc.
Box 695
Gold Beach, Oregon 97444

Dear Mr. Freeman:

Foundry sand has been taken from some of the dunes in the Hauser area just north of Coos Bay for many years and shipped to foundries in Portland. Apparently the sand was not processed, other than a simple screening, and was used for general gray iron or semi-steel casting.

This type of sand is abundant along this portion of the coast and you should have little difficulty in arranging for its removal to meet your requirements. We would like to suggest, however, that you might wish to investigate the use of some of your local "black sands" rich in chromite. Chromite, or chrome, as it is popularly called, is a very refractory mineral and should make an excellent molding sand.

The presence of magnetite, an iron oxide mineral, might prove bothersome with high temperature pours since the mineral grains could fuse to the surface of the metal. Since magnetite is easily removed with a magnet the sand could be treated rather simply. Ilmenite and zircon grains are often associated with chromite. Both of these minerals are also refractory and should actually improve the quality of the sand.

Black sand deposits along the coast are commonly mixed with a good deal of quartz and feldspar grains which are both lighter in color and in weight. These lighter fractions can be removed by running the sand over a sluice box and allowing the heavy black grains to be trapped behind the riffles.

A copy of a map from U.S. Geological Survey Bulletin 945-E is enclosed which shows the location of chromite-rich sands in the vicinity of Gold Beach.

Sincerely yours,

Ralph S. Mason
Deputy State Geologist

RSM:lk
Encl.

FREEMAN FABRICATION

Gold Beach, Oregon 97444

Box 695

Phone: CH 7-8768 or CH 7-2443
503 247-7936

Dept. of Geology and Mineral Industries
Portland, Oregon
1400 SW 5th

Gentlemen;

We are interested in a source of foundry sand-both moulding sand and core sand. We understand there is, or was, foundry sand mined in the Coos Bay area.

If your records show any beds located anywhere on the south coast we would appreciate knowing their location.

We are anxiously awaiting your reply.

Respectfully,

A handwritten signature in blue ink that reads "A. E. Freeman". The signature is stylized, with the first letters of the first and last names being prominent.

A. E. Freeman, President
FREEMAN-HOWARD, INC.

AEF:bs

Memorandum

on

STEEL FOUNDRY SAND AT EUGENE, OREGON

Portland, Oregon

March 10, 1944

The State Department of Geology and Mineral Industries has been investigating for some time a deposit of high-grade silica sand and associated clay located approximately three miles west of Eugene, Oregon, and it seems appropriate now to convey the available information relating to the sand to those who may be interested, even though the work is not completed. Ray C. Treasher, geologist formerly with the Department, realized the possible value of the sand in this deposit for steel foundry use. His report in 1943 led to further investigations by the Department and also a drilling program by the U. S. Bureau of Mines which showed that at least several hundred thousand tons of this sand is available in the deposit. In an earlier report on refractory clay deposits, Wilson and Treasher described the material at this locality.* These reports may be obtained at the office of the Department. They give much of the original information on this sand, although a report by Paul W. Cook, University of Oregon student in geology, had in 1923 described the general character of this deposit and its probable origin. At that time the deposit was being worked, and the material was used as a foundry sand and was manufactured into fire brick.

Treasher's report showed that clay made up more than 30 percent of the deposit, quartz sand forming almost all the rest. This high percentage of clay precluded its possible general use by steel foundries as a naturally bonded molding sand, as such a percentage of clay would not only greatly reduce the permeability but would decrease the flowability as well. However, this work on the sand fraction showed that it is very promising as a sharp sand and that it warranted further investigation.

As noted by H. Ries in his chapter, "Special Sands," in Industrial Minerals and Rocks published in 1937 by the American Institute of Mining and Metallurgical Engineers, New York, the important properties of a foundry sand are:

1. Fineness
2. Bonding strength
3. Permeability
4. Sintering point
5. Durability

Thus it was necessary to learn these properties of the Eugene sand in order to determine its value for steel foundry use. An outline of the characteristics of the sand follows:

1. Fineness:

Although degree of fineness exerts an influence on such properties as permeability and bonding strength of sand, the most important effect of fineness is in obtaining a smooth casting. It may be stated that, within certain

* Wilson, Hewitt, and Treasher, Ray C., "Preliminary Report on Some of the Refractory Clays of Western Oregon," 1938, Oregon Dept. of Geology and Mineral Industries, Bulletin No. 6.

limits, the finer the sand, the cleaner the casting. However, if a sand is too fine both its strength and permeability may be impaired.

Screen analyses of the Eugene sand show that it has an A.F.A. fineness number of about 59. Comparing the Eugene sand to a sand commonly employed here in Portland in steel foundries, namely, Ottawa Federal 17 which has an A.F.A. fineness number of about 44, the Eugene sand is seen to be somewhat finer. Attention is called to the distribution curves of these two sands shown by the graphs opposite p. 14 of the enclosed report. It is of interest to notice the greater uniformity in the grain size of the Eugene sand as shown by the smaller length of the base of its distribution curve, and also by the higher percentage of the average size grains. More than half of the sand is retained on 70 mesh and most of the remainder on 50 and 100 meshes. In spite of a somewhat smaller grain size, the permeability of the Eugene sand is, for practical purposes, equal to Ottawa Federal 17. This equal or nearly equal permeability of the Eugene sand is due to its greater uniformity of grain size, as pointed out above. As will be shown later, the strength values of the Eugene sand are equal to or greater than those for Ottawa. The Eugene sand offers the advantage of a finer sand without sacrificing permeability or strength.

2. Bonding Strength:

Like the Ottawa product, the Eugene sand will need to be bonded. Thus it is necessary to make up a synthetic mix to determine strength values. The amount of clay and water added to a sand roughly control the values obtained. However, the shape of the sand grains exerts a noticeable effect, especially on the dry strength values as illustrated by the figures given on page 13 of the enclosed report. These figures were obtained by the laboratory of the Electric Steel Foundry when testing the Eugene sand in parallel with the Ottawa sand. The same mix was used on both sands and approximately the same amount of moisture was present in each. As may be seen, the green strength values of the Eugene sand were somewhat greater. However, these greater values may be explained in part by the slightly higher percentage of moisture in the Eugene sand mix which may in turn explain the very slightly lower permeability reading. These values are also accounted for in small part by the very minor amount of clay probably left in the sand after washing.

The dry strength value, that is, the dry shear of the Eugene sand is shown to be more than twice that of the Ottawa. It is believed that the subangular shape of the Eugene sand produces an interlocking of grains whereas the Ottawa sand, which is rounded, does not. The interlocking effect is highly desirable as it greatly increases dry strength values. A comparison of the dry strengths of a subangular sand and a rounded sand might be made by comparing the height to which crushed stone can be piled to the height to which rounded gravel can be piled. As may be seen, the green strength values of the Eugene sand are at least equal to, and the dry strength values greater than, those of the Ottawa.

Additional green compression strength values as well as permeability values of various Eugene sand mixes, made by adding to the washed sand a certain amount of the clay previously removed, are listed below. These were determined at the laboratory of the Crawford & Doherty Foundry. No green shear or tensile strengths were measured as, for practical purposes, their ratios to the green compression strength are said by H. Ries* to remain constant.

* Personal communication.

Eugene Sand Mixes

(Made by adding enough of the original clay, which was removed from the sand by washing, to the washed sand to give 5%, 10%, and 15% clay mixtures.)

5% added clay

Moisture	Actual Permeability (Calculated)	Compression Strength (Green)
4.5%	211	2
7.4	192	8.3
9	149	7

10% added clay

Moisture	Actual Permeability (Calculated)	Compression Strength (Green)
6.2%	175	5.5
8.4	154	9

15% added clay

Moisture	Actual Permeability (Calculated)	Compression Strength (Green)
4.2	94	6.9
7.3	114	6
8.4	109	7.6

3. Permeability:

This property is largely determined by the porosity of the sand which is in turn greatly dependent on the uniformity of grain sizes. Much disagreement still exists as to whether a uniformly sized subangular sand has a porosity greater than a uniformly sized rounded or subrounded sand. Some argue that the rounded to subrounded sand has greater porosity, whereas others believe that the subangular sand, due to its somewhat irregular and in some cases embayed surfaces and protruding edges, will be more porous. The best answer is to measure their relative permeabilities.

No equipment was available for measuring the base permeability of the Eugene sand. However, it is of interest to note the permeability value of 211 calculated for the Eugene sand mix containing 5% clay and 4.5% moisture. The base permeability may be expected to be somewhat greater than the above figure. Attention is also called to the similar permeability readings of the Eugene and Ottawa sands shown on page 13 of the enclosed report. It was previously noted that the higher percentage of moisture in the Eugene sand mix may have accounted for the very slight difference in the permeability readings and may also in part have accounted for the greater green strength values of the Eugene sand. It should be stressed again that the greater uniformity in the grain size of the Eugene sand (as shown by the graphs opposite page 14 of enclosed report) permits the use of a sand finer than is now generally employed by Portland steel foundries because the greater uniformity in grain size overcomes the slight decrease in grain size as far as permeability is concerned.

Also the permeability values of the artificial mixes of the Eugene sand, given on page 3 are worth examining. It is thought that possibly the sand used in these mixes was washed a little cleaner than that used in the Electric Steel Foundry test and consequently gave higher permeability values. It should be pointed out that the Eugene sand, as used and measured in all these tests and as shown in the various screen analyses in the enclosed report, had not been sized by screening, surprising as that may seem. Its geologic origin explains, however, the great uniformity in grain size.

Should permeability values higher than those now obtained be desired, the smallest and largest fractions of the Eugene sand can be screened out to give even higher permeability.

4. Sintering Point:

In regard to refractory qualities, it is necessary to say only that the Eugene sand is a high silica sand made up almost entirely of quartz grains. Analyses of the washed sand show that it is more than 97% SiO_2 . The remaining amount, largely Al_2O_3 , is attributed partly to clay films that remained on the sand grains after washing. As the sintering point of silica is fixed, this property of the Eugene sand is for all practical purposes the same as Ottawa.

5. Durability:

Durability of a molding sand is defined as its ability to regain most of its green bonding strength after it has been heated by use and after water has again been added. As most steel foundries prefer to make up their own mixes, the durability, as above defined, depends largely on the binder added and in turn upon its reaction to the temperature to which it is subjected.

As such high silica sands can be economically used a number of times, it is desirable to know the durability, or life, of the sand grains themselves. To determine this property of the Eugene sand, it was thought advisable to subject it to actual foundry tests as no other approach seemed satisfactory. The enclosed report gives the results of these tests which show that even after four pourings there was no appreciable breakdown of the Eugene sand. Also pertinent are the screen analyses and distribution curves of the Eugene and Ottawa sands when tested in parallel by the Electric Steel Foundry. These are given in the memorandum beginning on page 13 of the enclosed report. The relative breakdowns may be estimated by comparing the areas enclosed by the upper portions of the two curves for each sand. These areas are substantially the same; possibly a very slight advantage rests with the Ottawa. If so, the small amount of sand saved would probably not be appreciable when compared to that lost on the floor and elsewhere.

Recent geologic field studies shed additional light on the durability of the Eugene sand and show that it belongs to a formation of Oligocene age, millions of years old. This formation was probably derived by the reworking of an older Eocene sandstone which in turn was probably either directly or indirectly derived from the Siskiyou Mountains. Thus we know the sand has withstood much weathering and transportation in past geologic times.

In discussing the five important properties of a molding sand as related to the Eugene product, it is shown that this sand is comparable to the Ottawa product and in some respects possibly superior. Its apparent superiority is that it permits the use of a somewhat finer sand than that now being used, giving equal or greater strength and without sacrificing permeability. The ability to use a somewhat finer sand should result in cleaner castings.

Although the Eugene sand has not been tested for core work, its characteristics indicate that it should be a very satisfactory core sand.

The results of the test on the Eugene sand run in parallel with Ottawa were set forth by the Electric Steel Foundry in a letter to Kenneth Hamblen of Silica Products Oreg., Ltd. As other foundries may wish to run a similar test, a 500-lb. sample of Eugene sand probably can be made available by the Department shortly after a request has been received.

Silica Products Oreg., Ltd. is building a plant to wash, dry, and screen this Eugene sand and will furnish it commercially to the coast area in the near future.

State of California
Department of Natural Resources
DIVISION OF MINES
OLAF P. JENKINS, CHIEF
FERRY BUILDING, SAN FRANCISCO 11

No. 3535

INFORMATION CIRCULAR

January 1, 1948

SILICA SAND FOR FOUNDRY USE

Silica sand for foundry or molding purposes can be divided into two classes: naturally bonded sands composed principally of quartz grains and a binder of colloidal material (usually clay); and unbonded sand composed of quartz grains without a colloidal binder. Feldspar grains are the commonest impurity. Miscellaneous rock fragments may be present in quantity. Silica sands containing much feldspar or fragmental rock are unsuitable for steel casting but may be usable for non-ferrous metal casting. Silica sands for iron casting may be somewhat less refractory (heat resistant) than steel casting sands, but must be of better quality in this respect than sands used for non-ferrous work such as brass or aluminum. The value of any foundry sand depends upon: bond or cohesiveness, permeability, grain size, refractoriness, and durability. Unbonded natural sand is converted into molding sand by addition of fire clay or some other suitable bonding medium. The result is a material which can be molded into intricate shapes without failing under its own weight. Naturally bonded sands can usually be used without major addition of binders. The permeability of a molding sand is that property which permits flowage of gas through the mold. This property is exceedingly important as confined gas causes flaws in the cast metal. Angular, coarse sand has greater permeability than fine, rounded sand but does not produce a smoothly finished casting. Molds for large intricate castings are often made up of several different sands each having different physical properties. Fine sand is used in intricate parts of molds, in cores, and to face molds where smooth finished castings are required. Refractoriness depends upon the chemical composition of the sand. In general, high silica sand is most refractory and high alkali sands least refractory. Steel molding sand usually must contain more than 96% of silica before addition of the bond. Naturally bonded sand for some purposes may contain as low as 57% silica, but it usually contains between 75% and 95% of free and combined silica. The durability of a sand depends upon the toughness of the individual grains and their angularity. Angular grains of cleavable feldspar are considerably less durable than unflawed grains of partly rounded quartz.

About eight sources of clay-free foundry sand are being exploited at present in California and about twenty deposits of naturally bonded sand are being worked. California can produce sufficient quantities of foundry sand for its own use in all categories except high silica sand for steel casting. Only three known California deposits contain sands high enough in silica to meet steel casting requirements. Two of these are in the vicinity of Mt. Diablo in Contra Costa County. The third is a fractured quartzitic deposit outcropping at "Quartz Hill" near Montrose in Los Angeles County. This rock is machine-crushed to meet steel casting sand requirements. Coarse, alluvial sands for use in heavy iron casting are found in the vicinity of San Francisco, Sacramento, and Los Angeles. The Torrance, Redondo Beach, and Santa Ana districts of Los Angeles County also produce coarse alluvial sands. Fine-grained sands for light iron and non-ferrous casting come from the following marine deposits: near Millbrae, San Mateo Co.; near Lompoc and Goleta, Santa Barbara Co.; the Ventura city

area, Ventura Co.; and the Santa Ana district, Los Angeles Co. A fine-grained alluvial sand is marketed from a shallow deposit near Riverside. Excepting the high-silica sands first mentioned, all the foregoing deposits produce sand of naturally bonded type. Two natural mixtures of silica sand and refractory type clay are marketed for patching purposes and for use in synthetic sand mixtures. One of these is produced at Livermore, Alameda Co., and the other in Trabuco Canyon in the Santa Ana Mts. of Orange Co. As yet, no first-grade high-refractory silica sand has been produced in California.

The majority of California foundry sands are removed from their respective deposits by simple surface mechanical means such as power shovels and dragline buckets. Because of extensive fracturing in the deposit, even the "hard rock" of Quartz Hill is mined by steam shovel. Underground mining by drifts and overhand stopes is being done in workings of the old Nortonville coal mine in Contra Costa Co. There, the sand is taken from poorly consolidated sandstone beds by use of explosives. At Riverside, the sand is both removed from the deposit and loaded onto trucks by use of a bulldozer and ramp. Some bedded sandstone deposits have been worked by ordinary quarrying methods in open workings.

Processing procedure for sand for foundry purposes depends upon the nature of the sand itself and upon the anticipated use. Many California sands are marketed exactly as taken from the deposit. Others require crushing or screening or both. Some high-quality sands are put through crushers or hydraulic-separation plants; mechanical washers or "scrubbers"; screens or other classifiers; and dewatering or dehydrating plants. Different companies use different equipment and little uniformity is evident in processing methods for foundry sand.

Three papers on foundry sands are now in press in the California Journal of Mines and Geology for January 1948, which will be released soon. These are Trends in the Foundry-Sand Industry, by Leonard O. Hofstetter, Properties of Foundry Sands, by Heinrich Ries, and California Foundry Sands, by Heinrich Ries and Lauren A. Wright.

References:

Ries, Heinrich, Special sands: Industrial Minerals and Rocks, pp. 749-754, Am. Inst. Min. Met. Eng., 1937.

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Weigel, W.M., Technology and uses of silica sand: U.S. Bur. Mines Bull. 266, pp. 95-108, 1927.

State of California
Department of Natural Resources
DIVISION OF MINES
OLAF P. JENKINS, CHIEF
FERRY BUILDING, SAN FRANCISCO 11

No. 36

INFORMATION CIRCULAR

January 1, 1948

SILICA SAND FOR GLASS

Silica sand is composed chiefly of quartz grains. For most purposes, the higher the quartz content the better the sand. This is particularly true of glass sands. Feldspar is a common impurity, sometimes in considerable amounts. Clay, organic matter, and iron-bearing minerals are often present. Among glass-sand impurities, iron-bearing minerals are least desirable. Silica sand for use in glass manufacturing must meet exacting requirements as to chemical composition. Until recently, the general chemical characteristics of a satisfactory glass sand were: very high silica content, low alumina and alkali content, and very low iron oxide (Fe_2O_3) content. Because of changes in glass-sand sources of supply and revisions in glass-making techniques, sand of higher alumina and alkali content are being utilized providing the alkali content includes little or no magnesia. Alumina, in some forms, tends to decrease the transparency of the glass, and both alumina and magnesia raise the melting point of the glass "batch." Admixed impurities such as clay, organic matter, and some forms of iron oxide can be removed by washing. Because of the high coloring property of iron oxide in glass melts, it is the most undesirable impurity found in glass sand. The effect of iron oxide present in glass sand up to about .2% can be neutralized by decolorizers, such as arsenic trioxide, sodium nitrate, manganese dioxide, nickel oxide, and selenium. However, California glass manufacturers require a sand containing .05% or less of ferric oxide.

Although physical characteristics of silica sand are not so important for glass as are chemical ones, uniformity of grain size is desirable for greater ease of melting. All material should pass a 14-mesh screen and be retained on a 100-mesh; 65% should pass a 20-mesh screen and be retained on a 65-mesh. Either rounded- or angular-grain sands may be used, but the latter melt more easily. Both unconsolidated deposits and weakly cemented sandstones can be utilized for silica sand. Consolidated or cemented deposits are broken down to grain form by hydraulic or crushing methods.

At present, only two deposits are producing glass sand in California. The first, near Corona in Riverside County, has been producing on a limited scale for many years. Greatly increased production is expected there by the end of 1948. The second deposit, known as the Del Monte sand, is located on Seventeen Mile Drive in Monterey County. The sand lies in dunes, having been washed and sorted by wave action and blown there by the wind. Two other deposits formerly produced glass sand but are now idle because of operating difficulties. These are at Pittsburg and Brentwood in Contra Costa County. Nevada glass sand is being used to some extent by California glass plants. A great deal of research has been done on potential glass-sand deposits in California and much more should be done. In other parts of the United States, glass sands come from the Tertiary of New Jersey and the Cretaceous of Maryland, the Carboniferous of Ohio and Indiana, the Oriskany formation of West Virginia and Pennsylvania, and the Ordovician Saint Peters sandstone of Illinois and Missouri. By far the greatest U. S. production of glass sand is from east of the Mississippi River.

California glass sands are mined entirely from loose or but slightly consolidated deposits. Drag-line transportation to the processing plant is used at both California operations. The Corona deposit is broken up, when necessary, by blasting. Eastern deposits are exploited by both surface mechanical and underground mechanical methods. As most of these eastern deposits are sandstones of some degree of cementation, wide use of explosives is necessary. Suction dredges are used to some extent.

All processing of glass sand includes washing to remove very fine material and impurities which might be adhering to the sand grains. The Del Monte sand deposit is processed by washing, classifying, drying, and magnetic separation. Consolidated deposits must be crushed or else broken down by hydraulic means prior to washing. Processing techniques vary with the type of glass being produced and with the individual operation. Revolving screens and vibrating screens are both used.

Glass is classified by chemical composition, by the predominating basic oxide used, and by the physical characteristics of the sand used. Optical glass requires the highest quality glass or quartz. Sand for flint glass has nearly as high specifications as that for optical glass. Other sand types in decreasing order of quality are: plate glass sand, window glass sand, and bottle glass sand. The latter is further subdivided as to use in green or amber glass. Specifications for sands for the above purposes vary with the manufacturer. Nine grades of glass sand are recognized by the American Ceramic Society and the National Bureau of Standards. Copies of the specifications for these sands may be obtained from the Bureau of Standards at Washington, D.

References:

A compilation, Glass sands and glass making materials in Georgia, Georgia Div. Mines, Mining and Geology, October 1940.

Fettke, C. R., American glass sands, their properties and preparation: Am. Inst. Min. Met. Eng. Trans., vol. 73, pp. 398-422, 1926.

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GEOLOGY DIVISION
OFFICE, SCIENCE HALL

E. F. BEAN
STATE GEOLOGIST

THE UNIVERSITY OF WISCONSIN
GEOLOGICAL AND NATURAL HISTORY
SURVEY

MADISON, WISCONSIN (6)

NATURAL HISTORY DIVISION
OFFICE, BIOLOGY BUILDING

E. A. BIRGE
BIOLOGIST

C. JUDAY
LIMNOLOGIST

May 13, 1944

Mr. F. W. Libbey
Acting Director
State Department of Geology
and Mineral Industries
702 Woodlark Building
Portland 5, Oregon

Dear Mr. Libbey:

All of the material dealing with road material reports
was intended to become your permanent possession.

Very truly yours

WISCONSIN GEOLOGICAL SURVEY

By

E. F. Bean
State Geologist

EFB LMV

RECEIVED
MAY 16 1944
STATE DEPT. OF GEOLOGY
& MINERAL INDS.

May 8, 1944

Mr. E. T. Bean, State Geologist
Wisconsin Geological Survey
Madison, 6, Wisconsin

Dear Mr. Bean:

You will recall that you gave Mr. Nixon some data concerning your work in making sand and gravel surveys in your State. These data included blueprint copies of your survey report. Mr. Nixon is under the impression that these reports were duplicates and that we would be allowed to keep them. If this is not your understanding of the matter, please let me know and I will return them to you promptly.

Very truly yours,

F. W. Libbey
Acting Director

FWL:ff

State of Oregon
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
702 Woodlark Building
Portland, Oregon
4

TO: F.W.L.

FROM: E.K.N.

I had a long talk with Ernie Bean on how they have gone about work on road metals with the Wisconsin Highway Commission. Bean has done a swell job. It is about all he has to do because he went political, rode a losing horse, and had his appropriation cut to nothing, so that he has no geological survey.

Some day this Department should get into the picture with the State Highway Commission and these copies of reports of Bean's will give an idea of how they do it in Wisconsin. I wish you would look over these and make any notes you think desirable and return them to Bean with the Department's thanks.

E. F. BEAN
STATE GEOLOGIST

THE UNIVERSITY OF WISCONSIN
GEOLOGICAL AND NATURAL HISTORY
SURVEY

MADISON, WISCONSIN (6)

E. A. BIRGE
BIOLOGIST

C. JUDAY
LIMNOLOGIST

March 17, 1944

Mr. Earl K. Nixon, Director
State Department of Geology
and Mineral Industries
702 Woodlark Building
Portland 5, Oregon

Dear Earl:

I am enclosing a copy of a road materials report on limestone and shale quarries, together with the notes for three locations. Copies of the report and notes are kept on file in our office and in the main office of the Highway Commission. Reports for the counties included in each division are sent to the division highway office and the individual county reports and notes are sent to the county highway commissioners. A set of dissected, mounted county maps showing all location numbers and the boundary of the survey are kept up to date and are kept on file the same as the reports and notes.

The road materials surveys are financed by an appropriation of \$15,000 from the Highway Commission. In addition to road materials surveys, we do a good deal of consulting work for them on questions of classification of excavations, subgrade treatment, etc. On several occasions I have been called as a witness for either the State or the County in suits involving highway matters.

I am enclosing a separate on this subject which was written some time ago. You may be interested in reading an article on "Geology in Highway Engineering," by Marshall T. Huntting, published in the PROCEEDINGS of the American Society of Civil Engineers, December, 1943, Vol. 69, No. 10.

Very truly yours

WISCONSIN GEOLOGICAL SURVEY

By

E. F. Bean

State Geologist

EFB LMV

Enclosures

RECEIVED
MAR 20 1944

STATE DEPT OF GEOLOGY
& MINERAL INDS.

FWK

REPORT #1193

ROAD MATERIALS INVESTIGATION

Material for Surface

CTH "YY"

From Barre Mills to St. Joseph

Length - 4 miles

La Crosse County

July 12-26, 1940

W. D. Michell, G. Hendrickson, and D. V. Dodge, under
the direction of E. F. Bean

Following is a brief description of the locations of material for surfacing on CTH "YY" from Barre Mills to St. Joseph, and for local town and county roads. Of these locations, the following should receive attention for CTH "YY" in the order mentioned; (Dolomite) - 187, 190, 189, 183, 164, 166, and 163; (Shale) - 188, 194, 195, 193, and 186. For CTH "F" and local town roads, locations 185 and 184 should be considered in the order mentioned. Locations 191 and 192 are recommended for specific local roads.

Accompanying this summary is a copy of the field notes from which more detailed information can be obtained. Page references in the summary are to these notes. Reference to the map of La Crosse County will indicate the scope of territory covered and the different quarries, pits, and prospects examined.

Location 34. Lower Magnesian dolomite quarry 120 yards N and 400 yards E of the SW corner of the NW $\frac{1}{4}$ SE $\frac{1}{4}$ of Sec. 30, T.16N., R.6W. Not recommended. Pages 1-4, inclusive.

Location 66. Lower Magnesian dolomite quarry 120 yards N of the S $\frac{1}{4}$ corner of Sec. 11, T.15N., R.8W. Not recommended for surfacing material, but can be used for agricultural lime. Pages 5-9, inclusive.

Location 163. Lower Magnesian dolomite quarry 280 yards S and 50 yards E of the NW corner of the SW $\frac{1}{4}$ NW $\frac{1}{4}$ of Sec. 7, T.15N., R.6W. For available yardage, see notes on earlier survey. Haul is $4\frac{1}{4}$ miles to CTH "YY" over STH 33. Recommended for consideration. Pages 1-14, inclusive.

Location 164. Lower Magnesian dolomite prospect about 150 yards W and 440 yards S of the center of Sec. 8, T.15N., R.6W. Large yardage of good material available. Haul is $3\frac{1}{4}$ miles to CTH "YY" over STH 33. Recommended for consideration. Pages 15-16, inclusive.

Location 165. Lower Magnesian dolomite quarry 430 yards W and 200 yards S of the E $\frac{1}{4}$ corner of Sec. 8, T.15N., R.6W. Not recommended. Pages 17-19, inclusive.

Location 166. Lower Magnesian dolomite quarry 240 yards N and 400 yards E of the SW corner of Sec. 9, T.15N., R.6W. For available yardage, see notes on earlier survey. Haul is 2 miles to CTH "YY" on STH 33. Recommended for consideration. Pages 20-23, inclusive.

Location 183. Lower Magnesian dolomite quarry 40 yards S and 130 yards W of the NE corner of the SE $\frac{1}{4}$ SE $\frac{1}{4}$ of Sec. 9, T.15N., R.6W. Owner: Albert Kreibich. About 25,600 cubic yards of dolomite available. Haul is 1.4 miles to CTH "YY" over quarry road and STH 33 (0.4 mile is on quarry road). Recommended for consideration. Pages 24-32, inclusive.

Location 184. Lower Magnesian dolomite quarry 330 yards E and 25 yards S of the NW corner of Sec. 6, T.15N., R.6W. Owner: John Miller. About 14,700 cubic yards of dolomite available. Haul is $\frac{1}{8}$ mile to town road over field road, and subsequent haul to CTH "F" is $\frac{1}{4}$ mile. Recommended for consideration for CTH "F" and local town roads. Pages 33-37, inclusive.

Location 185. Lower Magnesian dolomite quarry 150 yards N and 400 yards E of the center of Sec. 6, T.15N., R.6W. Owner: Wm. Meyers. About 33,600 cubic yards of dolomite available. Haul is $\frac{3}{4}$ mile to CTH "F" over field and farm road. Recommended for consideration for CTH "F" and local town roads. Pages 38-45, inclusive.

Location 186. Franconia shale pit prospect 150 yards N and just W of the SE corner of the SW $\frac{1}{4}$ SE $\frac{1}{4}$ of Sec. 32, T.16N., R.6W. Owner: John Ulrich. About 19,800 cubic yards of surfacing and shoulder shale available. Haul is 3 miles to CTH "YY" over good road. Recommended for consideration. Pages 46-52, inclusive.

Location 187. Lower Magnesian dolomite quarry 120 yards W and 180 yards N of the center of Sec. 3, T.15N., R.6W. Owner: Gust. Hehls. About 54,600 cubic yards of dolomite available. Haul is 0.4 mile to CTH "YY" over quarry road. Recommended for consideration. Pages 53-61, inclusive.

Location 188. Lodi shale pit 260 yards W and 280 yards S of the E $\frac{1}{4}$ corner of Sec. 3, T.15N., R.6W. Owner: George Simon. About 8,400 cubic yards of surfacing and shoulder shale available. Haul is 0 mile to CTH "YY". Recommended for consideration. Pages 62-69, inclusive.

Location 189. Lower Magnesian dolomite prospect in the SW corner of SW $\frac{1}{4}$ NW $\frac{1}{4}$ of Sec. 2, T.15N., R.6W. Owner: W. Plenge and Sylvester Clements. About 44,800 cubic yards of dolomite available. Haul is 1- $\frac{1}{8}$ miles to CTH "YY" over fields and farm road. Recommended for consideration. Pages 70-77, inclusive.

Location 190. Lower Magnesian dolomite quarry in the NW corner of the SE $\frac{1}{4}$ SE $\frac{1}{4}$ of Sec. 3, T.15N., R.6W. Owner: George Simon. About 64,800 cubic yards of dolomite available. Haul is $\frac{3}{8}$ mile to CTH "YY" over quarry road. Recommended for consideration. Pages 78-85, inclusive.

Location 191. Lower Magnesian dolomite quarry 120 yards W and 150 yards N of the SE corner of Sec. 1, T.15N., R.6W. Owner: Rossie Niesen. Large yardage of dolomite available. Haul is $\frac{1}{4}$ mile to town road over fields. Recommended for consideration for surfacing material for town road on Cattail Ridge. Pages 86-89, inclusive.

Location 192. Lower Magnesian dolomite quarry 50 yards N and just E of the SW corner of the SE $\frac{1}{4}$ SE $\frac{1}{4}$ of Sec. 30, T.16N., R.6W. Owner: O. Swennes. About 15,000 cubic yards of dolomite available. Haul is 1- $\frac{3}{8}$ miles to town road over quarry road. Recommended for town roads in Garber Coulee and vicinity. Pages 90-93, inclusive.

Location 193. Franconia shale prospect 150 yards S and 100 yards E of the $N\frac{1}{4}$ corner of Sec. 32, T.16N., R.6W. Owner: B. Garber. About 28,000 cubic yards of surfacing and shoulder shale available. Haul is 2.5 miles to CTH "YY" over town road. Recommended for consideration. Page 94-99, inclusive.

Location 194. Franconia shale pit prospect 150 yards S and just W of the center of the $NW\frac{1}{4}$ of Sec. 34, T.16N., R.6W. Owner: Aug. Nehls. About 16,800 cubic yards of surfacing and shoulder shale available. Haul is $\frac{1}{4}$ mile to CTH "YY" over hill slope. Recommended for consideration. Pages 100-105, inclusive.

Location 195. Franconia shale pit prospect 50 yards W of the center of the $NE\frac{1}{4}$ of Sec. 35, T.16N., R.6W. Owner: Wm. Manke. About 24,300 cubic yards of surfacing and shoulder shale available. Haul is 2.5 miles to CTH "YY" over good road. Recommended for consideration. Pages 106-113, inclusive.

Oregon population expected to ex

By FRED LEESON
Journal Staff Writer

Take every person in Multnomah County — all 553,000. And take half of everybody in Lane County — another 123,000.

Add them all to Oregon's future and you have a general idea of what the

population

state's population will be in the year 2000.

"It's a little frightening if you're a James Blaine type person," says James Weiss, director of the Center for Population Research and Census at Portland State University where the population estimates were calculated.

PROJECTIONS compiled by the center indicate that Oregon will have a statewide population of 3,019,900 at the turn of the century, compared to a 1976 total of 2,341,750.

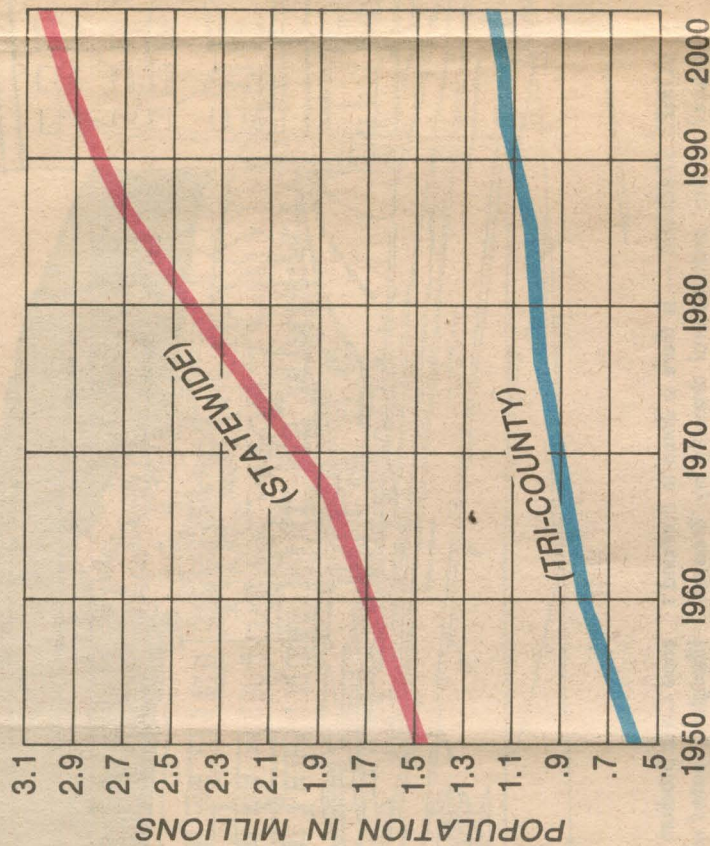
That means providing housing, economic support and recreational opportunities for another 678,150 Oregon people.

Where will they live? Will Oregon's natural beauty be lessened by increased numbers? Will the state continue to be attractive to migrants from other states?

MOST EXPERTS think Oregon's growth will occur west of the Cascades, predominantly in the Willamette Valley.

"I think the main thing will be a filling up of the Willamette Valley," Weiss says, particularly between Eugene and Portland. County-by-county population projections made at PSU estimate an increase of 120,600 in Clackamas County, 94,300 in Washington, 67,000 in Multnomah, 78,000 in Lane and 53,100 in Marion.

URBAN SCHOLARS think the availability of energy and transportation will play major roles in determining whether



er Oregon's increased population concentrates in cities or continues the current pattern of suburban sprawl.

The Land Conservation and Development Commission (LCDC) has guidelines aimed at setting definite urban boundaries, but not enough local plans have been submitted to the LCDC yet to indicate how the state will grow.

"I think few people here realize that even the City of Portland is half empty by Eastern standards," Weiss notes. "There's still a lot of potential growth left in cities themselves. Some people think that's the way to go, and others think we should keep densities low."

FRED KLABOE, chief of operations for the state Department of Transportation, also indicates that most growth

will occur in the Willamette Valley.

He predicts train trips in the valley "will increase dramatically," but automobile travel will continue to dominate most passenger travel.

"Even if use of other modes doubles from what it is today, automobiles will still account for 80 per cent of all trips in the state," he says.

CARS, he predicts, will be smaller, more efficient and will run on fuels other than gasoline. "The highway system probably will show very little change, with only a minor number of new miles."

Klaboe thinks bus or dial-a-bus transit service will be available in all cities with more than 5,000 residents, and the percentage of transit trips in Portland,

Eugene and Salem will increase by three or four times over current levels.

Outside the main transportation corridors across the state, Klaboe thinks improved commuter air service will link residents of smaller cities to bigger transportation centers.

EXTENSIVE population growth in Eastern Oregon is "unrealistic," Weiss thinks, primarily because of limited energy and water supplies.

"That kind of ecosystem simply wouldn't support large concentrations of population," he says. "It's such a parched area, even in the best of years."

The result of Oregon's growth, Weiss thinks, will make the state less attractive to outsiders.

"The main speculation is as Oregon fills up, especially in the Willamette Valley, it will cease to be as attractive as it is now. Also, the efforts of other states to clean up their environments will be a factor. Secondly, we figured there would be certain limits of growth due to energy and its impact on industrial expansion."

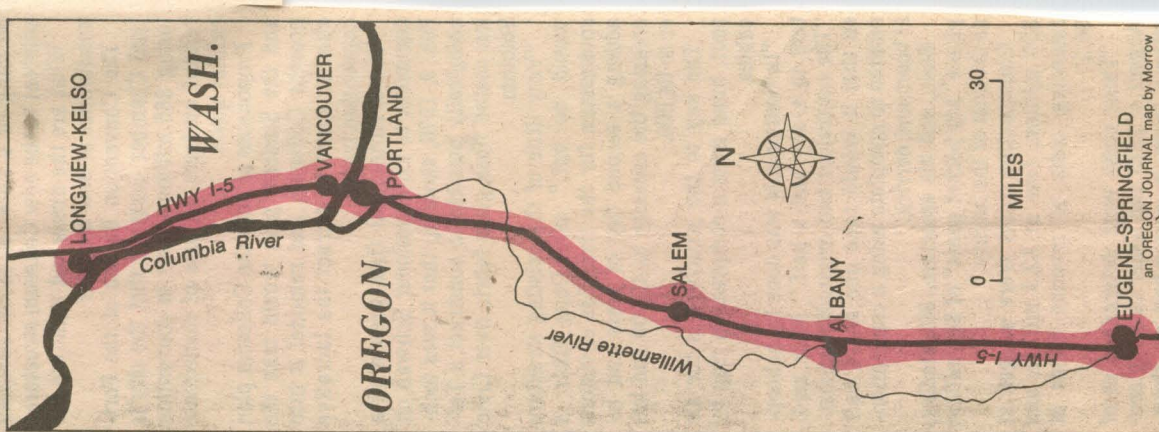
THE POPULATION projections compiled by Weiss assume that migration to Oregon from other states will taper down in upcoming years, reaching a point about 2000 at which the number of people moving into Oregon equals the number of people moving out.

The projections made at PSU assume that death rates will remain essentially the same over the next quarter century, and that birth rates will stabilize at the "replacement rate" of 2.11 children per woman.

Weiss acknowledges that Oregon's birth rate has slipped below the replacement level over the last three years, but says, "No society has ever failed to achieve replacement over time."

THE FIGURES indicate that females will continue to hold a slight numerical edge in the year 2000, comprising 51.25 per cent of the total population.

The proportion of persons over 65 will remain at 10 to 11 per cent of the



FILLING UP? — Population experts predict that most of Oregon's population growth will take place in the Willamette Valley. Additional growth also is expected in the same "corridor" north to Kelso, Wash.

plode

population, according to the projections, but that means an increase of about 18 per cent in the number of elderly over the present population.

Projections indicate at least some growth will occur in all Oregon counties except Gilliam County. The population there is expected to decline from 2,100 in 1975 to 1,400 by 2000.

March 19, 1969

Mr. Kessler Cannon
Committee on Natural Resources
207 State Capitol
Salem, Oregon

Dear Kess:

Here are a few comments on the letter from Mr. Albert L. Cox regarding the taking of sand and gravel from non-stream areas in the Willamette Valley.

This same problem has concerned us for quite a few years, and the enclosed machine copy of a letter to the State Land Board touches on several of the points. We feel also that it might make good sense to actually subsidize some dredging operations in critical areas subject to flooding.

We realize that if such a policy was adopted it might create some administrative problems. However, on balance, some very real advantages might accrue:

1. If all stream dredging by sand and gravel operators ceases then much dredging at public expense (in this case the Federal government) would have to be done just to keep the channels open enough to minimize overbank flooding. Characteristically dredging by the Army Engineers simply opens up the channel and usually the spoil is deposited on nearby banks where it eventually returns to the stream.
2. Stream dredging by sand and gravel operators removes the material completely from the stream to a point of ultimate use, often miles away. Also, the operators pay the State a royalty to boot.

3. Perhaps some arrangement could be made to offset the loss in revenue to the State by having the Federal government subsidize the State either wholly or in part for the loss of revenue, at the same time giving the sand and gravel to the operators either free or at a reduced cost in exchange for dredging in selected problem areas.
4. Until such time as the various planning groups responsible for long-range utilization of Willamette Valley lands can come up with some adequate plans which consider the total sand and gravel resources in the area, there will continue to be haphazard exploitation of valley lands.
5. We are keenly aware of the rapidly diminishing areas in which sand and gravel can be obtained in the face of an equally rapid rise in demand for this commodity. A similar problem exists with respect to prime agricultural lands. With competent planning it is possible to have our sand and gravel when we want it - and in the case of dry land areas, minimize the disruption to agriculture or other uses. Long-range planning for in-stream dredging is overdue. Flood control, maintenance of fixed stream channels, and development of "greenbelts" cannot be undertaken effectively without such planning.

Sincerely yours,

Ralph S. Mason
Mining Engineer

RSM:lk
Encl.

Crushed Rock
(5 & 9)

January 24, 1969

Mr. Earl C. Peterson
Director of
Research, Development & Corrosion Protection
Permduc International, Inc.
1300 Kelly Drive
Minneapolis, Minnesota 55427

Dear Mr. Peterson:

Thank you for your letter inquiring about crushed rock operations in Oregon.

Here is a copy of a Bureau of Mines tabulation of stone operators in the State. Also enclosed is a machine copy from a report on Columbia River Basalt which appeared in Northwest Science.

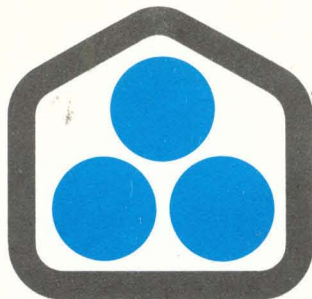
If we can supply any further information please call on us.

Sincerely yours,

Ralph S. Mason
Mining Engineer

RSM:lk
Encl.

JAN 17 1969



PERMADUC INTERNATIONAL, INC.

1300 KELLY DRIVE • MINNEAPOLIS, MINN, 55402

January 16, 1969.

Dept. of Commerce
Economic Development
560 State Office Bldg.,
Portland, Oregon. 97201

Gentlemen:

I am trying to obtain information on what rock crushing operations are active in your State. I am particularly interested in trap rock or basalt operations. If you have any information in regards to names and addresses and chemical analysis of such material in your state, I would be appreciative for this information.

I am enclosing herewith, a self addressed, stamped envelope for a reply.

Very truly yours,

Earl C. Peterson

ECP:ap

BASALT ANALYSES

TRAP ROCK LISTS OF MINES

RECEIVED
JAN 17 1969
STATE DEPT. OF GEOLOGY
GENERAL INDS.

S. & G.
September 30, 1968

Mr. Dale Mallicoat
Division of State Lands
20 Agriculture Building
Salem, Oregon

Dear Dale:

Here is a brief interim report on the current study being made by CH2M for the Oregon Concrete Aggregate Producers Association:

On August 27, 28, and 29 three barges belonging to Umpqua Navigation Company at Reedsport were surveyed by a crew of four men, two supplied by CH2M and two by the Department of Geology. The loaded barges were carefully profiled so that the volume of the load could be determined. The draught of the barges was taken at the loading site, loaded and unloaded, as well as at the discharge dock. Additional draughts were taken to determine the effect of loss of surface water from the aggregate upon standing overnight. Samples were taken to determine moisture and size range.

In my opinion the program was entirely adequate for the purposes, and the execution of the field work done in a thoroughly competent and impartial manner.

A similar program was carried out at Willamette Tug and Barge in the Portland Harbor on September 24 and 25, with a crew of four. Excellent cooperation was extended by Umpqua, the Willamette operation seemed to be somewhat less well coordinated and was plagued by breakdowns.

Sincerely yours,

Ralph S. Mason
Mining Engineer

RSM:lk

SAND AND GRAVEL AND STONE INDUSTRY IN THE WILLAMETTE VALLEY

Sand, gravel, and stone together rank as No. 1 in Oregon's mineral industry. The total production in 1966 was valued at \$57,000,000 as compared to \$23,000,000 for all other minerals (Collins, Gray and Kingston, 1966). The Willamette Valley area produces and consumes about two-thirds of the State's total in sand and gravel. This region requires more sand and gravel per capita than do other parts of the country because of the rapid industrial and urban expansion accompanying population growth. It is estimated that more than 7.5 tons are required annually per capita in this area as compared to the national average of 6.5 tons.

Uses

Deposits of sand, gravel, and stone are vital raw materials for the many new highways, bridges, and other heavy construction in the Willamette Valley. Large quantities of sand and gravel are used for fill as well as for asphaltic and portland-cement concrete. Stone, chiefly basalt, is quarried locally for riprap, and crushed basalt is used for embankment material, for rock-surfaced roads, and in asphaltic and portland-cement concrete.

Geologic OccurrenceSand and gravel

Sand and gravel occur in several types of deposits, chief of which are stream channels, floodplains, alluvial fans, and deltaic deposits.

Stream channels and floodplains. The larger streams deposit gravels in the form of bars within their channels and along the inside bank of meanders.

The quantity of gravel brought into the valleys from the Cascade Range is now being limited by the high dams built on the Clackamas, North and South Santiam, McKenzie, and Willamette Rivers and their tributaries. These dams do not allow new gravel to move past their ponded areas, and the leveling effect of most of the floods by dams slows the migration of gravels downstream. Flood control dams and placement of riprap along the banks to prevent erosion minimize bank gravels as a source of stream load.

Gravel deposits from Coast Range streams are generally small and of little consequence except locally. In some places the gravel is made up of good quality basalt from small dikes and sills. Eocene lavas are abundant but much of these lavas are badly weathered or altered and produce gravel of poor quality.

Large deposits of sand and gravel occur in the mile-wide floodplain of the Willamette River. These gravels, left by the Willamette River along old meander channels on the floodplain, have been buried by sandy silt to depths less than 10 feet (Schlicker, 1961). Gravel deposits of this type occur along the eastern margin of the Willamette River from Newberg south to the Eugene area. They merge with gravels similarly deposited by the larger tributaries flowing from the Cascade Mountains.

Alluvial fans. Alluvial or glacial outwash fans in the Santiam River drainage between Mehama and Turner provide a few hundred square miles underlain by sand and gravel. Although these gravels are quite deep, the deposits are usually not as clean as floodplain gravels. This may be due partly to weathering which has produced some clay in the deposits.

Deltaic gravels. In the east Portland area extensive gravels were deposited as deltas in a lacustrine environment. Gravel deposits in the east

Portland, southeast Portland, and in the Durham area of southwest Portland are of this type. According to Trimble (1963), these gravels were deposited by a fast-moving body of water which traveled through the Columbia River Gorge and formed a temporary lake in the Portland and northern part of the Willamette Valley during Pleistocene time. As the water spread out and lost its load-carrying capacity, the gravels were dumped forming stratified deposits with steep torrential foreset bedding. The material ranges in size from sand to large boulders and blocks and is composed primarily of basalt but contains some quartzite and granitic clasts.

Basalt

Basaltic rock suitable for construction purposes occurs in lava flows and intrusive bodies in the topographically higher areas within and surrounding the Willamette Valley region. These rocks consist of Eocene-Oligocene lavas and basaltic intrusives and Miocene lava flows of Columbia River Basalt. The basaltic rock is quarried and crushed for local use in areas where gravels are not available. The Columbia River Basalt is generally the best and most widely used quarry rock, but in some areas dikes and plugs of basalt and Eocene lavas are satisfactory rock sources. The intrusive and older lavas, however, tend to break large and are better suited for riprap than for crushed rock.

Commercial Aspects of Gravel Deposits and Rock Quarries

Gravel deposits and rock quarries are quite numerous throughout the Willamette Valley region, but the haul factor makes only those that are less than 20 miles from the point of use economical. These raw materials will become more valuable when urban expansion approaches the economic limits of

the deposits or when they are required for special uses such as highways, bridges, or concrete dams.

Gravel deposits are frequently forced out by urban encroachment before the deposits are completely utilized; thereby part of these resources are wasted. Measurements of total quantities do not reflect the available gravel resources unless for some reason the land is not suitable for housing or industrial sites. Unfortunately most gravel deposits lie in the flat ground adjacent to stream, highway, and rail transportation and therefore are also prime areas for industrial development.

Production and Consumption

From 1960 to 1965 the use of sand and gravel related to industrial and urban development in the Willamette Valley increased from 8.9 to 10.7 million tons, or about 20 percent, an average of 4 percent per year (Jerry J. Gray, U.S. Bur. Mines, Albany, Oregon, written communication, Oct. 6, 1967). During this period the population in the Willamette Valley increased about 12 percent, or about 2.4 percent per year (Willamette Basin Inter-Governmental Task Force, 1963). The usage per capita averaged about 7.5 tons in 1960 and increased to 8 tons in 1965. The quantity of gravel used annually per capita varies somewhat with the area. Studies elsewhere show at least 5 tons and frequently more. In general, a growing population will require considerably more raw material than a static population.

Crushed rock used, exclusive of dam and river-bank construction, increased from 3.8 million tons in 1960 to 4.0 million tons in 1965, an increase of 4.3 percent. The use of riprap for river-bank protection rose from 0.2 million tons in 1960 to 1.2 million tons in 1965 (op cit). This increase of 580 percent is due mainly to repair of the 1964-1965 flood damage.

Future Requirements

Aside from major dam construction, which is essentially completed for the Willamette Valley, and the use of materials for flood repair, the requirements for sand and gravel and crushed rock can be related directly to population growth.

The population in the Willamette Basin has for several decades been growing at an increasing rate (see Graph I), and this increase is not expected to diminish. Using a conservative average of 6.5 tons of sand and gravel per capita, the annual production will be 14 million tons in 1985 and 25 million tons by 2010 (Graph II).

In order to visualize the total sand and gravel resources which will be required for the future, accumulation curves have been drawn based on present average consumption per capita and future population projections. Beginning with 1965, in which approximately 10.5 million tons of material was produced, the accumulative production by the year 1985 will have been almost 300 million tons, and by the year 2011 the amount of sand and gravel used will have been 800 million tons (Graph III). Assuming gravel extends an average of 30 feet deep, an excavation one-half mile wide by 60 miles long will be required to produce the quantities needed by 2010.

The gravel in the Willamette Valley is in and adjacent to the Willamette River and a few major tributaries. It appears likely that most, if not all, of the available gravel will be needed for future development of the area. From past experience here and in other areas, gravel shortages become critical long before the entire resource can be used. The incomplete utilization of the resource is attributable to several factors previously mentioned in this report. Since gravel is a vital resource in the development of the Willamette

Valley area and it appears that most, if not all, of the gravel deposits of the area will be required, adequate protection by both state and local governmental agencies will be needed to assure its availability for future use.

Table 1

Sand and Gravel in Tons

<u>Year</u>	<u>Buildings</u>	<u>Paving</u>	<u>Railroad ballast</u>	<u>Fill</u>	<u>Dam con- struction</u>	<u>Other</u>	<u>Total</u>
1960	2,040,014	5,494,461	37,800	707,381	3,537,901	661,776	12,479,333
1965	2,910,000	6,894,000	23,000	712,000	610,000	158,000	11,307,000

1985 projected need - 14,000,000 tons.

2010 projected need - 25,000,000 tons.

Stone in Tons

<u>Year</u>	<u>Buildings</u>	<u>Road con- struction</u>	<u>Railroad ballast</u>	<u>Fill</u>	<u>Dam con- struction</u>	<u>Other</u>	<u>Total</u>
1960	937	3,458,519	206,463	205,122	978,600	156,505	5,006,146
1965	1,097	3,794,381	2,500	1,393,487	4,416,160	188,379	9,796,004

Graph 1.

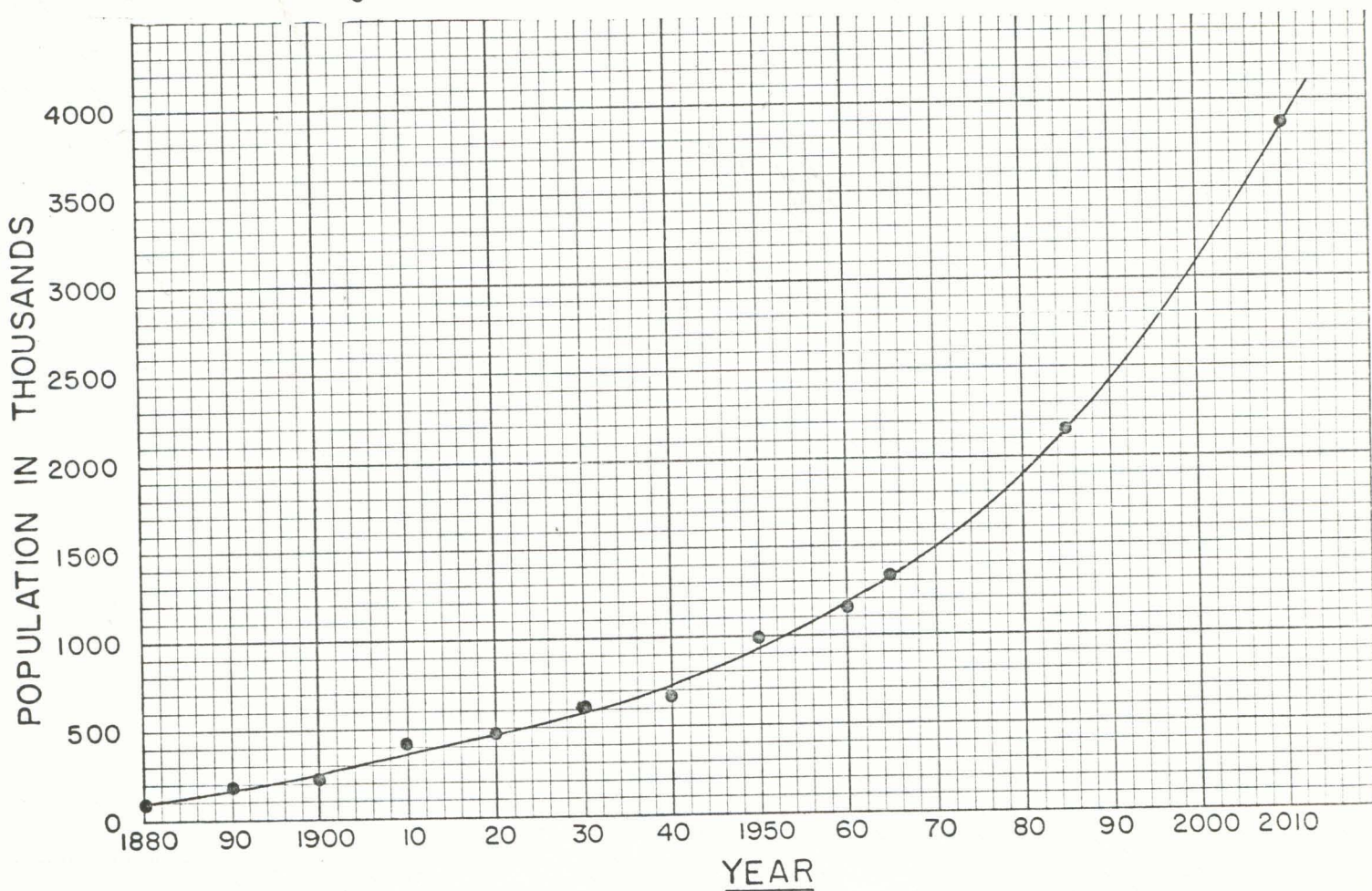
Population Curve for Willamette Basin Counties

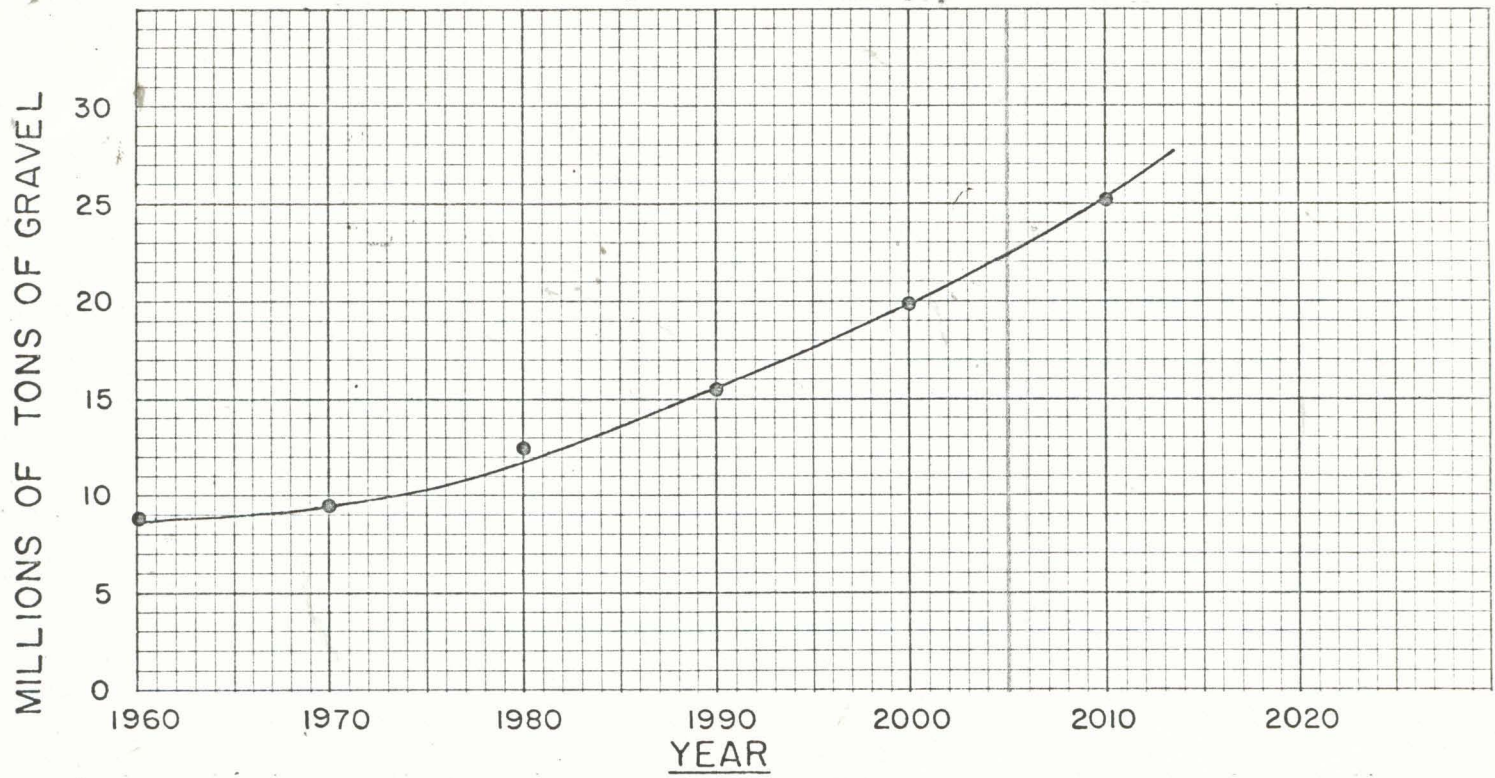
1870 - 1960: U.S. Bureau of Census, U.S. Census of Population: 1960, Oregon.

1960 - 2010: Preliminary Population Projections, Willamette Basin, 1960 - 2010

Prepared for Task Force, 1963.

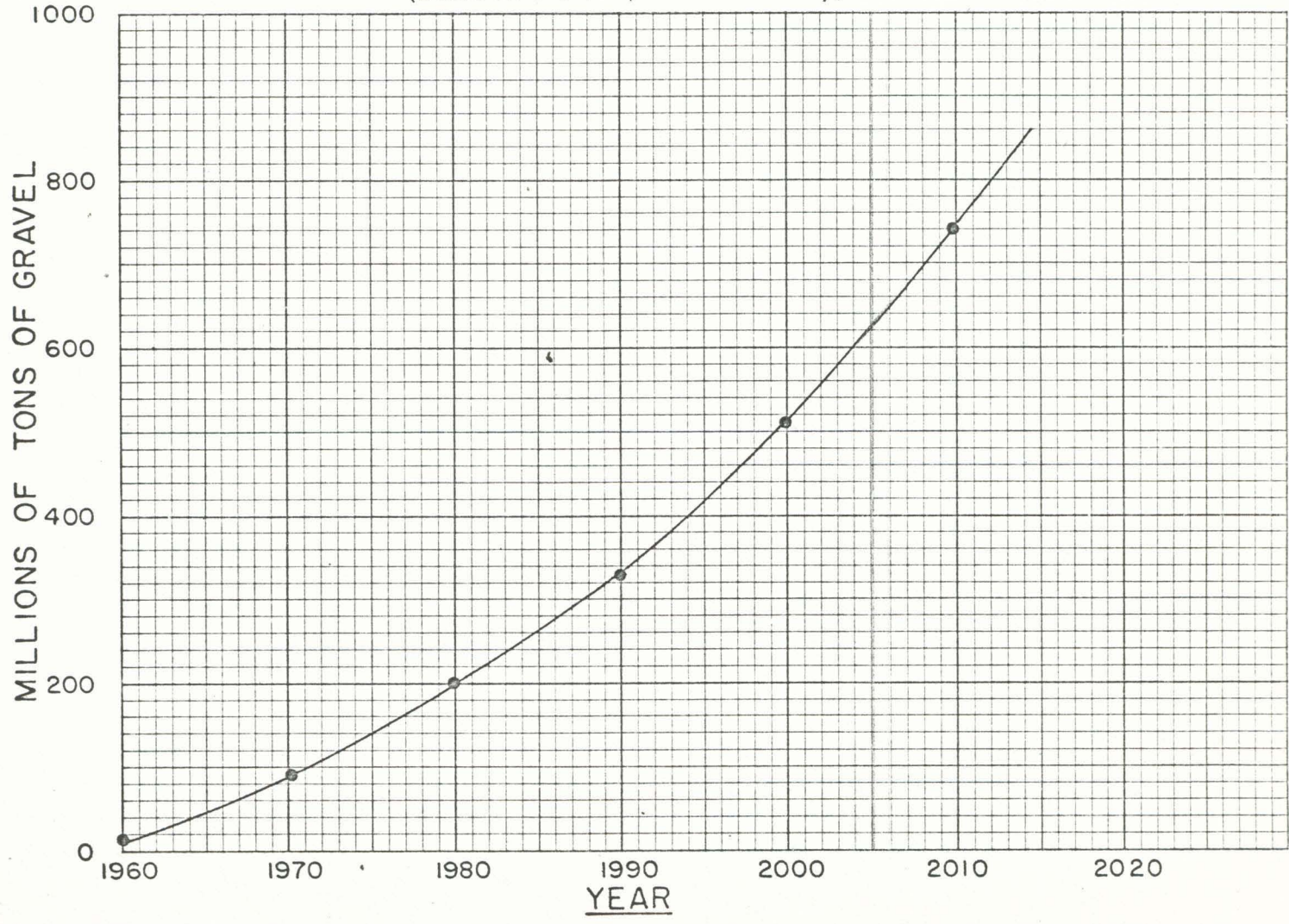
1965 - Oregon State Board of Census, Portland State College, Portland, Oregon, July 1965





Graph 3.

Accumulative Gravel-Production Curve
(Based on 6-5 Tons/Person Annually)



Bibliography

Collins, R. P., Gray, J. J., and Kingston, G. A., 1966, The mineral industry of Oregon: U.S. Bur. Mines Area Report B-120, Albany, Oregon, Dec. 7, 1966.

Schlicker, Herbert G., 1961, Gravel resources in relation to urban development in the Salem area: State of Oregon Dept. Geology and Mineral Industries open file report, May 19, 1961.

Trimble, Donald E., 1963, Geology of Portland, Oregon and adjacent areas: U.S. Geol. Survey Bull. 1119.

Willamette Basin Inter-Governmental Task Force, 1963, Preliminary population projections, Willamette Basin, 1960-2010, by sub-basin and by tributary: open file report.

September 12, 1975

Mr. Glen L. Wilfert
Project Coordinator
Battelle Pacific Northwest Laboratories
Battelle Boulevard
Richland, Washington 99852

Dear Mr. Wilfert:

We have reviewed the material you submitted on the Umpqua project and find ourselves in general agreement with your discussion. Projections are always chancey but until some clown invents a substitute for good old sand and gravel you should be on fairly safe ground.

Thank you for the opportunity to look over the manuscript.

Sincerely yours,

Ralph S. Mason
Deputy State Geologist

RSM:lk



Pacific Northwest Laboratories
Battelle Boulevard
Richland, Washington 99352
Telephone (509) 946-2300
Telex 32-6345

September 5, 1975

Mr. Ralph S. Mason
Deputy State Geologist
Oregon Department of
Geology and Mineral Ind.
1069 State Office Bldg.
Portland, Oregon 97201

Dear Mr. Mason:

We have prepared a preliminary draft of working papers for our study for the U.S. Army Corps of Engineers in determining the impact of proposed modifications to the Umpqua River Entrance. We are sending these working papers to various people who have an interest in this study and who may be able to supply us further data relative to it. We are eager to receive your reaction and any help you may be able to give.

Because of your particular interests and expertise, we are sending you the introductory background information and the following working papers:

Working Paper E - Mineral Products

In your discussions with Mr. Yandon you indicated that the excavation of sand and gravel on the Umpqua might be somewhat expandable. For working paper purposes we have allowed sand and gravel operations on the Umpqua to increase if Umpqua entrance conditions are improved.

Sincerely,

Glen L. Wilfert
Project Coordinator

GLW:tw

Enclosures

May 23, 1973

Mr. Lyle Balderson
Columbia Region Association of Governments
6400 S.W. Canyon Court
Portland, Oregon 97221

Dear Lyle:

Thank you for the copy of the sand and gravel report submitted to the Metropolitan Planning Commission in 1964.

The information presented in this report is quite useful and I am sure we will utilize much of it if we are allowed to make our Willamette Valley sand and gravel study.

Best regards.

Sincerely yours,

REC:jr

Raymond E. Corcoran
State Geologist



COLUMBIA REGION ASSOCIATION of GOVERNMENTS

6400 S.W. CANYON COURT

PORTLAND, OREGON 97221

(503) 297-3726

CLACKAMAS COUNTY

Canby
Gladstone
Happy Valley
Lake Oswego
Milwaukie
Oregon City
West Linn

CLARK COUNTY

Camas
Vancouver
Washougal

COLUMBIA COUNTY

Clatskanie
Columbia City
Prescott
Rainier
Scappoose
St. Helens
Vernonia

MULTNOMAH COUNTY

Fairview
Gresham
Portland
Troutdale
Wood Village

WASHINGTON COUNTY

Beaverton
Cornelius
Durham
Forest Grove
Hillsboro
North Plains
Sherwood
Tigard
Tualatin

May 21, 1973

Mr. Raymond E. Corcoran
State Geologist
1060 State Office Building
Portland, Oregon 97201

Dear Ray:

Here is the copy of the Sand and Gravel Report put out by the Metropolitan Planning Commission. Since it is our only copy, please return it to us when you have finished with it.

Also enclosed for your information is a copy of a letter being sent to the Ways & Means Committee today.

Sincerely,

LYLE BALDERSON

LB/mhm
enclosures

RECEIVED
MAY 22 1973

STATE DEPT. OF GEOLOGY
& MINERAL IND.

COLUMBIA REGION ASSOCIATION of GOVERNMENTS

6400 S.W. CANYON COURT
PORTLAND, OREGON 97221

(503) 297-3726

May 18, 1973

Representative Keith Skelton
Chairman, Ways & Means Committee #6
Room 107G
State Capitol Building
Salem, Oregon

Subject: Support for the budget of the State Department of
Geology & Mineral Industries for a sand and gravel
survey of the Willamette Valley

Dear Representative Skelton:

It has come to CRAG's attention that the State Department of Geology and Mineral Industries has requested certain funds within their budget to conduct a sand and gravel study for the Willamette Valley. The Executive Board of CRAG feels this is a very desirable undertaking as sand and gravel deposits are vital in providing construction material for the future development of the Valley. The scarcity of good deposits, the increase in cost if transportation over long distances is required, as well as the need not to allow incompatible uses or developments in the vicinity of good deposits, makes this study of a high priority.

CRAG is currently developing a new regional plan and this type of information would be valuable in the design of a land use plan for the CRAG Region.

Therefore, based on the above, we wish to add our support for the funding of this study.

Sincerely,

William H. Young
William H. Young
Chairman of CRAG and
Mayor, City of Beaverton

WHY/LEB;mhm

CRAG

CLACKAMAS COUNTY

Canby
Gladstone
Happy Valley
Lake Oswego
Milwaukie
Oregon City
West Linn

CLARK COUNTY

Camas
Vancouver
Washougal

COLUMBIA COUNTY

Clatskanie
Columbia City
Prescott
Rainier
Scappoose
St. Helens
Vernonia

MULTNOMAH COUNTY

Fairview
Gresham
Portland
Troutdale
Wood Village

WASHINGTON COUNTY

Beaverton
Cornelius
Durham
Forest Grove
Hillsboro
North Plains
Sherwood
Tigard
Tualatin

*Set up mtg w/ Dave,
Bill + Gus w/ Kess
Mtg 1:30 PM Oct. 18*

September 20, 1972

Water Res. Bd.

Mr. Kessler R. Cannon
Admin. Assistant - Natural Resources
Office of the Governor
State Capitol
Salem, Oregon

Dear Kess:

I have discussed the problem of gravel removal from the Willamette River with Ralph Mason as a result of our telephone conversation the other day.

As you recall, you proposed three different possibilities of how the situation could be handled that would provide a means for utilizing the resource while having a minimal impact on the environment:

- (1) The Division of State Lands should sell the land to the Highway Division but retain the mineral rights.
- (2) Mining operations should be carried on only during periods of low recreational use.
- (3) Mining should be halted in the "sensitive" areas until some future time when the resource is actually needed.

Alternative (1) might be agreeable to the Highway Division but it seems to me that it would be very unlikely the land could be opened up to mining once it was established as part of the Green Belt System.

Ralph points out that as far as alternative (3) is concerned, none of the gravel would be removed at the present time unless it was actually needed and I think his point is a good one. In other words, if we halted mining in one area, some other near-by area would have to be opened up to take care of the ever-increasing demand.

Alternative (2) might be feasible if we could get the companies to cooperate and the counties to provide lands for stockpiling. The problem would be that mining would only be allowed during the winter and early spring periods when the water was at its highest and gravel extraction was the most difficult.

September 20, 1972

Ralph has proposed a fourth possibility which would utilize planting of vegetation along the river to screen the operations as much as possible. As one area became mined out, it could be reclaimed and an adjoining area screened for the next operation.

None of these proposals is going to be completely satisfactory - to the Division of State Lands which needs money for the school fund, to the State Highway Division which is trying to develop a Green Belt along the river, or to the operators themselves.

What this means is that new sources of supplies beyond the boundaries of the Willamette River should be outlined and evaluated. This, of course, is what I have been trying to get funds to do for the past several years. If we could get the counties to cooperate by reserving good supplies of sand and gravel for future use, we could at least keep future operations in the river at a reasonable minimum.

Best regards.

Sincerely yours,

REC:jr

Raymond E. Corcoran
State Geologist

SAND AND GRAVEL INVENTORY STUDY OF THE WILLAMETTE VALLEY

Each new family residence constructed in the United States in 1969 used the equivalent of 25 ready-mix truck loads of concrete. This figure includes the concrete used in the house itself, the street out in front, part of the schools, churches, fire stations, etc. that had to be built to accommodate the new housing unit. When a ton of sand and gravel leaves the pit it has a value of about \$1.25. After mixing with some cement and water and being placed in a commercial building it represents approximately \$100 worth of construction. There is no economic substitute for sand and gravel for most purposes and no substitute at all for many other uses.

An acre of land with 27 feet of sand and gravel will yield more than 40,000 cubic yards or 80,000 tons. A community which, by comprehensive, careful planning, "saves" even as little as 100 acres of such land for future use has created an equity which will prove to have a value far in excess of the raw value of the sand and gravel.

The reserves of usable sand and gravel remaining in the nine counties which constitute the Willamette Valley are estimated at 76,000 acres. If a depth of 10 feet on an average is assumed and 100 percent of the reserves can be recovered, a total of 1.2 billion cubic yards or 2.4 billion tons are available. These reserves are constantly being diminished by two factors: (1) urbanization and (2) production. Urbanization involves all forms of land use which would preclude the extraction of sand and gravel. The spread of urban areas, extension of highways,

expansion of zoning districts prohibiting sand and gravel extraction, and other related factors are forms of urbanization.

(1) Projected Urbanization in the Willamette Valley

<u>Decade</u>	<u>Acres Urbanized</u>	<u>Cumulative Acres</u>
1970-80	7,410	7,410
1980-90	9,600	17,010
1990-00	11,700	28,710
2000-10	13,700	42,410

Projections for the per capita use of sand and gravel for the Valley to the year 2010 have been set at 12 tons. This figure compares with a state-wide 20 tons per person in 1968, a figure reflecting above normal consumption because of the dams being completed on the Columbia and Willamette Rivers. Historically the per capita use of sand and gravel in the State has been steadily increasing, with a 77 percent rise between 1920 and 1940, and a 255 percent increase from 1940 to 1960. In summary, the 12 tons per capita consumption for sand and gravel in the Valley seems a conservative figure.

(2) Projected Production of Sand and Gravel in the Willamette Valley

<u>Decade</u>	<u>Average Population</u>	<u>Factor*</u>	<u>Millions of Tons Consumed in Decade</u>	<u>Equivalent in Acres</u>	<u>Cumulative Acres</u>
1970-80	1,700,000	120	204	7,030	7,030
1980-90	2,150,000	120	258	8,900	15,930
1990-00	2,750,000	120	330	11,360	27,290
2000-10	3,475,000	120	417	14,350	41,640

*12 (tons per capita) x 10 (years in decade) = 120

The combined effects of urbanization and production, if both pursue the courses projected, could result in the complete exhaustion of all known sand and gravel resources in the Willamette Valley shortly after the year 2,000. The recently enacted H.B. 1407 states that "In order to conserve natural resources of the state, any land use zoning ordinance adopted by a county (city) shall take into consideration existing and potential lands that are, can or should be utilized for sources or processing of mineral aggregates."

Summary:

The Department of Geology has surveyed and mapped the bulk of the sand and gravel areas in the northern Willamette Valley from the general vicinity of Newberg southward to the mouth of the North Santiam River. A few of the other better known deposits in the middle and southern portion of the valley have been identified but their areal extent is not fully known. Most of the field work will, therefore, be carried out in the valley area south of Albany in order to complement the work in the northern portion. The floodplains at the confluence of the Willamette and Columbia Rivers in the Portland metropolitan region downstream, at least as far as St. Helens, should also be carefully surveyed.

When the project is finished, it will provide the first complete picture of the sand and gravel resource potential for the entire Willamette Valley.

The sand and gravel industry, working in cooperation with the planning commissions in the valley counties, must have adequate supplies of construction materials available as the need develops during the coming

years. It is imperative, therefore, that a study such as the one recommended in this memorandum be started at the earliest possible date. The survey will be of value not only to the construction industry, but also to governmental agencies (Fish, Game, Lands) who are in the process of developing a management framework for the entire Willamette River system.

Information generated by this project would be submitted in a published report largely on a county-by-county basis but with overall projections for the entire valley. Wherever possible 1:62,000 USGS topographic quadrangle maps would be used as bases with sand and gravel areas overprinted. A total of 1500 copies of the text portion of the report would be provided but only one copy of each quadrangle together with the overprinted information would be prepared. If desired the gravel resource areas could be drafted on a separate stable-base sheet, rather than directly on the printed map. This latter method would allow the transfer of the information to other maps required and periodic up-dating could be easily made on the overlay transparency.

SAND AND GRAVEL INVENTORY STUDY OF THE WILLAMETTE VALLEY
(Project Outline)

Work Items

A. Inventory all sand and gravel operations.

1. Willamette River
2. Tributaries
3. Older gravel terraces

B. Study of markets for each area

C. Obtain population projections and growth trend forecasts from Councils of Government to determine future markets and demand.

D. Map all gravel reserves

1. Obtain base map
2. Use aerial photos
3. Obtain water well logs
4. Obtain highway laboratory tests for quality evaluation

E. Preparation of report

1. Introduction
2. Population growth and gravel needs
3. Urban development versus gravel reserves (need for zoning)
4. Geology of the Willamette Valley
 - a. General information
 - b. Bedrock units
 - c. Gravel units
5. Gravel resources
 - a. Summary of reserves
 - b. Future requirements
 - c. Depletion rate
 - d. Summary and conclusions

6. Bibliography

7. Appendix

Schedule of costs

A. Inventory of sand and gravel operations	(2 weeks)	\$ 500
B. Population study - future markets	(1 week)	250
C. Field mapping gravel reserves	(8 weeks)	2,000
1. Base maps		
2. Photo study		
3. Study water well logs		
4. Obtain highway laboratory sheets		
D. Report writing and final editing	(13 weeks)	3,250
E. Drafting (Department cartographer)	(2 weeks)	500
F. Typing	(3 weeks)	400
G. Publication (1500 copies)		2,500
H. Transportation, meals and lodging		1,500
I. Supplies and equipment (base maps)		400
J. Office space		<u>600</u>
TOTAL		\$11,900

March 7, 1969

Honorable Governor Tom McCall
Oregon State Capitol
Salem, Oregon 97310

Dear Governor:

I am writing to you in hopes something can be done to correct a misconception in the minds of the people or person responsible for the present method of charging gravel operators royalties for the the removal of gravel from streams in the State of Oregon.

Since 1939 and the beginning of the construction of dams in the Willamette River Basin I have been closely associated with various problems concerning the streams in Oregon. I retired from the Corps of Engineers a little over two years ago and during my last fifteen years was employed as a civil engineer in the Flood Control Section of the Engineering Division of the Portland District. I became very well acquainted with many problems encountered concerning gravel deposits in the rivers and the problems caused by gravel shifting, dredging required to maintain navigation channels, bank protection projects and flood protection projects to combat flood damage from over-bank flooding.

I probably became as well acquainted with the Willamette River systems as any person in the state and also on many occasions discussed the problems with a number of the state employees as well as individual property owners, various groups of interested people such as organized flood control districts, county and city officials. I have studied the river system from aerial photographs, surveys and by inspections of the various rivers by helicopter, which consisted of about 200 hours of flying time. So you will understand the only interest I have in the matter is for the improvement of our beautiful state and the discontinuence of a practice that in my estimation as well as many others familiar with the problem, is not in the best interest of the people.

When the State Land Board first started charging a royalty of ten cents per cubic yard for gravel, there were a great many gravel operators obtaining their material from river channels. Back in 1956 the Land Board increased the price to twelve and a half cents per yard and many of the gravel companies moved out of the river, bought land and proceeded to desolate a great many

acres of fine land by digging gravel pits throughout the valley. These companies found it was more economical for them to purchase land outright and destroy it by removal of the gravel then to pay the State of Oregon the twelve and a half cents per yard for the gravel from the rivers. Recently I read in the newspaper that the Land Board has increased the price of gravel from state controlled streams to fifteen cents per yard.

This increase in all probability will eliminate gravel operations by private companies in the streams in Oregon. I realize the revenue from gravel royalties is used for educational purposes in the State of Oregon and I am also aware that funds set aside for education are sacred as far as politicians are concerned, but in my opinion the state in particular and the United States in general would profit much more by giving gravel away or perhaps even subsidizing gravel companies in the removal of gravel on a controlled basis, rather than increase the royalty and drive all of the operators out of the rivers so they will destroy additional land.

This is not only my opinion but many others familiar with this problem. May I suggest you talk this matter over with Mr. Warren Jones and Mr. Donel Lane with whom I am personally acquainted as well as a number of Engineers in the State Highway Department and engineers with the U. S. Corps of Engineers.

Gravel in large quantities along the rivers in Oregon washes from eroding banks, channel changes and various other erosion processes. The gravel in the stream bed continually moves downstream causing many problems by forming constrictions in the stream beds such as bars along the river courses and deltas at the confluences of all of the major tributaries of the Willamette River. As an example the junction of the McKenzie River and the Willamette River between Harrisburg and Eugene. has changed the channel capacity so much in recent years that during the 1963-1964 floods in this reach alone flooding from over-bank flows occurred at a lesser flow than any previous year. In time, even with reservoir control, the river channels will either have to be enlarged in capacity by gravel removal to put the flow below the river banks or an elaborate levee system will be required to provide flood protection originally expected with reservoirs.

This same condition of river bottom build up in the lower Mississippi River has necessitated the construction of levees along both banks of the river for many miles. Levees are not only costly to build and maintain, but they create major drainage and access problems.

3.

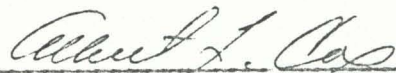
I am certain that the best approach to the problem is to maintain channel capacity below ground level and I'm sure this will be the most economical and satisfactory method of combating the constant changing channels. The removal of gravel by private enterprise from the stream beds in Oregon has been beneficial in helping to provide the necessary channel capacity.

Considering all the facts it seems to me the state and federal government would benefit in encouraging the removal of gravel from the streams in Oregon in the majority of instances.

May I suggest on your next visit to Eugene you take a little time and inspect the area along the Willamette River in the vicinity of Eugene that has been destroyed for all practical purposes by gravel removal from land near the river. One of the best methods of seeing this would be by helicopter.

I hope my long attempt to explain my thoughts regarding this serious matter will not discourage you in investigating the facts. I assure you I have no connections what-so-ever with gravel operators. I know gravel removal operations in the rivers will have to be closely watched as they are at present to protect the best interests of the state.

Yours truly,



Albert L. Cox

2622 S. W. Brae Mar Ct.

Portland, Oregon 97201

REC 10 1993

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RAW TONS
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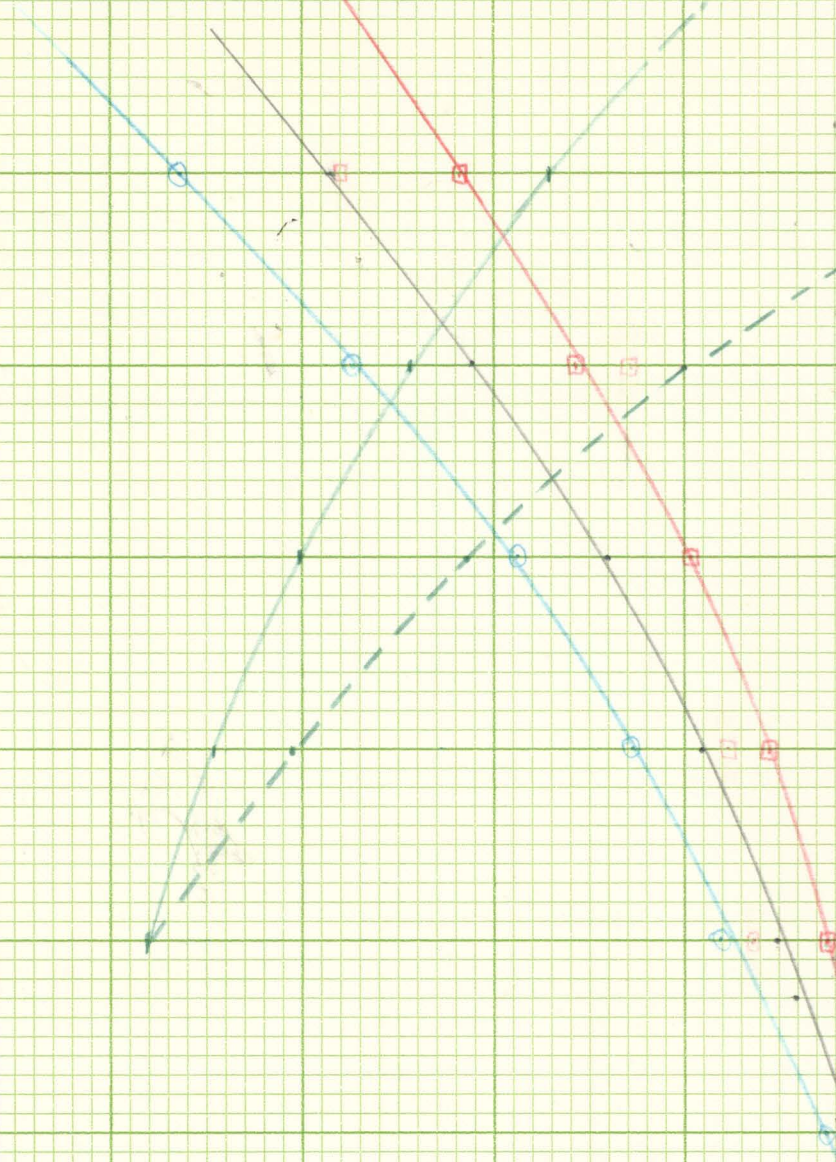
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ADDENDUM

Intergovernmental Environmental Planning September 1, 1971

I. PRELIMINARY BENCHMARKS - POPULATION AND EMPLOYMENT

A. Introduction

The projections of employment and population contained in this report represent very rough estimates of growth rates expected over the next 40 years. Limitations of time and resources in this project made it impossible to do a very acceptable job for planning purposes. These restrictions, for example, limited our ability to construct appropriate economic relationships and to test our assumptions. As a result, we had to accept many of the conclusions derived from other studies, changing only those which appeared to be quite unreasonable in light of current information. Generally, two fairly recent studies were used to set the framework for the projections: Appendix C of the Willamette Basin Review, and the recent projections prepared jointly by the office of Business Economics, Department of Commerce, and Economic Research Service, Department of Agriculture. Both of these project employment and population to the year 2020. The former relates directly to the Willamette Basin, while the latter encompasses a much larger region (but does not include Lane County).

Since the projections in these do not include the same geographical area, it was difficult to compare the results. However, despite this problem, we noted rather significant differences with respect to broad economic assumptions and projected structural relationships. Our projections were made by selecting those factors from each study which seemed to be the most reasonable in light of current events (or choosing our own if neither seemed reasonable) and by forecasting from the most recent base (1970 census and employment data).

B. Procedure

The general procedure used here consisted of projecting employment for the entire Willamette Valley and distributing the total figure among the three subregions. Population projections were then built up from the employment estimates for each 10-year period. The link between employment and population was provided by our projections of overall labor force participation rates (LFPR) for each subregion and for the Valley as a whole (the latter was used as a check against the summation of the population forecasts of each subregion). The use of an overall LFPR is very gross and can lead to serious error; however, time did not permit an analysis of trends in each age-sex specific participation rate. Also, since a computer program

was not used to project natural population growth (zero net migration), age-sex cohorts were not available anyway. The rough overall LFPR's for each area and the Valley were projected using the assumption implicit in the OBE-ERS study that the rate will increase slightly over the next 20 years and then level off afterwards. This is in contract to the Basin Study's and Bonneville's assumption of a declining rate in the future (both studies significantly over-estimated population growth in relation to expected gains in employment for 1970 because of this assumption). If an error exists in our projected LFPR's, it is likely to be conservative with respect to population. In other words, since our projections of overall participation rates are biased in an upward direction, the resulting population projections have a greater probability of being on the low side.

For the Willamette Valley, the employment and population projections are ultimately based upon two assumed rates of employment growth in the basic industries (as defined in the Basin Study) and two different growth paths of the basic-to-total employment multiplier. Out of the four possible outcomes, three were chosen as the high, baseline and low projections (low basic-low multiplier, high basic-low multiplier, and high basic-high multiplier). Employment was then distributed among the subregions using the percentage shares of each as implicitly contained in the projections of the Willamette Basin Study.

Since we could not use the computer program at Portland State, it is impossible to distinguish between projected growth attributable to natural increase and that caused by net in-migration. Hence, all that we have here is an "economic demand" projection of employment with a "required labor supply" projection of population. As is the case with any very long-run forecast, the possibility of error becomes progressively larger as our time horizon increases.

C. Assumptions

1. Employment and population projections for the entire U.S. by OBE-ERS were used as guidelines for our growth assumptions relative to the Willamette Valley.
2. Many of the assumptions concerning industrial growth and diversification were taken from "Appendix C" of the Willamette Basin Review.
3. The basic non-basic industry dichotomy was used to project total employment.
4. Basic industries were defined as:
 - Mining
 - Agriculture
 - Federal Government
 - Manufacturing

"SIBERIANIS - FARLEY MOWATT
"AFFLUENCE IN JEOPARDY" - CHAS. PARK

5. Total employment was derived from projections of basic employment through a projection of the basic-to-total employment multiplier.
6. Two projections were made for employment in basic industries.
 - a. Both projections assumed a slower rate of growth from 1970 to 1990, after which the rate is expected to pick up again through the year 2010. Several reasons for the assumption include:
 - The rate of decline in agricultural employment is expected to slow down significantly after 1980 and level off after 1990. Beyond the year 2000 employment in agriculture should be relatively stable. In other words, as we approach the year 2000 the effects of technological change upon agricultural employment will have diminished significantly, and furthermore will be offset by expected increases in the demand for food products.
 - Manufacturing in general is expected to register a slower growth rate over the next ten years due principally to projected declines in lumber employment and to an expected slower rate of growth in the metal-working industries. After 1980, the rate is expected to pick up again receiving much impetus from all sectors of manufacturing. Also, beyond the year 2000, employment in lumber production is expected to level off and perhaps increase.
 - Growth in Federal Government employment is projected to increase gradually from now until 1990, and then level off. The decreasing rate experienced over the last few years has been due largely to declines in the area of national defense. As the demands for more domestic services increase, federal employment is likely to grow at a healthy rate in the Valley.
 - b. Differences in our two projections were mainly ones of magnitude. The general direction of growth assumed for the various industries described above is the same for both estimates of basic employment.
7. Two projections were made of the basic-to-total employment multiplier:
 - a. Both projections call for a gradually increasing multiplier throughout the period 1970-2010. Our estimates were based upon OBE-ERS's implicit multiplier projections for the entire Northwest portion of Oregon, including five counties in Southern Washington (Economic Area No. 157).

- b. Again, as in our projections of basic employment, the difference between our two multiplier projections involve only magnitudes. In essence, the direction and marginal rates of change for both are the same.
8. Projections for each economic sub-area were derived by distributing our employment estimates for the Valley among these sectors. The distributions were made by using those implicit in the Willamette Basin Review (Appendix C). In other words, we didn't have time to project independently for each sub-area and likewise there wasn't time to scrutinize the study's assumptions here.
9. Employment projections for each area were translated into estimates for the civilian labor force by assuming gradually decreasing unemployment rates to the year 2000 and a leveling off thereafter (as the rate for the Valley approaches that projected for the U.S.).
10. Finally, population projections were derived from projections of the civilian labor force through assumed trends in labor force participation rates. Here OBE-ERS's implied trends in this regard were used as guidelines in our estimates. Generally, population in each sub-area was projected on the basis of increasing overall participation rates from now to the year 1990, with a leveling off thereafter. Two forces seem to be working in this direction: (1) larger than expected increases in the rates for women in various age groups, and (2) the relatively high number of persons expected to enter the prime working age group over the next ten to fifteen years.

POPULATION

	<u>1960</u>	<u>1970</u>	<u>1980</u>	<u>1990</u>	<u>2000</u>	<u>2010</u>
<u>WILLAMETTE VALLEY</u>						
		1,333,300	1,604,191	1,907,560	2,297,081	2,801,563
High	1,191,278	1,475,384	1,843,056	2,202,046	2,679,501	3,340,259
Baseline	1,191,278	1,475,384	1,732,998	2,082,132	2,512,031	3,091,105
Low	1,191,278	1,475,384	1,687,914	1,973,633	2,316,211	2,768,377
<u>LOWER AREA</u>						
High	750,467	909,465	1,108,877	1,356,695	1,684,885	2,152,489
Baseline	750,467	909,465	1,045,499	1,282,815	1,579,578	1,991,933
Low	750,467	909,465	1,018,297	1,215,967	1,456,446	1,783,965
<u>MIDDLE AREA</u>						
High	277,921	352,571	444,649	508,598	595,638	694,386
Baseline	277,921	352,571	419,232	480,901	558,412	642,590
Low	277,921	352,571	408,329	455,843	514,881	575,501
1. Middle: Subarea A						
High	178,981	226,900	286,354	345,593	413,729	487,849
Baseline	178,981	226,900	269,985	309,700	359,617	413,828
Low	178,981	226,900	262,964	293,563	331,583	370,623
2. Middle: Subarea B						
High	98,940	125,700	158,295	191,042	228,707	269,681
Baseline	98,940	125,700	149,247	171,201	198,795	228,762
Low	98,940	125,700	145,365	162,280	183,298	204,878
<u>UPPER AREA</u>						
High	162,890	213,358	284,530	336,753	398,978	493,384
Baseline	162,890	213,358	268,267	318,416	374,041	456,582
Low	162,890	213,358	261,288	301,823	344,884	408,911

CIVILIAN LABOR FORCE

WILLAMETTE VALLEY

	<u>1960</u>	<u>1970</u>	<u>1980</u>	<u>1990</u>	<u>2000</u>	<u>2010</u>
High	484,450	658,220	809,193	973,168	1,200,765	1,502,348
Baseline	484,450	658,220	762,942	920,174	1,125,717	1,390,286
Low	484,450	658,220	743,094	872,224	1,037,964	1,245,133
<u>LOWER AREA</u>						
High	316,700	426,600	504,539	617,296	775,047	990,145
Baseline	316,700	426,600	475,702	583,681	726,606	916,289
Low	316,700	426,600	463,325	553,265	669,965	820,624
<u>MIDDLE AREA</u>						
High	105,080	142,270	182,306	211,068	250,168	295,114
Baseline	105,080	142,270	171,885	199,574	234,533	273,101
Low	105,080	142,270	167,415	189,175	216,250	244,588
1. Middle: Subarea A						
High	68,270	89,560	114,853	136,922	165,941	198,056
Baseline	68,270	89,560	108,288	125,732	147,756	172,054
Low	68,270	89,560	105,471	119,180	136,237	154,090
2. Middle: Subarea B						
High	36,810	52,710	67,453	80,415	97,458	116,319
Baseline	36,810	52,710	63,597	73,842	86,777	101,047
Low	36,810	52,710	61,944	69,995	80,013	90,498
<u>UPPER AREA</u>						
High	62,670	89,350	122,348	144,804	175,550	217,089
Baseline	62,670	89,350	115,355	136,919	164,578	200,896
Low	62,670	89,350	112,354	129,784	151,749	179,921

TOTAL EMPLOYMENT

	<u>1960</u>	<u>1970</u>	<u>1980</u>	<u>1990</u>	<u>2000</u>	<u>2010</u>
<u>WILLAMETTE VALLEY</u>						
High	460,100	625,180	773,788	931,584	1,149,907	1,438,737
Baseline	460,100	625,180	729,562	880,854	1,078,038	1,331,420
Low	460,100	625,180	710,581	834,953	994,001	1,192,413
<u>LOWER AREA</u>						
High	301,800	408,000	482,844	591,370	742,495	948,559
Baseline	301,800	408,000	455,247	559,166	696,089	877,805
Low	301,800	408,000	443,402	530,028	641,826	786,158
<u>MIDDLE AREA</u>						
High	98,740	133,530	174,102	201,781	239,411	282,424
Baseline	98,740	133,530	164,151	190,793	224,448	261,358
Low	98,740	133,530	159,881	180,851	206,951	234,071
1. Middle: Subarea A						
High	63,820	83,840	109,684	130,898	158,805	189,540
Baseline	63,820	83,840	103,415	120,200	141,402	164,656
Low	63,820	83,840	100,725	113,936	130,379	147,464
2. Middle: Subarea B						
High	34,920	49,690	64,418	76,876	93,267	111,317
Baseline	34,920	49,690	60,736	70,593	83,046	96,702
Low	34,920	49,690	59,156	66,915	76,572	86,607
<u>UPPER AREA</u>						
High	59,560	83,650	116,842	138,433	168,001	207,754
Baseline	59,560	83,650	110,164	130,895	157,501	192,257
Low	59,560	83,650	107,298	124,074	145,224	172,184

PROJECTED PRODUCTION OF SAVED & GRASSED IN W.V.

DATE DECIDE	DECADE	PER CAP	MILLION SEGS IN DECADE	Acres
1970-80	1,700,000 x 12 x 10 = 204	7030		
1980-90	2,150,000 x 12 x 10 = 258	8900		
1990-00	2,750,000 x 12 x 10 = 330	11,360		
2000-10	3,475,000 x 12 x 10 = 417	14,350		

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 7030 \\
 8900 \\
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12 Fm 223

1780
2273

2270 516 834

SQ #11
TOTAL
COUNTY
1967
1967

	1960 1960	1960	Total	S Totals
MINT	1,081,000	2,400,000	3,481,000	424
AM	406	60,000	60,400	709
CLARK	226,700	955,000	1,181,700	1890
MAX	434,000	375,000	809,000	1173
WINN	185,500	109,000	294,500	2,299
ROCK	78,000	82,000	160,000	739
BENT	180,000	140,000	320,000	668
LANE	3,586,000	1,880,000	5,460,000	8,207
WASH	81,600	160,600	242,000	716
				16,739
		TOTAL	12,663,900	500
				16,239

	@ 12 TON DRAIN CAP	AL TONS COME/AC
70-80	703	20,200,000
80-90	890	25,800,000
90-00	1136	33,000,000
0-10	1435	46,700,000

RF	(SEG REMAINING AC REMAINING)	(REMAINING AC) (URBANIZATION)	NET AC REMAINING
76,000	76,000 AC	76,000	76,000
DECADES:	76,000 AC	76,000	76,000
70-80	- 7,030 AC	+1.16 - 7,410 AC/TK	14,440
	68,970	68,590	61,560 (1980)
80-90	15,930 - 8,900 AC	+1.5 9600 AC/TK	18,500
	60,070	58,990	43,060 (1990)
90-2000	11,360 - 11,360 AC	1.83 11,700 AC/TK	23,060
	48,710	47,290	20,000 (2000)
0-2010	14,350 - 14,350 AC	2.16 13,700 AC/TK	28,050
	34,360	33,590	0
	(53.6 SQ #11)		

34360	76,000	76,000	84,850
33590	- 41,640 A	+ 18,4050	76,000
2,671,950	- 34,360	33,590	8,050
	76,000	76,000	640
			216
			3840
			640
			1280
			37240

November 9, 1970

Mr. Quentin G. Bowman
State Water Resources Board
500 Public Service Building
Salem, Oregon

Dear Mr. Bowman:

This letter is regarding the need for sand and gravel in the Portland area relative to the navigation locks at Bonneville Dam. We understand that the approach to the locks from the downstream side is hazardous due to irregularities in the channel and that the locks themselves are inadequate for increased traffic.

Sand and gravel is a very necessary commodity in all large metropolitan areas such as Portland. Here most of the resource is gone or the area has been developed so that the removal of gravel is out of the question.

Recently a deposit has been opened near Scappoose which can supply sand and gravel to Portland delivered on barges at reasonable cost. The deposit contains some 300 million tons of sand and gravel but just how much can be extracted is not presently known. If 150 million tons is barged to Portland it would represent less than 10 years' supply.

It appears that after that gravel could be delivered by barge to the Portland area from the upper Columbia River. The barge traffic at that time would need to supply gravel to the Portland area at the rate of 40,000 tons daily, 5 days per week. Although other sources might be found locally their effect on the environment would probably prevent their use.

Sincerely yours,

Herbert G. Schlicker
Engineering Geologist

HGS:lk

Economic Development

Production. In 1961, approximately 44 million tons of sand and gravel valued at about 52 million dollars was produced from deposits in the counties covered by this report. This represents approximately 40% of the total production of sand and gravel in California for that year.

The present market for sand and gravel in central California is primarily in residential, commercial, and industrial construction. About 90% of the sand and gravel is processed fixed plants and sold commercially. The remainder is produced by contractors with portable plants for use by city, county, state or federal agencies on public works projects.

Nearly all production is obtained from well-established aggregate-producing areas located near population centers. Few new deposits are being developed annually, and there is small possibility of locating a large, as yet unknown, source close to a marketing area.

The press of urban growth is being felt by producers in central California, and expansion of existing pits becomes increasingly difficult in view of tightening zoning restrictions. In some counties, it is virtually impossible to obtain a permit to open a new pit. Future production will come from existing sources, leading to depletion of a number of deposits within the next 20 years. It may then become necessary to import sand and gravel from deposits which are beyond the present economic limit of hauling (about 50 miles) in California.

—From: Sand and Gravel in Central California,
Calif. Div. Mines & Geology Bull. 180, 1964.

Sand and Gravel in Oregon

In 1969 the per capita consumption of Sand and Gravel in Oregon was 7.87 tons

"	"	"	"	"	"	"	Crushed stone	"	"	"	5.83 tons
---	---	---	---	---	---	---	---------------	---	---	---	-----------

TOTAL 13.70 tons

The combined value of Sand and Gravel and Crushed Stone was \$39,388,000

This amounts to \$19.69 per capita .

Expressed in terms of cubic yards the total aggregate volume equalled 6.85, or
load
approximately one large ready mix truck/per person in 1969.

At the national level each new single family residence constructed in the United States in 1969 used the equivalent of 25 ready mix truck loads. This figure includes the concrete used in the house itself, the street out in front, part of the schools, churches, fire stations etc. that had to be built to accommodate the new housing unit.

When a ton of sand and gravel leaves the pit it has a value of about \$1.25. After mixing with some cement and water and being placed in a commercial building it represents approximately \$100 worth of construction.

An acre of land with 27 feet of sand and gravel will yield over 40,000 cubic yards or 80,000 tons. A community which, by comprehensive, careful planning, "saves" even as little as 100 acres of such land from urbanization, has created an equity which will prove to have a value far in excess of the raw value of the sand and gravel.

A common cold can be cured and a broken leg will mend, but when you run out of sand and gravel you are dead.

There is no economic substitute for sand and gravel for most purposes and no substitute at all for many other uses.

Where else can you find a material that has withstood the attack of the elements

for several million years, is fireproof, termite resistant, dimensionally stable, tough, hard, strong---and still as cheap as dirt?

The Department of Geology and Mineral Industries has urged the adoption of "Consecutive Conservation" for many years. Briefly, this means the best use of all of the natural resources of a piece of land. Some land, currently zoned as "agricultural" may be underlain with valuable sand and gravel deposits. Conceivably the topsoil could be removed and stockpiled, the sand and gravel removed, the hole used for a variety of purposes such as sanitary land fill, a lake in a park, an "instant basement" or an excavation for underground storage. Eventually the site could be restored by re-soiling to its original status of agricultural land.

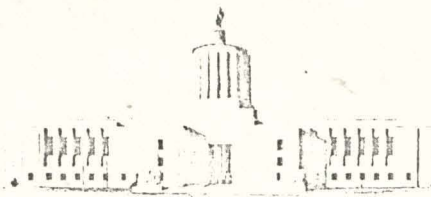
Recent studies show that the Willamette Valley will have used up all of its supply of sand and gravel by about the year 2000---30 years from now. The rate of consumption is approximately equalled by the "loss" of reserves through urbanization, zoning and other factors.

One of the big problems in community ^{PLANNING} ~~problem~~, and this involves the production of sand and gravel, is "Anticipatory, Punitive, Taxation." Simply stated this is the present practice of upping taxes on undeveloped land or farm land, which lies adjacent to a freeway or land occupied by industrial developments. The temptation to do this is understandable in the current era of tight budgets. The effect on orderly community planning---and sand and gravel production can be disastrous.

We don't get silver thaws and snowstorms very often but when we do we should be eternally thankful that sand and gravel was available for the streets.

TES/A
11-23-70

GOVERNING BOARD
FRANK C. MCCOLLOCH, CHAIRMAN, PORTLAND
HAROLD BANTA, BAKER
FAYETTE I. BRISTOL, ROGUE RIVER



FIELD OFFICES:
2033 FIRST STREET
BAKER 97814
521 NORTHEAST "E" STREET
GRANTS PASS 97526

STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
1069 STATE OFFICE BUILDING
PORTLAND, OREGON 97201

FOR IMMEDIATE RELEASE -- April 29, 1969

Contact: Raymond E. Corcoran, State Geologist
State of Oregon Department of Geology & Mineral Industries
1069 State Office Building
Portland, Oregon 97201
Telephone: 226-2161 - Ext. 488 or 489

* * *

SAND AND GRAVEL INDUSTRY HELPS STABILIZE EMPLOYMENT

R.E. Corcoran, Director of the State Department of Geology and Mineral Industries, announced today that the sand and gravel industry has a tremendous stabilizing effect on national employment. Figures just released by the federal Bureau of Mines in Washington show that in 1966, the last year for which data are available, workers in the sand and gravel industries averaged 1897 hours of worktime during that year. With deductions made for sick leave, annual vacations and weekends, this number of hours totals 237 working days, or in other words, pretty close to full employment for the entire 12 months.

Corcoran, who as State Geologist is responsible for Oregon's mineral resources, pointed out that last year sand and gravel accounted for almost three-fourths of the approximately \$100-million generated by the State's mineral industry. Furthermore, almost all sand and gravel operations are locally owned and operated with payrolls and profits plowed back into communities nearby and the product used in community development.

More

H. G. Schlicker, engineering geologist for the Department, is currently conducting a meticulous study of sand and gravel resources in the Willamette Valley. One of the facts developed by this cooperative project with local government agencies is that if present trends of population growth and consumption of this resource continue, coupled with a steady increase in urbanization which eliminates areas containing sand and gravel from future production, the valley will have exhausted known reserves by the year 2005. That is only 36 years away.

"There is no known substitute for sand and gravel", Corcoran explained. The commodity is cheap, indestructible, completely stable, and is indispensable for much modern engineering construction, commercial buildings and private homes.

The Department is making a series of environmental geologic surveys in western Oregon to inventory the nonmetallic mineral resources, determine the engineering geology character of the land, ground water levels, and flood and landslide hazards. The rapid spread of urbanization poses a real threat to the availability of sand and gravel for the very near future in many areas, and land suitable for construction of buildings and engineering projects is also rapidly diminishing.

. . End . .

The OREGONIAN Oct 27, 1961

Park Plans 'Shot Down'

The Board of County Commissioners voted formally Friday to deny the petition of Rockwood residents for a park at Vance Pit and tabled any suggestion for closing or fencing the gravel operation.

The move came only two days after submission of an exhaustive report submitted by the county's planning staff on park and recreation needs of the East County area. The report, which was accepted for further study Tuesday, contained a flat recommendation for continued gravel mining at Vance "for the good of all county residents" and tagged the area for park use only after exhaustion of the gravel resource, some 25 years from now.

There were no representatives of the Rockwood group at the meeting.

Multnomah County Commissioners

and

Multnomah County Planning Commission

and

Metropolitan Planning Commission

Gentlemen:

The recent action taken by the Board of County Commissioners with respect to the Vance gravel pit in eastern Multnomah County is to be commended. Although the area has a fairly large quantity of this basic industrial building material the reserves are not inexhaustible and the combination of rapidly increasing demand for sand and gravel and the equally rapidly spreading urban boundaries will within a few years create problems.

The recommendation prepared by the county Planning Commission reveals the results of intelligent appraisal of a primary economic reality. This department hopes that similar action will be forthcoming presently in dealing with other deposits of economically valuable and useful mineral raw materials lying within the county.

Without being presumptuous and with complete respect for the capabilities of the Planning Commission and its staff may we offer our assistance in the future study of problems of this type? Our staff has been cooperating with the Mid-Willamette Valley Planning Commission for the past year on just this sort of thing. One of the important features of this study has been the location of potentially

usable sand and gravel deposits which are not yet developed and which have not be engulfed by industry or housing. Sedondarily, this department is also advising the Mid-Willamette group on the expected life of the various sand and gravel deposits and how they may best be converted into either public use sites, housing developments or other specialized uses.



United States Department of the Interior

BUREAU OF MINES

Suite 7, Standard Insurance Bldg.
475 Cottage St. NE
Salem, Oregon 97301

May 18, 1972

Memorandum

To: Grant Woolley, Permit Review Officer, Department of the Interior, Portland, Oregon

From: Walter E. Lewis, Bureau of Mines Liaison Officer - Oregon

Subject: Dredging application by Ross Island Sand & Gravel Co., Mile 15, Willametter River, Multnomah County
Public Notice NPP 72-33

Ross Island Sand & Gravel Co. with two other firms produces about 75 percent of the sand and gravel produced in Multnomah County in the immediate vicinity of Portland. In comparison with the other two firms, Ross Island is third in quantity of production; however, each of the three produces above 20 percent of the total.

In 1970, the cost per ton for sand and gravel in Multnomah County ranged from about \$1.10 to \$1.75 per ton, averaging about \$1.60 per ton. The Ross Island Sand & Gravel Co., because of its location, was in a strong competitive position to supply the Portland city area and immediate suburbs, and the company probably was able to sell at below the average cost per ton in the downtown area.

Elimination of the Ross Island Sand & Gravel Co. from the competitive picture by refusal to grant a permit would eliminate a strong producer, and the action could affect the cost of sand and gravel in the Portland city area and immediate suburbs. Just how much an effect it would have is difficult to judge, because the cost of expansion by other companies to fill the demand gap and their exact competitive position is unknown.

It is possible that the cost in the downtown area could raise as much as \$0.25/ton, and in the outlying areas and suburbs about \$0.10/ton, a raise in average cost ranging from 6 to 15 percent. This possible increased cost would be reflected mostly in increased costs for sand and gravel used in road, bridge, office, industrial, and home building construction in the Portland city area. If there is a large amount of such construction, the increased costs could total a substantial amount in an annual period.

It is recognized that the increased costs cited above are conjectural, but because of the currently strong competitive position of the company, it is almost certain that eliminating it as a producer will have an effect on the price per ton for sand and gravel. If denial of the permit is considered necessary because of one of the relevant factors, other than economics, cited in Public Notice NPP 72-33, paragraph 5, it is recommended that the Corps of Engineers weigh these factors against an increased cost per ton for sand and gravel to the Portland city public. If it is found that the economics of an increased cost per ton could counteract the other factors, the company should be given an opportunity to furnish an economic analysis of its competitive position in the Portland area to weigh against the factors that are being considered to deny the permit.

Walter E. Lewis

Walter E. Lewis

CC: Department of Geology and Mineral Industries

RHMote

People Win River Rights

The people won the rights to beds of the navigable waters and rivers in Oregon Tuesday in a milestone decision that ultimately could mean millions of dollars in revenue to the State of Oregon.

The Circuit Court in Benton County ruled for the state in its long-fought battle with the Corvallis Sand & Gravel Co., over ownership of the gravel beds in the Willamette River in Corvallis.

THE STATE was awarded \$82,500 in damages for wrongful removal of minerals by Corvallis Sand & Gravel Co. The court also ruled that the state is the owner of all parcels claimed except the portion where the company's plant sits and a separate area called Fisher's Cut.

Atty. Gen. Lee Johnson hailed the decision by Judge Richard Menglar as "another significant milepost protecting public rights in navigable waters and riverbeds."

Although the state had asked for damages of more than \$200,000, Johnson said the actual damages received are not as significant as future royalties that will accrue to the state as a result of the decision.

JOHNSON pointed out that the case makes it a matter of finding that the State of Oregon holds title to beds of all navigable rivers in sovereign capacity for the benefit of all the people.

The Corvallis Sand & Gravel case has been in and out of the courts in Oregon since 1920, when the company first claimed various parts of the Willamette River bed at Corvallis. The state took no real action until 1958, when it filed a suit to quiet title asserting ownership to that portion of the river bed between ordinary high and ordinary low water.

The defendant company obtained dismissal of this suit on the basis that the state's evidence was defective.

IN 1960, the state again filed suit asking an accounting of all gravel taken from the 2.5 miles of riverbed claimed by Corvallis Sand & Gravel. This suit also was dismissed on the state's own motion.

The next suit was filed in 1965, when the state sought to recover the 2.5 miles of riverbed and sought damages for use of the area. Corvallis Sand & Gravel Co., filed countersuit seeking to enjoin the state from prosecuting on grounds

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AFTER this decision, the state filed an amended complaint that led to the current decision.

This complaint divided the land into 11 parcels and claimed ownership and damages for each parcel since 1959.

Johnson said the state probably will appeal the decision on the Fisher Cut portion, which was excepted from the decision because the river suddenly had changed its course in that area.

Johnson said, "We disagree with this decision based on the evidence, which essentially was uncomplicated." He added that an important principle of ownership of ancient riverbeds is involved that should be solved.

Senior counsel Peter Herman handled the case for the state.

Riverbed Disclaimer Proposed

By DOUG YOCOM

Journal Staff Writer

SALEM — A legislative interim committee has ordered a proposed law drafted that would permit the State Land Board to disclaim any interest by the state in dry riverbeds, particularly along the Willamette River.

William S. Cox, director of the Division of State Lands, said such a law would apply only to old riverbeds the state has never claimed and decides it has no right to do so.

"WE WOULD be disclaiming any ownership because we just don't have any interest and never have had," Cox told the Advisory Committee to the State Land Board Thursday.

The committee approved drafting such a proposed bill but, at the insistence of State Sen. Betty Browne, D-Oakridge, also asked for an alternative proposal.

Her alternative would be for the state to "take an affirmative stand on what the state's ownership interest is" by defining the location of the riverbeds.

THE PROPOSALS are designed to meet the question of who owns the beds of the rivers, especially the troublesome, meandering Willamette, and where the state's ownership actually lies.

Oregon gained ownership of the beds and banks of all navigable rivers in the state in 1859, when it became a sovereign state. But since then many rivers, particularly the Willamette, have changed course periodically.

Cecil Edwards, executive secretary to the Advisory Committee to the State Land Board, said the courts have held that when the change was gradual (by reliction or accretion), the state's ownership in the riverbed follows the river.

BUT WHEN the change is quick (avulsive), as during a flood, the state's ownership would remain in the old riverbed.

A Circuit Court judge in Benton County ruled recently that Corvallis Sand & Gravel Co. actually owns about 1,600 feet of the Willamette River at Corvallis. (The state attorney general's office said it plans to challenge this ruling. The state contends that the change in riverbeds at Corvallis was gradual, not during a 1909 flood, as the judge found.)

Cox said the proposal, whereby the state would disclaim any interest in the old riverbeds, would apply only to

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Cox said the proposal, whereby the state would disclaim any interest in the old riverbeds, would apply only to portions of the river where the state has no question about what it owns. "We would remove any question of state ownership and let the deeds control (ownership)," he said.

FOR EXAMPLE, he said the Division of State Lands wants to begin by "disclaiming" the state's interest along about nine-tenths of the Willamette River between Salem and Portland.

Cox said the main problem area along the Willamette is above Corvallis, particularly in the Harrisburg area. South of Corvallis the Willamette has changed course more often, leaving the state in doubt of its ownership.

Cox said "other avenues" would have to be pursued to establish the state's ownership to riverbeds in dispute. The avenue used in gaining title to riverbeds in the Corvallis Sand & Gravel case was a court suit, which committee members say cost the state more than \$100,000.

THE "DISCLAIMER" approach would be similar, although more simplified, to the approach the 1969 Legislature took in quitclaiming tidelands of questionable ownership in Astoria. Much of modern-day Astoria along the Columbia River was built on filled tidelands after a destructive fire.

March 19, 1969

Mr. Kessler Cannon
Committee on Natural Resources
207 State Capitol
Salem, Oregon

Dear Kess:

Here are a few comments on the letter from Mr. Albert L. Cox regarding the taking of sand and gravel from non-stream areas in the Willamette Valley.

This same problem has concerned us for quite a few years, and the enclosed machine copy of a letter to the State Land Board touches on several of the points. We feel also that it might make good sense to actually subsidize some dredging operations in critical areas subject to flooding.

We realize that if such a policy was adopted it might create some administrative problems. However, on balance, some very real advantages might accrue:

1. If all stream dredging by sand and gravel operators ceases then much dredging at public expense (in this case the Federal government) would have to be done just to keep the channels open enough to minimize overbank flooding. Characteristically dredging by the Army Engineers simply opens up the channel and usually the spoil is deposited on nearby banks where it eventually returns to the stream.
2. Stream dredging by sand and gravel operators removes the material completely from the stream to a point of ultimate use, often miles away. Also, the operators pay the State a royalty to boot.

3. Perhaps some arrangement could be made to offset the loss in revenue to the State by having the Federal government subsidize the State either wholly or in part for the loss of revenue, at the same time giving the sand and gravel to the operators either free or at a reduced cost in exchange for dredging in selected problem areas.
4. Until such time as the various planning groups responsible for long-range utilization of Willamette Valley lands can come up with some adequate plans which consider the total sand and gravel resources in the area, there will continue to be haphazard exploitation of valley lands.
5. We are keenly aware of the rapidly diminishing areas in which sand and gravel can be obtained in the face of an equally rapid rise in demand for this commodity. A similar problem exists with respect to prime agricultural lands. With competent planning it is possible to have our sand and gravel when we want it - and in the case of dry land areas, minimize the disruption to agriculture or other uses. Long-range planning for in-stream dredging is overdue. Flood control, maintenance of fixed stream channels, and development of "greenbelts" cannot be undertaken effectively without such planning.

Sincerely yours,

Ralph S. Mason
Mining Engineer

RSM:lk
Encl.

February 5, 1965

Mr. Dale Mallicoat, Clerk
Oregon State Land Board
State Capitol
Salem, Oregon

Dear Mr. Mallicoat:

This is in response to your letter of February 4 jointly addressed to the State Forester and myself and concerns the effect on Land Board revenues from timber sales or sand and gravel as a result of the recent floods.

We have not tried to evaluate this in the field and therefore my statement will be strictly a judgment based on our past experience with geologic processes.

It is our feeling that the sand and gravel revenues received by the Land Board may increase by as much as 10 percent this coming year. This is based on the fact that large gravel producers, such as Ross Island Sand and Gravel, will find that their company-owned gravel pits will have received considerable silt and therefore reconditioning of these pits will take some time. In the meantime they will have to turn to State-owned resources for a larger percentage of their production. We feel that this situation of siltation of company-owned pits will also pertain to the many small sand and gravel producers bordering the Willamette River from Eugene northward. Also we feel that reconstruction of bridges, dikes, roads, and other facilities damaged by the flood will require increased need for sand and gravel in the coming months.

Incidentally, I met last Wednesday with the Lane County Commissioners and they were most concerned about the sand and gravel producers in and adjacent to Eugene. They felt that the high charge the Land Board makes for sand and gravel from the Willamette Valley has forced the S&G producers to the flood plains and to private land for their raw material. The net result of this was that the Willamette River channel was not being deepened and voids were being created along the flood plain and the old Willamette Valley channels. Consequently, with the rise in water, the river returned to the old channels and the holes that were dug caused flooding of adjacent farm land. It was their feeling that if the sand and gravel had been taken from the Willamette, a good many acres of farm land would not have been flooded.

Sincerely yours,

Hollis M. Dole
State Geologist

HMD:jr



TOM MCCALL
GOVERNOR

OFFICE OF THE GOVERNOR
STATE CAPITOL
SALEM 97310

March 12, 1969

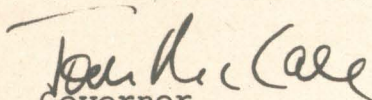
Mr. Albert L. Cox
2622 S. W. Brae Mar Ct.
Portland, Oregon 97201

Dear Mr. Cox:

Thank you for writing on your concerns with gravel removal in Oregon from stream beds and adjacent lands. I have sent copies of your letter to the Division of State Lands, the State Water Resources Board, and the State Department of Geology and Mineral Industries for their evaluation.

The problem certainly not only points up the needs for gravel removal from streams to assist in channel protection and development, but also centers squarely on the need for land use planning.

Sincerely,


Governor

TM:ms

RECEIVED
MAR 19 1969
STATE DEPT. OF GEOLOGY
& MINERAL IND.

A COMPREHENSIVE INVENTORY OF THE SAND AND GRAVEL RESOURCES
OF THE WILLAMETTE VALLEY

The State of Oregon Department of Geology and Mineral Industries wishes to undertake a comprehensive study of the sand and gravel resources of the Willamette Valley. In addition to a determination of the volume and location of the resource, the proposed study would include data on past, present, and projected rates of consumption, market areas, trends in end-use, effects on other geologic processes at work in the valley such as changes in ground water tables, river bank erosion, flooding, and slope stability.

The proposed work would be a continuation of earlier studies conducted by the Department in the central portion of the valley and at various other points. It is anticipated that only a minor amount of original field work will be needed to complete the study and heavy reliance will be made on other independent and isolated studies, aerial photos, topographic maps, and records made by various local governments, industry, and other state and federal agencies.

The Department of Geology proposes to prepare, in addition to the written report, a series of maps, probably using U.S. Geological Survey topographic quadrangles at a scale of one inch to the mile for bases, showing the areal extent of the sand and gravel deposits. Information would be divided into county units but projections and other data would be presented for the entire valley. In addition to the overprinted maps, it would be possible to provide stable-base transparencies containing the overprinted information. The transparencies could easily be updated from time to time and could be used to transfer data to other maps having the same scale.

The Department of Geology estimates that the study could be completed not later than July 1, 1972, with one full-time field man to be assigned to the program immediately it is inaugurated.

Need for a comprehensive sand and gravel study has become steadily more urgent as natural resource agencies and local and state governments realize that long-range planning must consider the impact of a natural resource which:

- (1) is non-renewable
- (2) has no known substitutes for most of its uses
- (3) can create considerable disruption during the period of extraction
- (4) is vital to community growth
- (5) must be produced locally if at all possible to hold costs within reason
- (6) can, with proper long-range planning provide secondary benefits by creating excavations useful for public use sites, lakes, solid waste disposal areas, or underground storage
- (7) exists in large but not inexhaustible quantities in terms of present and projected usage
- (8) by the very nature of the extraction process can create favorable habitat conditions for wildlife and fish management with proper planning, or, conversely, cause considerable damage to these same resources with insufficient planning.

The single objective of the study will be to make available the best information on sand and gravel resources of the Willamette Valley in a form that will be most useful to governing bodies and industry. Although primarily designed as a tool to assist in long-range planning by local governments, natural resource agencies, and the mineral extraction industries, the study

should be of considerable interest to other segments of government and industry since sand and gravel production and future reserves provide one of the best indices for community growth and development available.

The three Councils of Government located in the valley, plus CRAG, were canvassed to determine whether: (1) they would use the results of the proposed study in long-range planning, and (2) what information, if any, they might have on sand and gravel resources, extractive activity, and problems in their respective areas. Without exception all of these groups were wholeheartedly enthusiastic about the program, with several stressing the great need for a comprehensive approach rather than isolated studies which failed to take into account related factors located outside of the limited study area. Although the type and amount of information available from the groups varied widely, all of them indicated that they would cooperate fully in making everything they had available.

Information and data needed for the study are available in part from a variety of sources. Principal among these are the following:

(1) Division of State Lands. Data on annual sales of sand and gravel from the beds of navigable streams and other state-owned lands.

(2) U.S. Bureau of Mines. The Bureau has in the past made an annual canvass of all mineral producers in the state in cooperation with the State Department of Geology and Mineral Industries. Transfer of the statistical gathering facility from Albany to Washington D.C. recently may have some effect on the scope of this survey, which has included considerable production detail. Although much of the Bureau's data on individual production are confidential, it is possible to combine and publish county totals, and conceivably a running computation could be made of individual operations provided figures

were not released without either clearance from the Bureau and the individual operators or combined into periodic up-dates for specific areas.

(3) County and urban planning groups. Considerable data have been accumulated by this type of organization and should be readily amenable to the study.

(4) Soil and water conservation districts. There are nearly 20 districts in the study area. Most, but not all, of the counties in the valley are covered with soil maps which conceivably could contain useful information on the areal extent of lands underlain with sand and gravel. Very possibly the individual districts could be most helpful in providing additional data.

(5) U.S. Geological Survey. The Ground-water Branch of the Survey has a great deal of information on water wells, ground-water levels, and the composition of the material encountered in wells. Much of this information will be useful in outlining reserves, determining depths, and in some instances the nature of the overburden and the character of the resource.

(6) State Engineer. Copies of drillers logs are filed by county, section, township, and range. Although some logs provided by drillers are not too definitive, it is felt that considerable useful data on depths of sand and gravel can be abstracted from the logs.

(7) Various other sources. The U.S. Army Engineers, public utilities, county and city engineers, well drillers, and private individuals and companies have varying amounts of information useful to the proposed study. Although the Department has availed itself of these sources in the past, the collection of data is quite time consuming even though the fullest cooperation has been extended.

(8) State Department of Geology and Mineral Industries. The Department of Geology has surveyed and mapped the bulk of the sand and gravel areas in the northern Willamette Valley from the general vicinity of Newberg southward to the mouth of the North Santiam River. A few of the other better known deposits in the middle and southern portion of the valley have been identified but their areal extent is not fully known. Most of the field work will, therefore, be carried out in the valley area south of Albany in order to complement the work in the northern portion. The floodplains at the confluence of the Willamette and Columbia Rivers in the Portland metropolitan region downstream, at least as far as St. Helens, should also be carefully surveyed.

(9) Fishery agencies. Information on spawning and rearing areas, their location, requirements, effects of gravel removal, flooding, and bank erosion on propagation of the fishery resource can be provided.

The Mined Land Reclamation Law takes effect on July 1, 1972. Since the Department of Geology and Mineral Industries will be administering the law, a certain amount of production data will be developed. As presently drafted only those operations mining over 10,000 cubic yards annually from dry land pits and quarries will be subject to these regulations. Considerable additional data will also necessarily be collected on those operations which almost, but not quite, reach the minimum volume figure. Although most of this work will be done after the study will be completed, there will be some input from the "tooling up" activities prior to the July 1st date. Much information will be derived after the law goes into effect and will be useful for up-dating purposes.

Summary of Sand and Gravel Resources

<u>County</u>	<u>Area</u>	<u>Acres</u>	<u>Cu. yds.</u>	<u>Extraction</u>	<u>Environmental Impact</u> <u>Reclamation</u>	<u>Remarks</u>
Marion	7	11	150,000	Minor	Excellent	Bottom of deposit is well above water table. Can be reclaimed for variety of secondary uses.
Yamhill	3	150	1,250,000	Moderate	Difficult	Area subject to occasional flooding. Proximity to Yamhill River might induce channel alteration.
Lane	14	74	670,000	High	Moderate	Resource lies in full view of numerous homes on slopes above. Bank stability and high water table could be problems during operation.

SAND AND GRAVEL INVENTORY STUDY OF THE WILLAMETTE VALLEY
(Project Outline)

Work Items

A. Inventory all sand and gravel operations.

1. Willamette River
2. Tributaries
3. Older gravel terraces

B. Study of markets for each area

C. Obtain population projections and growth trend forecasts from Councils of Government to determine future markets and demand.

D. Map all gravel reserves

1. Obtain base map
2. Use aerial photos
3. Obtain water well logs
4. Obtain highway laboratory tests for quality evaluation

E. Preparation of report

1. Introduction
2. Population growth and gravel needs
3. Urban development versus gravel reserves (need for zoning)
4. Geology of the Willamette Valley
 - a. General information
 - b. Bedrock units
 - c. Gravel units
5. Gravel resources
 - a. Summary of reserves
 - b. Future requirements
 - c. Depletion rate
 - d. Summary and conclusions

6. Bibliography

7. Appendix

Schedule of costs

A. Inventory of sand and gravel operations	(6 weeks)	\$ 1,500
B. Population study - future markets	(2 weeks)	500
C. Field mapping gravel reserves	(10 weeks)	3,000
1. Base maps		
2. Photo study		
3. Study water well logs		
4. Obtain highway laboratory sheets		
D. Report writing and final editing	(20 weeks)	5,000*
1. Consultation with COG's, CRAG, natural resource agencies, and industry.		
E. Drafting (Department cartographer)	(4 weeks)	1,000
F. Typing	(3 weeks)	500
G. Publication (1500 copies)		3,500
H. Transportation, meals and lodging		1,500
I. Supplies and equipment (base maps)		750
J. Office space		<u>1,000</u>
TOTAL		\$18,250

* This figure covers only a portion of the total effort to be expended. State natural resource agencies will donate considerable time and effort; local governments have indicated a willingness to lend assistance, and industry associations have offered to help with the study.



DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

ADMINISTRATIVE OFFICE

1069 STATE OFFICE BLDG. • PORTLAND, OREGON • 97201 • Ph. (503) 229-5580

TOM McCALL
GOVERNOR

May 8, 1974

Mr. Dale Dennis
Barton Sand & Gravel Company
7355 S.E. Johnson Creek Boulevard
Portland, Oregon 97206

Dear Mr. Dennis:

We are happy to respond to your request for some background information on the need for and availability of sand and gravel in the northern Willamette Valley. We are enclosing a copy of a short report we prepared a number of years ago which pretty much sums up the situation. If anything, the gravity of the situation has increased since this report was made.

The sand and gravel industry provides an indispensable commodity for community growth and continued existence, but unfortunately the industry as a whole has maintained a very low public profile and it has been taken for granted when its goods and services were required but attacked vigorously by the same customers whenever the industry sought to obtain additional resource areas to replace those exhausted through production. One of the hardest concepts to get across to the public generally and to a certain extent to planning and local government groups is that the mining industry is involved with a non-renewable resource and new deposits must constantly be found. A community must have large quantities of readily available, low cost aggregate to remain competitive, otherwise that community will suffer with respect to other areas. Adequate, long-range planning must provide for the identification of sand and gravel areas, the preservation of these resources by proper zoning until they are extracted, and finally, proper reclamation of the site for subsequent beneficial use.

As you are no doubt fully aware, the delivered cost of a truckload of aggregate increases sharply with every mile it has to be hauled from plant to customer. The location of sand and gravel pits near community centers makes good economic sense, but all too often local pressures either preclude the extraction of the resource or curtail the activities of on-going operations. The inevitable result is added cost for the customer as the product is brought in from a greater distance.

Mr. Dale Dennis
Page 2
May 8, 1974

We feel very strongly that the aggregate resources of every county should be determined and evaluated as promptly as possible so that local governments can plan as effectively as possible. We have done this type of survey for several counties and the benefits have already been considerable. With this knowledge, both the residents of the community and the operator will know what to expect over the long pull.

The sand and gravel industry is an integral and indispensable part of a community and both the community and the industry must learn to accommodate to each other. As you already know, we are charged with the administration and enforcement of the Mined Land Reclamation Act. We will be most happy to work with you and all interested parties in providing possible solutions to some of the problems that might arise.

Sincerely yours,

A handwritten signature in cursive script, appearing to read "Ralph S. Mason".

Ralph S. Mason
Deputy State Geologist

RSM:lk
Encl.



United States Department of the Interior

BUREAU OF MINES

Suite 7, Standard Insurance Bldg.
475 Cottage St. NE
Salem, Oregon 97301

July 14, 1975

R.E. Corcoran, State Geologist
Department of Geology and Mineral Industries
1069 State Office Bldg.
Portland, Oregon 97201

Dear Andy:

Reference is made to your request for information from different States as to the royalty rates charged for mining sand and gravel from State-owned lands. Attached hereto is a table on Royalty Charges - Sand and Gravel Deposits in Eight States.

For a comparative analysis, I attempted to obtain the western coastal States, Washington and California, the Rocky Mountain States, Montana, Idaho, Wyoming, and Colorado, two midwestern States, Minnesota, Illinois, and two eastern States, North Carolina and Georgia.

Oregon's rates vary. For the dredge spoils above the beds of the rivers, the State charges \$0.30/cu. yd. For the material out of the bed of the river, \$0.15/cu. yd.; rates on upland deposits vary widely with the State appearing to accept what the buyer offers. It is extremely difficult to compare one State's royalty rates against another primarily because of the varying systems. Carl Brenna, Division of State Lands, has informed me that the State converts the \$0.15/cu. yd. rate to \$0.15/3,836 pounds, if the material is on a barge. This charge would convert back to about \$0.08/ton, which would not appear to be an excessive royalty rate.

Based on the above conversion rates, I would estimate the royalty rates from other States to compare with Oregon's roughly as follows:

Other States	Minimum	Maximum	Average
Washington	Higher	Higher	Higher
California	About same	Higher	Higher
Idaho			About same
Montana			Lower
Wyoming			Lower
Colorado			Higher
Minnesota	Lower	Higher	Unknown
Illinois	-	-	-
Georgia	Lower		Same
North Carolina	-	-	-

The State with the lowest royalty rate is Wyoming, followed by Montana.

I prefer an appraisal system for setting royalty rates like either Washington or California. However, such a system requires strong field organizations throughout the State. The simplest system that I have ever seen is a percentage of the gross value f.o.b. mine. The royalty rate then varies automatically with inflation and varying locations in the State. In all the States I picked for this survey, none have this system exactly, although California probably comes the closest. The U.S. Forest Service (headquarters Atlanta, Ga.) in the southeastern United States has this system. The royalty rate is 5 percent of the gross value f.o.b. mine, and it is the same in all the southeastern States. It is easy to administer without a large staff, and it need not be changed because of local conditions or inflation. The rate of 5 percent of the gross value f.o.b. mine is, in my opinion, a low royalty rate, and I do not mean by citing the example here that I am in favor of the 5 percent rate. I feel that the percentage rate would have to be determined by each State for its own particular situations, and it is possible that a different rate is applicable in different localities.

Sincerely yours,



Walter E. Lewis
Liaison Officer - Oregon

WEL:lp

CC: R.H. Mote

Royalty charges - Sand and gravel deposits

State	Royalty charges
IDAHO	Royalty rate: \$0.15/cu. yd. Rental rate: \$160.00/year. The lessee pays whichever is the larger of the two rates; thus, to obtain the \$0.15/cu. yd. rate, the lessee must produce at least 1,067 cu. yds. yearly.
MONTANA	Royalty rate: \$0.15/cu. yd. for first 25,000 cu. yds. .10/cu.yd. for next 25,000 cu. yds. .05/cu. yd. for all over 50,000 cu. yds.
WYOMING	Royalty rate sand and gravel to all companies and individuals - \$0.06/ton. Royalty rate to State highway and municipalities - \$0.05/ton.
COLORADO	Royalty rate: \$0.15/ton extracted, irregardless of whether it is sold or the amount of waste in the ton. The rate appears to be essentially on the basis of bank measure. Assuming equal amounts of marketable sand and gravel and varying percentages of waste, the following rates are estimated: 100% sand and gravel - Royalty rate: \$0.15/ton plus either \$10.00/year or \$1.00/acre/year, for 5 years. 95% sand and gravel, 5% waste - Royalty rate: \$0.158/ton plus either \$10.00/year or \$1.00/acre/year for 5 years. 90% sand and gravel, 10% waste - Royalty rate: \$0.166/ton plus either \$10.00/year or \$1.00/acre/year for 5 years. 85% sand and gravel, 15% waste - Royalty rate: \$0.176/ton plus either \$10.00/year or \$1.00/acre/year for 5 years. 80% sand and gravel, 20% waste - Royalty rate: \$0.187/ton plus either \$10.00/year or \$1.00/acre/year for 5 years. 75% sand and gravel, 25% waste - Royalty rate: \$0.20/ton plus either \$10.00/year or \$1.00/acre/year for 5 years.

Permits are issued for \$10.00 to mine in a borrow pit in which others also have a permit. The regular royalty rate must be paid by each miner in addition to the \$10.00/year permit fee.

Exclusive rights on a deposit may be obtained by paying \$1.00/acre/year; however, the entire deposit must be tied up, and the acreage costs are in addition to the royalty rate.

WASHINGTON

Royalty rates on sand and gravel deposits vary throughout the State. The State Division of Lands has area offices throughout the State. Under normal circumstances, an appraiser is available in the immediate area, so that the going rate can be quickly determined. The royalty rate charges are essentially an appraisal system for localized areas within the State.

Carl McFarland, State Division of Lands, estimates that in the Peninsula area the charge is \$0.25/ton. In Skamania County (north of Bonneville Dam across the river), the charge may be \$0.25/ton or greater, even up to \$0.50/ton. McFarland estimates that the average rate throughout the State is \$0.20/ton. Under the appraisal system, the normal minimum royalty rate charge under the best circumstances is \$0.15/ton.

CALIFORNIA

California has developed a formula that attempts to equalize the price against other sources.

$R = m + s (G - t)$ Where:

R = Royalty charge per ton in dollars and cents.

m = The minimum, which is predetermined by a survey of the market area; it is based primarily on royalty that fee owners in the area get.

s = The bid factor which is dependent primarily upon what competition is being experienced by the bidder for the deposit. Under no competition, the bidder will use 0, which will, of course, eliminate the quantity $(G - t)$.

G = The gross price, which is the average price for the year charged to the customers.

t = The transportation costs, which are subtracted from the gross price; thus the quantity $(G - t)$ is the cost of the material f.o.b. plant. The State is now attempting to obtain royalties on new contracts that calculate on the formula at about \$0.23/ton. Older contracts and those on large deposits are now around \$0.10/ton. Further information may be obtained from Norman Harvey or James Smith, California State Lands Division, Long Beach, California. 213-435-6681, Ext. 214.

MINNESOTA

An appraisal system is used to determine the price. A field man is the appraiser. The royalty rates vary from \$0.10/cu. yd. to \$0.25/cu. yd.

Wherein the sand and gravel is being furnished to the State, the royalty rate is more often \$0.10/cu. yd. As an item of information, jig tailings from the iron-ore processing plants in northern Minnesota are being sold by private companies for \$0.50/cu. yd. Much of Minnesota's sand and gravel deposits are mined from glacial outwashes and other forms of glacial formations. The percentage of waste to marketable product is often exceptionally high.

ILLINOIS

No leases on State-owned land.

GEORGIA

Royalty rates are determined on a bid basis for mining in river beds. The latest bid was for \$0.15/cu. yd. For the first year, the lessee must pay a \$1,000 permit fee, which can be reclaimed totally or in part, dependent upon the number of cubic yards produced during the year. There is no permit charge after the first year.

NORTH CAROLINA

No permits issued to mine on State-owned lands.

Urbanization of Willamette Valley Lands
Containing Economic Sand and Gravel Deposits

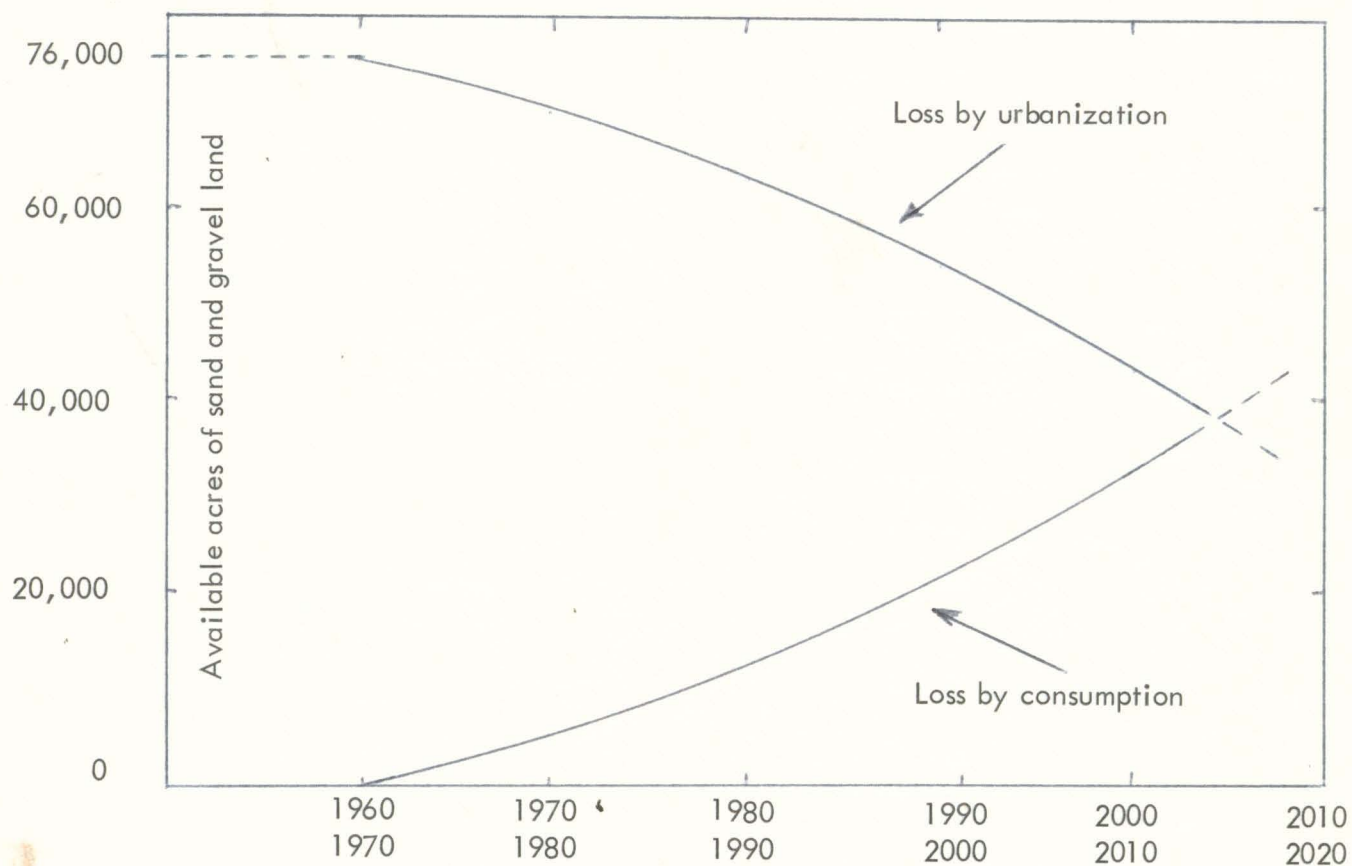
The reserves of usable sand and gravel remaining in the nine counties which constitute the Willamette Valley are estimated at 76,000 acres. This figure has been arrived at by on-the-spot studies, examination of production records and by extrapolating known reserves into areas of similar geology but where no direct surface expression is indicated.

In the attached graph there is a curve showing the loss of sand and gravel lands through the process of urbanization. This curve, and the supporting figures appearing in the table below have been derived as follows: (1) the "Total Acres Urbanized" figure for the decade 1970-1980 was abstracted from "Urban Land Use in the Willamette River Basin, Oregon, Review and Tentative Projections", by the Economic Research Service, Natural Resource Economics Division, USDA, Corvallis, Oregon, June 1968. The acreage figures for the decades 1980-1990 and 1990-2000 were arbitrarily increased by 10%, and reduced by 5% for the decade 2000-2010. (2) The percentages used in the column "Percent Containing Sand and Gravel" are based, first of all on the best estimates available on the current situation. Percentages for the succeeding decades reflect a slow but steady increase in this percentage as more and more bottom lands are paved over directly or removed from extraction by zoning and other environmental prohibitions enforced before the resource can be utilized.

Table 1. Projected Urbanization of Sand and Gravel Lands in the Willamette Valley

<u>Decade</u>	<u>Total Acres Urbanized</u>	<u>% Containing Sand & Gravel</u>	<u>Acres of S&G Urbanized</u>	<u>Cumulative Acres S&G</u>
1970-1980	68,480	11	7,410	7,410
1980-1990	75,325	13	9,600	17,010
1990-2000	75,325	15	11,700	28,710
2000-2010	71,560	19	13,700	42,410

Department of Geology & Mineral Industries
November 19, 1971



Projected loss of sand and gravel lands in the Willamette Valley by urbanization and consumption

State Department of Geology
and Mineral Industries

November 1971