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700 BURRARD BUILDING

VANCOUVER 5, B. C. CANADA

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FINAL REPORT

ON

STAVE LAKE PROPERTY

VENTURE 123

BY

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# SUMMARY

The Stave Lake copper-molybdenum property, situated at 5,400 feet elevation approximately 11 miles northeast of Stave Lake, was found by Les Kiss as one result of a reconnaissance stream sediment sampling program undertaken in 1969. Surface mapping outlined a mineralized zone 4,800 feet long, east to west, and 1,100 feet wide, north to south. This zone was sampled by three trenches in 1969 and seven NQ diamond drill holes in 1970. The tonnage and grade indicated by the work are 272.5 million tons averaging 0.051% Cu and 0.009% MoS<sub>2</sub>. The 1970 program cost \$80,972, of which at least \$15,750 can be applied to assessment.

# CONCLUSIONS .

- One set of very tight mineralized fractures is not enough to make this deposit economically attractive at today's metal prices.
- 2) Diamond drilling showed that the better mineralized zones were spotty and narrowed with depth.
- Surface work indicated that no improvement in grade could be expected within the area mapped but not drilled or trenched.
- 4) No evidence was found to indicate that there might be economic mineralization elsewhere on the property.

# RECOMMENDATIONS:

It is recommended that:

- 1) No further exploratory work be done on this property in the immediate future.
- The sum of \$15,750, derived from diamond drilling costs, be applied as assessment on claims KF 1-30 to hold them for five years.

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3) The property be returned to Les Kiss.

# INTRODUCTION

Copper-molybdenum mineralization was first found on the Stave Lake property by L. Kiss in mid 1969 during follow-up stream sediment sampling. Mineralized float led him to examine the drainage basin in detail and a large mineralized zone was found. The area was staked and three trenches blasted. Samples obtained from these trenches gave encouraging results, so the mineralized zone was further sampled by diamond drilling during July and August, 1970.

# LOCATION

The Stave Lake property (File V-123) is 3½ miles northeast of Winslow Lake, near the head of the third major west-flowing tributary of Winslow Creek (See Fig. 1). The coordinates (N.T.S. 92 G 9/E) are 49°34'40"N, 122°05'10"W.

# TOPOGRAPHY

The terrain in the area is mountainous, with marked changes in elevation. The property lies on the north side of a cirque, with the showing lying between elevations of 5,400 feet and 6,000 feet. Treeline lies between 4,000 feat and 4,600 feet elevation, with bare rock, talus and snow above. The slope of the hillsides varies from 20° to 45°. Numerous small streams drain the slopes and provided water for drilling and camp use.

#### ACCESS

No roads lead to the property. Helicopter's are required to move men and material in and out. Equipment which must be "slungin" by helicopter is best brought to the end of the private Chehalis Lake-Eagle Creek logging road, controlled by Canadian Forest Products Limited. A less satisfactory route is up Stave Lake by barge and then by truck to Winslow Lake. There is an airstrip for small fixed wing Aircraft at the Warnick camp at the head of Stave Lake.

Walking into the property from the airstrip would take about eight hours (estimate by L. Kiss).

#### WEATHER

Weather in the vicinity of the property is typical of the coast range in general - clear weather for two to four days, fog, clouds and some rain for the next week to ten days. Even when surrounding cirques had cleared, the one the property is in was often still cloud filled. When the sky is clear during the summer temperatures on the hillside reach the low eighties; when the valley is fogged in the temperature seldom rises above fifty degrees. Winds are usually moderate at five to ten knots from the west.



The camp was situated at about 4,600 feet elevation in a relatively flat but swampy area south of the centre of the showing. Water for the camp was obtained from a creek flowing across the area and from a sump on the hillside east of camp. Seven framed tents, to accommodate thirteen man, were erected for the drilling program. Four of the tents were accurately made to measure 12 feet by 16 feet, and as a result, the frames were erected with a minimum amount of cutting of plywood. The office tent and cook's tent were smaller, the core tent larger. For a crew of twelve man one 12' x 16' tent as a cook shack is not sufficient.

A plywood and clear vinyl shower was built and water heated in a 45 gallon drum using a Tiger Torch. This system using gravity feed, was satisfactory for the shower, but could not be used to supply hot water to the cook shack. A drum lined with plastic or painted inside should be used for heating the water.

CAMP

# INTRODUCTION

The Stave Lake deposit was found by Les Kiss as a result of a regional stream sediment sampling program conducted during the summer of 1969. Samples from streams draining the mineralized area returned values of greater than 100 ppm Cu and 10 ppm Mo, in contrast to background values of 40 - 60 ppm Cu and 2 - 3 ppm Mo. Sample locations and values are plotted on Fig. 2. Kiss prospected the drainage area and staked 10 claims initially. Seventy more claims were added later.

#### SAMPLING

Three trenches were drilled, blasted and sampled by Kiss during August, 1969. The relative locations and values obtained are plotted on Fig. 3. Combined grab and chip samples were used. The subjective element inherent in this type of sampling commonly results in optimistic values. Channel sampling would have been difficult and time consuming but preferable.

During July and August, 1970, the surface was mapped and the mineralized zones sampled by seven NO diamond drill holes. The holes are summarized in Table I and plotted on Fig. 4. Individual Cu and MoS<sub>2</sub> values and averages are plotted on the diamond drill hole sections, (Appendix B) and the average for each hole is given in Table 2.

HOLE NO.	AZIMITH	DIP	LENGTH	ZONE TESTED
1 2 3 4 5 6 7	020 <sup>0</sup> 200 <sup>0</sup> 200 <sup>0</sup> 200 <sup>0</sup> 185 <sup>0</sup> 200 <sup>0</sup> 020 <sup>0</sup>	-35° -50° -35° -44° -45° -58° -35°	501 217 805 506 536 300 787 3652	Middle Zone South " Middle " South " North " South " Middle "

TABLE I





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HOLE NO.	INTERSECTED	TRUE	AVERAGE	METAL CONTENT
	WIDTH, FT.	WIDTH, FT.	<u>Cu ź</u>	MoS <sub>2</sub> Z
1	497	326	.065	.001
2	213	175	.024	.002
3	802	520	.053	.013
4	502	438	.080	.009
5	532	450	.036	.010
6	294	238	.130	.027
7	782	453	.030	.006

TABLE 2

True width measured perpendicular to dip of fractures.

# GEOLOGY

#### REGIONAL GEOLOGY

The Stave Lake deposit is in the south central Coast Range, in an area mapped and studied by Roddick (1965). He divided the plutonic rocks into granite, granodiorite, etc., and then subdivided these on the basis of mafic mineral content. The "stock" in which the mineralization was found was designated as #82 (Map 1151 AGSC), and was mapped as quartz diorite with hornblende more abundant than biotite (type  $h_3$ ). Two miles north of the showing this "stock" is in contact with one of granodiorite with a similar mafic mineral distribution (type  $h_2$ ). Four miles east of the showing the quartz diorite is in contact with a roof pendant of Jurassic metavolcanics and sediments.

Numerous north northeast linears are visible on aerial photographs of this area, one of which can be traced from two miles north through the deposit and a mile or more to the south. Tipella Creek, Tretheway Creek, Winslow Creek and the pendant-quartz diorite contact are approximately parallel to these linears. The linears are probably faults with little recognizable offset.

The absolute ages of the plutonic rocks in this area have not been determined. The rocks in the roof pendant to the east have been placed in the Middle and Upper Jurassic; those in a small pendant six miles south of the deposit are pre-Jurassic metamorphic rocks.

#### LOCAL GEOLOGY

An area approximately 5,200 feet by 2,600 feet covering the showing was mapped at a scale of 1'' = 200'. On the resulting map (in pocket) are plotted faults, surveyed control points and claim posts, and the distribution of the mineralized fractures. The control points were surveyed by Charles Wilmot, and the mapping done principally by Denis Clarke. Trench #3 was mapped by Eric Standen at a scale of 1'' = 20'' (Fig. 5).

# ROCK TYPES

Quartz diorites and a porphyritic granodiorite are the two major rock types found. The former occupy over 90% of the area mapped. Contacts between the quartz diorite were very hard to define in outcrops at the scale used, but in split core five varieties of quartz diorite could be distinguished. Descriptions of the rock types are given in Appendix A.

Contacts between the varieties vary from sharp to gradational; but most are sharp. Table 3 summarizes the contacts noted in core from five of the seven holes drilled. Holes six and seven were both in MQD for their entire lengths. The only chilled contacts recognized were in large boulders. In both cases PGD was chilled against MQD.



# TABLE 3

#### CONTACT RELATIONS

	PGD	QDFM		DOD	ogr		DOD		MOD egr	
		$(z) \in \mathcal{T}_{p} \in E_{0}$				S. 18 - S.				
MQD.	8,8	5,5,5	11.13	8,8,8,	S, S, S, S,	3	s, s, j	20	s,s,g	
MQD cgr		8		ß,	8				A en la com	

s - sharp contact; g - gradational contact. Each appearance of a letter indicates a contact observed in core.

Small, rounded, partly assimilated xenoliths are present in the quartz diorites and the porphyritic granodiorite. The degree of assimilation is relatively constant regardless of host rock and the xenoliths are always darker and finer grained than the host. There are occasional local concentrations of as many as four or five per square yard, but in general they are more widely distributed. They vary in diameter from one inch to four inches, most being in between. Very few subangular ones were seen, the majority being definitely rounded.

#### STRUCTURE

The only major structural features which are readily apparent on aerial photographs (1:32,000) of the area are the north-south trending faults. These linears are marked by alignment of streams and notches in ridges, and can be traced for miles. One of these faults crosses the west central part of the deposit, and provided access for most of the basic dykes found on the property. Less pronounced parallel faults are also marked by topographic depressions and the presence of basic dykes.

These faults are paralleled by numerous fractures not visible on the aerial photographs. These strike 000° to 020°, dip steeply east or west, and are unmineralized. A second group of unmineralized fractures are present here and there. One set dips steeply northwest or southeast, the other steeply northeast or southwest. A third group strikes east-west with a shallow dip to the south. The slope of the hillside is largely controlled by this group. On the east end of the property some of these fractures are filmed by epidote.

Sulphide mineralization is confined to an east-west striking set of fractures which dip steeply north. The strike of these varies locally but most trend 110° to 115° along the zone. They are extremely tight features, often not apparent from a distance of five feet but marked periodically by ridges or lumps caused by local silification. These fractures extend beyond the limits of the mineralization and the southern bounderies of the mineralized zones have a flatter dip to the north than the fractures. The northern boundaries of the mineralized zones dip to the south.

Movement has occurred on fractures of each of these sets, the amount seldom exceeding a few inches on any one fracture. The predominant sense of movement in the western part of the area was right lateral; in the east it was left lateral. Characterizing the four sets as NW, NE, EW and SE, the following relationships have been found:

FRACTURES ON WHICH	FRACTURES WHICH	SENSE	AMOUNT OF
MOVEMENT OCCURRED	WERE OFFSET	OF MOVEMENT	MOVEMENT
NS NE	ew NS VW	Right lateral	2" 4 - 6"
44	EW	left lateral	2"
95	SE		3/4"
e,	SE	Right lateral	2 - 3"
EW	NS		5"
SE	ns ne	Left lateral	3 - 2" 4"

TABLE 4

These examples were obtained from the western and central parts of the mineralized area. Both right and left lateral movement appears to have occurred on fractures trending NE and EW. This may be more apparent than real, because vertical movement on one fracture crossing two others with opposite dips would give the same pattern.

The dark quartz diorite is locally foliated, whereas the medium quartz diorite very rarely is. The foliated appearance is caused by alignment of hornblende. Foliation in the medium quartz diorite is restricted to contacts with the dark quartz diorite. In one outcrop the medium and dark quartz diorites appear to have been "swirled" together.

# MINERALIZATION

Sulphide mineralization, consisting of chalcopyrite, bornite and molybdenite, is present in narrow quartz veins, as coatings on fractures and as disseminations between fractures. Secondary minerals are predominantly malachite and "limonite", with some azurite and ferrimolybdate. Scheelite and powellite are present in minor amounts in quartz veins and with sulphide in fractures. No pyrite was seen anywhere on the property.

The quartz veins at the east and west ends of the mineralized zone are narrow, seldom exceeding & inch. In the centre they are thicker, to 2 inches, but fewar in number. Chalcopyrite and molybdenite are the principal sulphides in the quartz veins. Mineralization is seldom continuous for more than two feet, except in the west central part of the zone where there are & inch to % inch veins of molybdenite 10 to 20 feet long, separated on strike by veins of quartz with disseminated molybdenite. Chalcopyrite is a minor constituent of these veins, but lenses up to 2 inches wide and 2 feet long were found in the wide quartz veins. The chalcopyrite in these lenses is accompanied by coarse rosettes of molybdenite and intimately admixed bornite. Similar thick lenses of molybdenite were not seen. Scheelite and powellite in the quartz veins occur as irregular milky white grains occasionally as wide as & inch.

Most of the sulphide mineralization occurs as coatings and fillings in fractures. They are usually accompanied by euhedral quarts and sometimes biotite. The surface of a fracture seldom contains more than 50% sulphides, and more commonly only 30%. Euhedral quartz grains up to 4 inch long, with the C axis parallel to the fracture, are present with the sulphides on many of the fractures. When biotite is present it is coarse grained and intergrown with the sulphides. Both the quartz and the biotite appear to have preceeded the sulphides.

Towards the eastern end of the deposit molybdenite decreases, and the copper sulphides on the fractures have chlorite and/or hornblende associated with them.

The distribution of the mineralized fractures was mapped on the basis of the number of fractures per ten foot interval, the same scheme as used in logging the core. Three arbitrary divisions have been used - less than 5 fractures per 10 feet, 5 to 10, and greater than 10. Three zones of 10+ fractures/10 feet were defined. Fractures in the northern one have more molybdenite than chalcopyrite, and bornite is seldom present. Those in the central zone contain more chalcopyrite and bornite, and less molybdenite. The fractures in the south zone are mineralized with predominantly chalcopyrite and bornite, and molybdenite is scarce. The chalcopyrite: bornite ratio is always 5:1 or greater. There is very little disseminated sulphide mineralization. When present it occurs between closely spaced fractures, and the grains of sulphides are almost invariably in the coarser grained hornblende. Chalcopyrite is found disseminated much more often than bornite, and disseminated molybdenite is very rare.

There is also very little alteration associated with the sulphide mineralization. The mafic minerals, principally hornblende, present in and immediately adjacent to the mineralized fractures have been slightly chloritized. No sericite was visible megascopically. There is evidence of sporadic silicification along some of the fractures, but no pervasive silicification is evident. Coarse grained bornblende containing sulphides is not visibly altered or bleached.

No distinct correlation was found between rock type and sulphide composition, but fractures in the dark quartz diorite appeared to contain relatively more bornite than fractures in the other varieties.

# PROPERTY EVALUATION

A mineralized zone 4,800 feet long, east to west, and averaging 1,065 feet wide, north to south, was outlined on surface. The mineralization, consisting of chalcopyrite, molybdenite and bornite, is confined to narrow east-west fractures. Hydrothermal alteration is essentially absent, Seven NQ diamond drill holes were drilled in the central part of the zone to test the exposed width and to determine depth extension. All core was split and analyzed for copper and molybdenum. Although the values returned were low, an attempt has been made to indicate tonnage and grade.

First, an area was assigned to each of the drill holes, in plan and section. (See Figs. 6 to 10, Appendix B). The grade determined by each drill hole was assigned to each of the mineralized blocks outlined. The tonnage of each block was determined by calculating the volume enclosed, and dividing by a tonnage factor of 12.2 cu.ft./ton. This factor was calculated from the weight and volume of the core from holes one and two (Appendix C). Finally, the tonnage per block was multiplied by the average metal content of each block, these products summed and the totals for copper and molybdenite divided by the total tonnage (Table 5). For the material blocked out by drilling the result is 33,092,000 tons averaging 0.051% Cu and 0.009% MoS<sub>2</sub>.

The volume of the entire zone was calculated using an area 4,800 feet by 1,065 feet. Vertical sides for the block were assumed, and the upper surface was given an average  $25^{\circ}$  slope, rising from south to north. The approximate elevation of the southern boundary is 5,400 feet, and the elevation to which the deposit has been tested is 5,000 feet. Dividing the volume by the factor of 12.2 gives an estimated tonnage of 272.5 x 10<sup>°</sup> tons. The only grade that can be assigned to this tonnage is that determined for Elocks A to G. The value per ton of this material, based on metal prices published in the Northern Miner, September 24, 1970 and an average grade of 0.051% Cu and 0.009% MoS<sub>2</sub>, is \$0.78.

BLOCK	VERTICAL SECTION AREA	HORIZONTAL WIDTH FT.	VOLUME FT.x106	TONS ×10 <sup>6</sup>	<u>CuxT</u>	MoS2XT
Ā	122,400	292'	35.75	2.925	190,000	2,925
B	18,560	292	5.42	.444	10,650	888
C	334,000	414	128.57	10.52	558,000	137,000
D	103,100	414	42.70	3.50	280,000	32,500
E	101,600	-133	14.42	1.183	42,600	11,830
P	38,400	528	20.24	1.66	226,000	. 44,800
G	297,600	528	156.90	12.86	386,000	70,750
	tan na shina sa shina Tan			33 002	1 693 850	200 603

TABLE 5

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Description of rock types found on the Stave Lake property. Medium quartz diorite - MQD and MQD cgr.

This quarts diorite is medium grained, medium grey, holocrystalline, and hypidiomorphic granular (i.e. granitic). Hornblende is in euhedral to anhedral grains 1/8 inch to 3/16 inch long and is coarser grained than the biotite. The larger hornblende grains have irregular, resorbed boundaries and are commonly polkilitic. Biotite is subhedral to anhedral, occasionally in small (1/10") pseudohexagonal books, more often in irregular, fine grained (1/16" to 1/31") flakes. Quartz forms subrounded to irregularly rounded clear grains 1/16 inch to 1/8 inch in diameter. Coalesced grains have inclusions of hornblende and/or biotite. Plagioclase occurs as white, euhedral to anhedral equant grains, 1/8 inch to 1/16 inch long, and is not noticeably twinned. Sphene is a constant but sparse accessory.

Chalcopyrite and molybdenite are the predominant sulphides. Where disseminated chalcopyrite is preferentially associated with grains of poikilitic hornblende. Most of the chalcopyrite is present as fracture fillings in or associated with the mafic numerals. Molybdenite is essentially restricted to the fractures, and most commonly is found in narrow (1/8" to 4") quartz veins with some chalcopyrite.

The coarse grained variety (MQD cgr) is similar texturally to MQD but hornblende is markedly coarser grained. Biotite and quartz are slightly coarser grained, but the feldspars appear to be unchanged.

Dark Quartz diorite - DQD and DQD cgr.

The dark quartz diorite is a hypidiomorphic granular, holocrystalline rock, medium to dark grey in colour. The mafic minerals vary in grain size from less than 1/64 inch (biotite) to 1/8 inch x 1/16 inch (hornblende). The dark colour is due to the fine grained biotite. Coarse grained hornblende is poikilitic with inclusions of quartz and felspar. The texture of this variety is similar to the medium quartz diorite, but quartz and feldspar are slightly finer grained and twinning in plagioclase is more evident. Sphene is less abundant in this variety than in the medium quartz diorite. Bornite is the prominent sulphide with accompanying chalcopyrite and some molybdenite. The latter is reduced in quantity, often markedly, compared to its quantity in the MQD. Disseminated bornite and chalcopyrite are found predominantly in coarse grained, poikilitic hornblende.

DQD cgr differs from DQD principally in the grain size of the hornblende. In the coarse grained variety large (to  $\frac{1}{2}$ " x 3/16") grains of hornblende are prominent, while biotite is relatively fine grained (1/64"). In other respects the varieties are similar.

Quartz diorite with fuzzy mafics - QDFM

This variety is similar to DQD cgr in grain size and mode but the mafic minerals are much less distinct. It is not as dark as DQD and a greenish grey colour is characteristic. Hornblende tends to be coarse grained, equant, and poikilitic. There may be an increase in K-feldspar in this variety - rounded, milky white grains distinct from quartz.

Porphyritic granodiorite - PGD

This is a light grey rock which when weathered is buff to white. It is holocrystalline but unequigranular. The round mass is composed of fine grained quartz and feldspar with evenly distributed fine grained (.01") biotite. The phenocrysts are most noticeably grains of hornblende, to 4 inch long; of shiny black biotite, 1/8 inch to 1/16 inch in diameter; and, least apparent, of quartz to 3/16 inch across. Less than 10% of the rock is composed of these phenocrysts.

# Aplica

Dykes of aplite, varying from less than 1 inch to over 6 inches wide, were found on the property. Most strike 090° to 100°, and appear to be concentrated near the north and south limits of the mineralized zone. One or two seemed to grade into quartz veins, particularly near DDH 5 on the north side of the zone. Aplite dykes striking 010° to 020° were not common, and were finer grained than the others.

Minor rock types

Small lenses of pegmatitic material were occasionally seen associated with aplite dykes. Characteristically these were composed of coarse grained quartz, K-feldspar, and biotite or chlorite. Coarse grained apatite was found in two of these lenses.

Irregular bodies, with generally lobate boundaries, of medium grained Alaskite (?) were found in the porphyritic granodiorite. They appeared to be younger than the granodiorite.

Elongate blebs, 4 to 6 inches long and an inch wide, of "microademellite" were found along east-west fractures. Characteristically, they had very mafic cores. Much coarser grained elongate pegmatitic pods contained blebs of rusty chalcopyrite up to one inch across. Both the "microademellite" and the pegmatitic material were restricted to a zone about 200 feet wide on the north side of the mineralized area. Most major north-south trending faults, and some east-west ones, contain discontinuous basic dykes of variable width. The dyke rocks are generally dark to greenish brown, fine grained with phaneritic borders, and occasionally amygdaloidal. In composition they are probably andesitic.

							and the second	
HOLE NO.	INTERSECTED LENGTH, FT.	FROM	TO	TRUE WIDTR, FT.	% Cu	Z MoS <sub>2</sub>	<b></b>	
	100		200	-	075	0.03		
	497	4	501	326	.005	.001		
	130	4	140	90	.120	.002		
	50	140	190	34	.100	.011		
	190	6	190	124	.130	.004		
	130	230	360	65	•130	.006		
2	213	4	217	175	.024	.002		
					and the second			
3.	800	S	805	520	.053	.013		
	35	5	40	21	.067	.016	·注意: · · · · · · · · · · · · · · · · · · ·	
1.1	50	40	90	35	.120	.017		
in a state of the	140	90	230	90	.065 -	.026		
	30	230	260	18	.110			
	330	260	590	212	.037	.010		
	40	590	630	25	.120	.004		
1. 15 1	175	630	805	113	.026	.008		
	135	5	140	87	48-996	.028		
The second	265	5	270	172		.021		
and all an	50	460	510	35		.024		
	40	630	670	25	-	.026		
4	502	. 4	506	438	.080	.009		
	206		506	177	.150	.011		
	116	4	120	105	and the second	.016		
	-30	320	350	25		.028		
	40	.440	480	.34	attar altar	.019	Second Second Second	
5	532	4	536	450	.035	.010		
	50	390	440	42	.090	.026		
	266	270	536	227		.016		
6	294	6	300	238	.130	:027	12	
•	144	6	150	118	.210	.048	118 - 8.00 tock	
7	782	5	787	453	.030	.006		
	60	20	80	35	.140	.005		
	80	220	300	46		.013		
11.2		field for the	1				N. A. F. M. Hall and	

Breakdown of averaged portions of diamond drill holes.











# TABLE 7

# VOLUME CALCULATION

Area of mineralized zone = 5.115 x 10<sup>6</sup>ft.<sup>2</sup> Effective rectangle = 4,800 ft. x 1,065 ft. Average slope of hillside, rising to the north = 25<sup>0</sup> Rise over 1,065 feet = 500 ft.

Volume above south boundary datum (5,400 ft. elevation)  $250 \times 4,800 \times 1,065$  = 1.28 x 10<sup>9</sup>ft.<sup>3</sup> Elevation of assumed bottom of mineralized zone = 5,000 fact Volume below south boundary datum  $400 \times 5.115 \times 10^6$  = 2.046 x 10<sup>9</sup>ft.<sup>3</sup> Total volume =  $3.326 \times 10^9$  = 3.326 x 10<sup>6</sup>ft.<sup>3</sup> Total tons =  $3.326 \times 10^9$  = 272.5 x 10 tons