

STATE OF WASHINGTON  
Clarence D. Martin, Governor

---

DEPARTMENT OF CONSERVATION AND DEVELOPMENT  
J. B. Fink, Director

---

IC 6

Summary of Information

on

IRON ORE DEPOSITS

of

WASHINGTON

by

DIVISION OF MINES AND MINING  
Thomas B. Hill, Supervisor  
J. W. Melrose, Assistant

November, 1940

## INTRODUCTION

It is the purpose of this paper to present a summary of the information of all the known deposits of iron ore, of whatever kind, found in the State of Washington. Should there develop a substantial local market for our iron ores, other deposits might be found.

The feasibility of developing a large industry based upon our iron ores is dependent upon many factors, chief of which is a profitable market. But if such large industry is not established, we are hopeful that because of availability of cheap power, and by reason of advances in metallurgy, our ores may come to be profitably used in increasing quantities by existing plants that are now dependent upon scrap and imported pig.

The cheap power generated at Bonneville and Grand Coulee dams has caused widespread interest in the possibilities of an iron and steel industry near the coast in the Pacific Northwest. The question of the availability of iron ores in the State of Washington has arisen from many sources, particularly since the announcement of a pig iron plant to be established by the Sierra Iron Company at Vancouver.

## VARIETY OF ORE IN STATE

Various kinds of iron ore in Washington have been known for many years but attempts to mine several of the deposits in the past for the manufacture of pig iron have not been particularly successful because of market conditions. The first iron plant was established in 1880 at Irondale near Port Townsend and bog iron ore was used. Later iron ore from the Hamilton District, Skagit county and magnetite from Texada Island, British Columbia were utilized in this furnace. The plant was abandoned after a few years of operation. In recent years the principal iron ore production has been in Stevens and Okanogan Counties where both hematite and magnetite are mined and used at the Northwest Magnesite Plant at Chewelah.

The iron deposits in Washington consist principally of magnetite, hematite and limonite. One or more of these minerals are found in substantial quantities in several counties including Stevens, Ferry, Okanogan, Chelan, Kittitas, King, Skagit, Whatcom, Snohomish, Grays Harbor, Pacific and Thurston. Present information available on most of the deposits does not permit accurate statements as to their size. It is impossible to estimate tonnages where only minor development work has been done. Possibly in some instances considerably more ore may be present than is now known. Even though some of the Washington deposits may be relatively small, the present day conditions of cheaper transportation and smelting may make them of commercial importance.

In the United States iron ore is smelted almost entirely by blast furnace method. To be economically feasible the blast furnace method requires large scale operations involving adequate reserves of iron ore

and coking coal capable of yielding satisfactory coke. The electric furnace method is being used successfully in Sweden to produce pig iron. It is built in capacities up to fifty tons per day. For a reducing agent both coke and charcoal are used. A report by the Market Development Section, Bonneville Project, points out that the pit-type electric furnace, particularly a furnace recently developed by A. E. Green, could be used to meet conditions existing in the Northwest. Structurally strong coke that is needed in the blast furnace is not necessary for the pit-type furnace, and in the case of the Green furnace coal may be used as a reducing agent.

This type of furnace might make possible the utilization of Washington's large reserves of noncoking bituminous and sub-bituminous coal.

It has been estimated (Bulletin 27, Division of Geology) that in the State 875,000 tons of ore have been exposed by development and that it is quite probable that there are nearly three million tons available from all of the deposits. There is a possibility that seven or eight million tons might be found to exist if efficient prospecting and mining were carried on.

#### IRON ORE DEPOSITS

Many agencies have examined and analyzed iron ore deposits in the State and among the publications consulted for the descriptions of the mines and analyses of the ores are as follows: Bulletin 27, Division of Geology; United States Geological Survey, Snoqualmie Folio No. 139; Available Raw Materials for a Pacific Coast Iron Industry, Vol. 5, United States Engineering Department; and Washington Geological Survey Annual Report for 1901, part 4.

#### Grays Harbor County

A sedimentary deposit of titaniferous magnetite occurs in Sec. 28, T. 18 N., R. 5 W. near Elma. The ore consists of the minerals magnetite and ilmenite and is intermixed in places with sand and gravel. It is developed by several open cuts and pits. One shipment is reported to have been made from the property for the production of titaniferous iron.

#### Thurston County

A bog iron deposit occurs about thirteen miles east of Olympia near the south end of Lake St. Clair. The ore is hematite and limonite and covers an area several acres in extent. It ranges in depth from 14 feet to the vanishing point. The property is owned by Mr. Talcott of Olympia who has extracted the material for use as a mineral pigment. It is estimated that nearly seventy-five thousand tons have been exposed by pits and trenching. There is doubtless much more of the substance in the nearby marshy portion of Lake St. Clair, where iron oxide is at the present time being precipitated. Analyses of the ore show the iron oxide content to vary

from 58.55 to 63.80 per cent. Division of Geology Bulletin 33, page 68 shows the following analysis: 54.05 per cent iron oxide, 14.9 per cent silica and 7.25 per cent alumina.

#### Pacific County

Quantities of black sand similar to the Elma deposit have been concentrated in places near the mouth of the Columbia River. In Sec. 22, T. 9 N., R. 10 W., P. J. McGowan has exposed beds of the black sand several acres in extent. Test pits have disclosed the sands to be at least four feet thick in places.

#### King County

Among the first claims patented in King County were the Denny iron claims located on the west slope of Denny Mountain near Snoqualmie Pass, and the Guye property, two and one-half miles north of the Pass. The ore at these mines is made up of magnetite and is found in bands and irregular masses in the country rock. Some iron sulphides occur with the magnetite at the Denny mine. The development work at each mine consists of one tunnel and several open cuts.

Analyses of the ore show the percentage of metallic iron to be high, varying from 55 to 71 per cent. In most analyses the phosphorous and sulphur content is low, although at the Denny property the sulphur content is higher where sulphides are present. Jenkins, (Bulletin 27, Division of Geology) states: "The ore from these properties is representative of the best grades of magnetite in the State. According to the descriptions and the appearance of the deposits they are comparatively large but irregular and discontinuous. Their tonnage cannot be safely estimated from the data collected. The situation of the ore bodies should make them of economic importance if iron ore is needed locally on the Coast"

In the Miller River District two magnetite properties exist and the ore is quite like that which is found near Snoqualmie Pass. They are the Anderson property in Sec. 11, T. 26 N., R. 10 E., near Baring, and the Williams-Smith property in Sec. 35 and 36, T. 26 N., R. 10 E.

The analyses of the ores from the two mines show the metallic iron content to vary from 55 to 60 per cent. It is rather low in phosphorous and sulphur. An analysis from the Anderson mine shows 0.94 per cent of titanium oxide.

#### Analyses of King County Iron Ores (Bull. 27, Div. of Geology)

	1	2	3	4	5	6
Iron (Fe)	66.81	66.82	62.45	68.54	55.48	67.80
Silica (SiO <sub>2</sub> )	3.60	4.20	5.78	1.89	7.99	3.33
Alumina (Al <sub>2</sub> O <sub>3</sub> )					3.74	
Phosphorus (P)	Tr.				0.021	Tr.
Sulphur (S)			0.21	0.25	0.089	0.12

7	8	9	10	11	12	13	14	15	16	17
64.00	67.00	62.80	64.50	61.00	69.39	71.17	68.56	62.17	69.40	70.18
5.56	1.67	7.39	6.03		2.72	1.30	2.77	4.02	2.23	1.87
0.02	0.02	Tr.	Tr.	0.018	0.35?	0.039	0.035	0.031	0.035	0.031
0.12	0.05	0.05	0.05	0.063	0.042	0.005	0.019	0.041	0.008	0.013

1 - 2 From Guye Property  
3 - 5 From Denny Claims

6 - 11 From Snoqualmie Pass  
12 - 17 From Snoqualmie veins

	1	2	3	4
Iron (Fe)	66.00	67.00	55.00	60.70
Silica (SiO <sub>2</sub> )	4.10	2.70	10.20	9.51
Alumina (Al <sub>2</sub> O <sub>3</sub> )			0.75	
Lime (CaO)			4.53	
Magnesia (MgO)			1.15	
Phosphorus (P)	0.0264	0.37	0.065	0.034
Sulphur (S)	none	none		0.09
Titanium Oxide (TiO <sub>2</sub> )			Tr.	0.94

1 - 2 From Williams-Smith Property  
3 - 4 From Anderson Claims

#### Skagit County

The iron ore deposits of Skagit County are in the Hamilton District near the town of Hamilton in Sec. 23 and 24, T. 35 N., R. 6 E. and Sec. 30, T. 35 N., R. 7 E. The ore was utilized by the Pacific Coast Steel Company in the old Irondale blast furnace. Iron was manufactured by combining the ore with magnetite from Texada Island, British Columbia.

Although outcrops of iron are at intervals along the Skagit valley between Hamilton and Marblemount the principal exposures are on Iron Mountain on the south side of the valley opposite Hamilton. The development work on several of the claims consists of shafts, tunnels, and numerous open cuts and exposes the ore in places for several thousand feet from the Skagit River up the slope of Iron Mountain.

The WPA mineral investigations sponsored by the Department of Conservation and Development exposed an appreciable amount of ore in Sec. 30, T. 35 N., R. 7 E. Numerous trenches show an almost continuous band of iron ore for over 800 feet. The ore is a mixture of magnetite and hematite. It ranges in thickness from 15 feet to the vanishing point, averaging a little over 3 feet. The average metallic-iron content is 31.6 per cent; manganese 6.6 per cent, silica 33.1 per cent and only traces of phosphorus and sulphur.

The ore as exposed by private workings is found in irregular layers that range in thickness from a few feet to 30 feet. The analyses given below show that the ore contains from 31 to 41 per cent metallic iron with a high percentage of silica. The phosphorus content is fairly high, sulphur is low, and manganese oxide averages about 10 per cent.

It has been estimated that probably one hundred thousand tons of low grade iron ore could be extracted from the properties. The exposures made by the WPA will increase this figure considerably.

Analyses of Hamilton Iron Ores (Bull. 27, Division of Geology)

	1	2	3	4	5	6	7
Iron (Fe)	43.89	31.08	43.91	32.14	36.72	33.88	46.60
Silica (SiO <sub>2</sub> )	19.98	31.82	18.36	30.53	20.24	32.94	27.04*
Alumina (Al <sub>2</sub> O <sub>3</sub> )	3.30	6.79	3.109	7.25	7.40	2.57	
Calcium Carbonate (CaCO <sub>3</sub> )	3.98	5.82	8.92	5.82	9.77	8.81	3.95
Manganese Oxide (Mn <sub>3</sub> O <sub>4</sub> )	12.30	14.28	12.00	11.74	13.04	7.31	0.19
Phosphorus (P)	0.11	0.18	0.69	0.72	Tr	1.06	0.59
Sulphur (S)				0.06		0.16	

	8	9	10	11	12	13	14	15 <sup>†</sup>
Iron (Fe)	42.43	43.72	32.92	29.11	35.90	37.00	37.00	40.50
Silica (SiO <sub>2</sub> )	24.13	22.85	28.05	32.46	26.60	17.00	17.00	22.00
Alumina (Al <sub>2</sub> O <sub>3</sub> )	9.54	3.17	8.43	8.56				
Calcium Carbonate (CaCO <sub>3</sub> )		3.78	8.06	6.71				
Manganese Oxide (Mn <sub>3</sub> O <sub>4</sub> )		8.08	8.11	13.11	13.52		0.36	12.51
Phosphorus (P)	0.64	0.44	0.31	0.20				
Sulphur (S)	0.25							

\* Given as insoluble residue

\*\* Given as Mn and recalculated to Mn<sub>3</sub>O<sub>4</sub>

† Titanium is given as 3.00

1. From tunnel, Inaugural mine, Hamilton
2. From surface, Inaugural mine
3. From shaft, depth 85 feet, Inaugural mine
4. From Hamilton mine, average sample
5. From Hamilton mine, near middle of vein
6. From Hamilton mine, near wall
7. From J. J. Conner prospect, Hamilton
8. From vein highest above river, Hamilton
9. From Treadwell mine, near Marblemount
10. From ore body lowest down on hill, Pittsburg mine
11. From upper ledge, Pittsburg mine
- 12.-15. From Snowstorm claim, Hamilton

**Snohomish County**

A deposit of bog iron, several acres in lateral extent and from 2½ to 3 feet thick, is exposed near Arlington in Sec. 36, T. 32 N., R. 5 E. In Sec. 30, T. 32 N., R. 6 E. bog iron was mined and utilized at the Irondale furnace. At this locality about six thousand tons of ore are reported to have been removed from an area of two or three acres. Hodge (Vol 5, United States Engineering Department) estimates about 250,000 tons of ore are available and reserves of 150,000 tons.

## Whatcom County

Bog iron is found in several places in Whatcom County principally near Bellingham, Ferndale, and Lynden. The deposits are similar to the Snohomish deposits and are in most cases small in extent. The largest deposits are in Sec. 8 and 17, T. 40 N., R. 3 E. near Lynden and cover an acre or so to a depth of several feet. It has been estimated that the total tonnage of these deposits is about twenty thousand tons.

On the west slope of Sumas Mountain the Hematite Iron and Gold Mines Development Company of Seattle has a group of claims in Sec. 2, T. 39 N., R. 4 E., and Sec. 35, T. 40 N., R. 4 E. This ore is a low grade hematite in an irregular zone that reaches a maximum thickness of 20 feet but in places pinches out entirely. It is exposed along a stream channel by a series of outcrops for a distance of about 1,500 feet.

### Partial Analyses of Sumas Mountain Iron Ore (Bull. 27, Div. of Geology)

	%
Iron (Fe)	37.31
Silica (SiO <sub>2</sub> )	20.83
Phosphorus (P)	0.20
Sulphur (S)	0.008

## Kittitas County

Probably the largest iron ore deposits in the State occur along the Cle Elum River north of Cle Elum Lake. The outcrops range in thickness from a few feet to 30 feet and extend from a point near Camp Creek southward for about two miles along the river, then swing eastward where the outcrops may be followed across the mountains that parallel the river.

The ore is a mixture of hematite and magnetite. The iron content for the whole body averages between 40 and 50 per cent and usually contains less than 0.05 per cent phosphorus. The sulphur content varies from none to 0.17 per cent.

The analyses of the ore in the Cle Elum District indicates that it is of fairly good grade. Jenkins ( Bulletin 27., Division of Geology) states: "This deposit is undoubtedly the largest known iron ore body in the State. Judging from the extent of the outcrop of the ore body and the character of the deposit, it may be estimated to contain possibly as much as five million tons. Further development of adjacent properties may disclose additional bodies. It is a type of deposit which may extend to considerable depth."

The Duerwachter claims, Sec. 9 and 10, T. 19 N., R. 15 E., on the west side of Mount Peo, contain iron ore similar in character to the Hamilton deposits. The ore is largely hematite with lesser amounts of magnetite. It is low grade and has a high percentage of silica and phosphorus.

Deposits of iron ore are reported from the Teanaway District. The Iron Mountain and Devine groups of claims are on Beaver Creek about three miles south of Mt. Stuart. Analyses made by J. C. Benecker of Seattle, show that the average iron content is 50.13 per cent and silica 11.71 per cent. No sulphur is recorded and phosphorus is generally low.

Analyses of Iron Ore from Cle Elum District (Bull. 27, Div. of Geology)

	1	2	3	4	5	6	7	8
Iron (Fe)	60.55	42.58	68.84	59.23	58.10	60.00	60.89	56.79
Silica (SiO <sub>2</sub> )	12.99	31.23	1.85	9.55	12.95	12.71	12.87	9.49
Alumina (Al <sub>2</sub> O <sub>3</sub> )	1.53	2.98		1.21	0.89	1.01	1.27	2.26
Chromic Oxide (Cr <sub>2</sub> O <sub>3</sub> )	0.72			1.53	2.39	1.26	0.63	
Lime (CaO)	0.11	2.09	0.05	1.69	1.13	0.93	0.09	
Magnesia (MgO)	0.21	0.45	0.09	1.90	1.75	0.19	0.12	
Manganese Oxide (MnO)	Tr	1.85		Tr	Tr	Tr	Tr	
Phosphorus (P)	0.03	0.18	0.04	0.03	0.05	0.02	0.02	0.02
Sulphur (S)		0.07		Tr				

9	10	11	12	13	14	15	16	17	18	19
15.36	52.31	42.38	47.10	47.87	47.10	51.68	46.24	54.40	51.13	57.12
37.33	14.32	20.89	15.58	14.00	8.70	7.84	7.50	5.54	6.94	5.68
7.71	4.72	6.19	1.92	6.02	12.22	5.67	25.95	8.29	14.23	4.80
	Tr	Tr								
				Tr	0.39*	0.30*			Tr	0.58*
0.05	0.03	0.01					Tr	Tr		
0.03		0.01					Tr			

\* Recalculated from original figure. Mn to MnO

1. Magnetic Point claim
2. Iron Chancellor claim
3. Iron Boss claim
4. Yankee claim
5. Iron Monarch Claim
6. Roslyn claim
7. Iron Duke claim
8. Magnet claim
9. Cle Elum Lake claim
10. Stronghold claim
11. Iron Yankee claim
12. Emerson (laminated ore)
13. Hardscrabble mine
14. Roslyn (laminated ore)
15. Yankee (laminated ore)
16. Iron Monarch (oolitic ore)
17. Yankee (massive ore)
18. Iron Monarch (massive ore)
19. Roslyn (high grade massive ore)



## Chelan County

The Washington Nickel and Alloys Company is reported to be developing both hematite and magnetite deposits a short distance north of Blewett Pass. The magnetite is in Sec. 13, T. 22 N., R. 17 E. The ore occurs as small segregated masses in peridotite and a tunnel on the property crosscuts several of these bodies. The hematite is in Sec. 11 and 14, T. 22 N., R. 17 E. Several open cuts have exposed the ore. Analyses of the ore show the metallic-iron content to range from 42 to 51 per cent. The phosphorus ranges from a trace to 0.024 per cent.

## Okanogan County

Magnetite ore from the Meyers Creek District is being utilized at the Northwest Magnesite plant at Chewelah. The Magnetic Mining Company is shipping the ore from their property on Buckhorn Mountain east of Chesaw.

The ore bodies on Buckhorn Mountain are irregularly shaped masses of magnetite enclosed by metamorphosed limestone and shale. A few sulphides of iron and copper are associated with the magnetite. The ore is exposed close to the surface and is developed by means of large open cuts.

A short distance northeast a similar deposit of magnetite is exposed in the workings of the Teddy Roosevelt mine operated until recently by the late J. A. MacLean of Spokane. This was formerly the Grant property.

An analysis of ore from Buckhorn Mountain shows it to contain 70 per cent metallic iron, 0.009 per cent phosphorus, and 0.21 per cent sulphur. The sulphur content is higher where the iron and copper sulphides occur with the magnetite. It is estimated (Bulletin 27, Division of Geology) that 375,000 tons of ore are present on the Neutral-Aztec claims of the Magnetic Mining Company and further development may disclose additional amounts.

### Analyses of Iron Ore from Meyers Creek District (Bull. 27, Div. of Geology)

	1	2	3	4	5	6	7	8	9	10
Iron Sesquioxide (Fe <sub>2</sub> O <sub>3</sub> ) and Alumina (Al <sub>2</sub> O <sub>3</sub> )	84.74	83.80	85.30	87.54	88.28	90.36	85.76	86.90	84.16	85.50
Silica (SiO <sub>2</sub> )	9.42	9.80	9.62	8.80	8.00	7.56	8.50	7.46	8.50	8.64
Lime (CaO)	6.36	6.40	5.46	4.86	5.00	4.88	6.18	3.82	6.04	5.24

1-10:-Analyses of average weekly samples of iron ores from Neutral mine (Magnetic Mining Company) from July 25, 1920 to October 31, 1920, by the Northwest Magnesite Company.

Magnetite occurs in the east half of Sec. 26, T. 30 N., R. 23 E., northwest of Pateros. The magnetite is intermixed with large amounts of hornblende and actinolite, and is never entirely free of the association of these rock-forming minerals. An analysis shows it to be a titaniferous iron ore containing about 57 per cent iron, 0.05 per cent

phosphorus pentoxide, 0.097 per cent sulphur, and 3.25 per cent titanium oxide. It is estimated that twenty thousand tons of ore mixed with rock are possibly present.

### Ferry County

The iron properties of Ferry County are situated on Belcher and Cooke Mountains about ten miles northeast of Republic and include the Copper Key, Oversight, and Belcher mines.

The Copper Key mine is near the summit of Belcher Mountain. Underground workings expose the minerals pyrite, pyrrhotite, magnetite, and chalcopyrite. Howland Bancroft (United States Geological Survey, Bulletin 550, page 174) describes the deposit as an irregular replacement of limestone or dolomite by the iron minerals and further states that: "A large quantity of magnetite is present in the ore body, and, as in places it is remarkably free from pyrite and pyrrhotite, it may be of economic importance."

The Oversight mine is on Cooke Mountain and about half a mile south of the Copper Key mine. The deposit here is similar to the Copper Key deposit and the magnetite occurs as irregular masses in the country rock and is in places associated with iron sulphides.

The Belcher mine is about half a mile northeast of the Copper Key and is on Belcher Mountain. Magnetite occurs here under similar conditions as at the Copper Key and Oversight mines but is not as prominent as pyrite which is the principal mineral exposed in the workings.

Copper and gold have been the metals sought at these properties with little attention paid to the magnetite as a source of iron ore, and development does not disclose the size of the magnetite bodies. Analyses of the magnetite show the metallic-iron content to be high. However, where iron sulphides are intermixed with the magnetite the per cent of sulphur will also be high.

#### Analyses of Iron Ore, Belcher District, (Bull. 27, Div. of Geology)

	1	2
Iron(Fe)	26.97	63.21
Silica (SiO <sub>2</sub> )		0.64
Lime (CaO)	14.71	8.78
Magnesia (MgO)	12.91	1.10
Phosphorus pentoxide (P <sub>2</sub> O <sub>5</sub> )	0.164	0.164
Sulphur (S)	8.90	0.08
Arsenic (As)	none	none

1. Wander Claim, Oversight Group.
2. Copper Key mine.

### Stevens County

Limonite and hematite are exposed at the Kulzer property about

three miles east of Valley in Sec. 20, T. 31 N., R. 41 E. Ore from this mine has been used at the Tacoma smelter and the Northwest Magnesite plant. Analyses show the metallic-iron content to range from 41 to 68 per cent. The phosphorus content ranges from 0.14 to 0.51 per cent.

The Hill Iron property is in Sec. 17 and 20, T. 31 N., R. 39 E., about nine miles west of Valley. The ore minerals are hematite and magnetite of an excellent grade. The percentage of metallic iron is high and the phosphorus content low.

The Read property is in southwestern Stevens County and consists of three claims in Sec. 14, T. 30 N., R. 37 E., four miles east of Hunters. Magnetite is the principal mineral found. The ore body occurs along the contact between limestone and granite. It ranges in width from a few inches to 50 feet or more and may be followed along the contact for 3000 feet.

An analysis shows the iron content of the ore to be about 60 per cent, phosphorus 0.07, a trace of titanium, and .048 per cent sulphur. The sulphur content may be higher in places where pyrite and chalcopryrite are found with the magnetite. It has been estimated that there may be as much as five hundred thousand tons of ore in the deposit.

In the Northport District and near Deep Lake are the Bechtol and Thompson properties. The Bechtol claim is in Sec. 27, T. 39 N., R. 41 E. Four claims make up the Thompson group and are in Sec. 23, T. 39 N., R. 41 E.

Limonite is the principal ore mineral at each mine and occurs as a vein deposit between walls of dolomitic limestone. An analysis of a specimen of ore from the Thompson mine shows it to contain nearly 60 per cent metallic iron; 0.048 per cent phosphorus and 0.006 per cent sulphur. It has been estimated that at least seventy thousand tons of ore are exposed by the workings in these properties.

Analyses of Iron Ores, Stevens County, (Bull. 27, Div. of Geology)

	1	2	3	4	5	6
Iron (Fe)	56.58	50.48	67.56	68.10	59.19	58.53
Silica (SiO <sub>2</sub> )	4.49	14.90	1.66	1.12	5.80	3.54
Alumina (Al <sub>2</sub> O <sub>3</sub> )	2.00	2.48			1.85	3.18
Manganese (Mn)						
Phosphorus (P)	0.31	0.30			0.36	0.51
Sulphur (S)	0.32	0.32	0.38	0.25	0.33	0.21
Titanium Dioxide (TiO )						

Analyses of Iron Ores, Stevens County, Continued.

	7	8	9	10	11	12	13
Iron (Fe)	50.05	41.70	51.50	53.56	68.57	60.40	59.99
Silica (SiO <sub>2</sub> )	10.12	10.30	10.80	8.45	1.69	3.23	2.33
Alumina (Al <sub>2</sub> O <sub>3</sub> )	17.23						
Manganese (Mn)		0.37	0.19				
Phosphorus (P)	0.20	0.117	0.116	0.14	0.024	0.07	0.048
Sulphur (S)	0.42	Tr	Tr	0.004	0.006	0.048	0.023
Titanium Dioxide (TiO <sub>2</sub> )		0.25	0.30			Tr	

- 1 and 2 - From IXL mine, Sec. 11, T. 39 N., R. 37 E
- 3 and 4 - From Silver King mine near Valley
- 5. From Vigilant claim (Kulzer)
- 6. From Capitol claim (Kulzer)
- 7. From Mineral Point
- 8-9-10. From Capitol claim (Kulzer)
- 11. From Hill property
- 12. From Read property
- 13. From Thompson property