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MANGANESE													
TYPE:	Mn-Feed Grade												
Description	Al <sub>2</sub> O <sub>3</sub>	BaO	C	CaO	FeO	K <sub>2</sub> O	LOI	MgO	Mn	Na <sub>2</sub> O	P	S	SiO <sub>2</sub>
	%	%	%	%	%	%	%	%	%	%	%	%	%
2-069	1,9	2,45		5,43	15	0,48		1,23	36,16		0,11	0,04	15,11
2-081	0,196	0,053		19,472	5,658	0,037		3,659	30,924		0,017	0,008	4,192
2-082	0,183	0,092		14,32	5,58	0,005		3,67	37,81		0,017	0,018	4,85
2-084	0,19	0,12		14,29	6,09	0,03		3,65	36,96		0,019	0,03	4,97
2-092	0,188	0,112		14,297	5,942	0,008		4,13	36,913		0,018	0,019	6,151
2-096	1,7	0,53		2,21	29,71	0,46		0,49	36,2		0,035	0,07	5,39
2-097	0,194	0,062		13,35	5,58	0,009		3,82	38,61		0,019	0,017	5,11
2-100	0,302	0,104		13,148	6,846			3,841	37,468		0,019		6,123
2-101	10,833	0,765			28,89	1,282		0,509	28,012		0,035	0,007	5,156
2-104	0,23	0,106		13,29	7,157	0,012		3,606	38,061		0,018	0,023	6,037
2-108	0,296	0,044		19,61	7,353	0,031		3,551	29,1		0,016	0,01	5,68
2-122	0,22	0,116		13,51	6,76	0,018		3,88	37,33		0,016	0,019	6,09
2-133	0,23	0,14		11,99	7,56	0,014		3,57	38,72		0,019	0,034	6,28
2-139	0,19	0,23		13,05	6,82	0,013		3,75	37,98		0,019	0,045	5,87
2-152	1,283			1,76	12,527	0,491		0,423	35,878		0,207	0,033	17,498
2-159	0,24	0,15		13,32	6,53	0,02		3,63	37		0,017	0,057	7,17
2-164	3,476	0,649		1,931	36,647	0,617		0,609	28,851		0,041	0,039	4,167
2-167	0,193	0,17		12,995	6,868	0,012		3,85	37,277		0,017	0,039	6,384

Certification Status	Origin
COA Issued (New)	Mamatwan
COA Issued	Mamatwan
COA Issued	Mamatwan
COA Issued (New)	Mamatwan
COA Issued	Mamatwan
COA Issued (New)	Wessels
COA Issued (New)	Wessels
COA Issued	Blackrock Mine
COA Issued	ALS
COA Issued	Blackrock Mine
COA Issued (New)	Wessels
COA Issued (New)	Blackrock Mine
COA Issued (New)	Blackrock Mine
COA Issued (New)	Blackrock Mine
PT Report	Reassigned from batch 2008, PT # 2-045
COA Issued (New)	Blackrock Mine
PT Report	Reassigned from batch 2008, PT # 2-034
PT Report	Blackrock Mine

TYPE:	Mn-Product Grade												
Description	Al <sub>2</sub> O <sub>3</sub>	BaO	C	CaO	FeO	K <sub>2</sub> O	LOI	MgO	Mn	Na <sub>2</sub> O	P	S	SiO <sub>2</sub>
	%	%	%	%	%	%	%	%	%	%	%	%	%
2-057	1,096	2,313		1,998	18,374	0,338		0,626	44,495		0,129	0,031	10,37
2-058	0,27	0,84		4,75	11,08	0,01	4,23	0,69	50,16	0,045	0,029	0,258	5,93
2-070	0,809	0,614		6,225	13,25	0,05	6,71	1,064	43,34	0,034	0,028	0,141	8,749
2-073	0,409	1,089		4,786	19,277	0,011	4,592	0,602	43,849	0,079	0,036	0,233	5,792
2-075	0,348	1,348		4,315	18,045	0,01	6,038	0,537	46,452	0,043	0,032	0,331	1,794
2-076	0,281	0,857		4,683	11,195	0,011	4,387	0,657	50,106	0,041	0,025	0,307	6,061
2-079	0,4	0,93		4,76	18,73	0,009	3,88	0,64	44,74		0,035	0,22	5,18
2-085	0,434	0,46		7,098	17,088	0,019		0,551	44,397		0,032	0,085	4,561
2-089	0,268	0,475		3,9	8,74	0,012		0,661	52,1		0,027	0,186	7,74
2-093	0,294	0,324		7,151	11,323	0,01		1,808	44,761		0,025	0,115	7,164
2-105	0,287	0,251		6,097	13,324	0,082		1,275	47,36		0,028	0,053	3,713
2-117	0,301	0,881		6,45	12,46	0,017		1,11	46,32		0,033	0,291	6,3
2-120	0,389	0,441		4,95	9,66	0,023		1	51,12		0,025	0,136	6,94
2-123	0,357	0,825		6,47	14,67	0,012		0,686	45,8		0,033	0,181	7,38
2-126	0,31	1,04		3,95	17,22	0,012		0,48	48,63		0,03	0,25	1,7
2-134	0,35	0,36		4,99	12,83	0,03		1,27	47,43		0,029	0,08	6,03
2-137	0,32	0,34		6,93	12,51	0,04		1,68	46,28		0,028	0,1	3,98
2-144	0,273	0,34		5,415	12,178	0,079		1,324	48,704		0,029	0,058	3,346
2-145	0,492			16,706	7,361			4,012	44,569				6,45
2-156	0,26	0,492		7,78	14,61	0,022		2,06	42,06		0,028	0,15	5,13
2-168	0,304	0,527		5,099	23,579			0,292	42,362		0,031	0,117	3,962
2-171	0,311	1,898		7,809	17,102	0,019		0,416	43,735		0,039	0,438	3,788
2-176	0,29	0,352		5,7	15,596	0,082		0,903	46,917		0,03	0,071	2,51

Certification Status	Origin
COA Issued	ALS
COA Issued	Blackrock Mine
COA Issued	Blackrock Mine
COA Issued	Wessels
COA Issued	ALS
COA Issued	Wessels
COA Issued (New)	Wessels
COA Issued	Mamatwan
COA Issued (New)	Mamatwan
COA Issued	Mamatwan
COA Issued	Blackrock Mine
COA Issued (New)	Wessels
COA Issued (New)	Blackrock Mine
COA Issued (New)	Wessels
COA Issued (New)	Blackrock Mine
COA Issued (New)	Blackrock Mine
PT Report	Blackrock Mine
PT Report	South32 Mamatwan
COA Issued (New)	Blackrock Mine
PT Report	Blackrock Mine
PT Report	Manganese Metal Company
PT Report	Blackrock Mine

**QOTHO REFERENCE MATERIAL SUMMARY**

Date Printed: 18 May 2022

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TYPE:		Mn-Slag									
Description	Ba	C	Cr	Fe	Mn	N	Ni	P	S	Si	
	%	%	%	%	%	%	%	%	%	%	
2-086											
2-090	0,826	0,542	0,037	2,506	20,987		0,003	0,007	1,077	12,539	
2-132	1,1	0,86		1,31	22,76				1,11	13,31	
2-178				4,416	43,072			0,02		8,071	

TYPE:		Mn-Alloy									
Description	Ba	C	Cr	Fe	Mn	N	Ni	P	S	Si	
	%	%	%	%	%	%	%	%	%	%	
2-074		1,48	0,02	17,31	80,17		0,018	0,09	0,009	0,29	
2-087		1,502		17,276	80,146			0,094	0,01	0,36	
2-091		1,169		16,28	77,63		0,005	0,075	0,014	0,54	
2-103		6,71	1,84	16,6	69,93		0,009	0,08	0,05	0,7	
2-127		6,87	0,21	16,61	75,74		0,009	0,083	0,008	0,13	
2-131	0,16	6,41	2,28	15,84	66,54		0,016	0,06	0,09	1,17	
2-138	0,05	6,74	1,21	16,16	71,37		0,01	0,07	0,05	0,55	
2-172		0,436		5,975	70,577			0,029	0,054	1,528	
2-177		7,1	0,031	12,24	79,32		0,009	0,07	0,011	0,61	

Certification Status	Origin
PT Report	Catoridge
PT Report	Catoridge
QRM Report	Catoridge
PT Report	Transalloy

Certification Status	Origin
COA Issued (New)	Catoridge
PT Report	Catoridge
COA Issued (New)	Catoridge
COA Issued (New)	Machadodorp
COA Issued (New)	Machadodorp
COA Issued (New)	Assmang Machado
COA Issued (New)	Assmang Machado
PT Report	Catoridge
COA Issued (New)	Transalloy