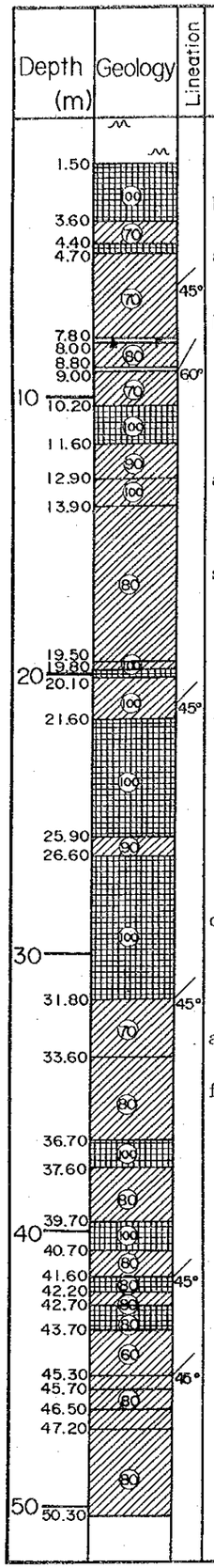
THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE III)

GEOLOGIC DRILL LOG
DDH JMC-21

Elevation 788.9m
Total Depth 50.3m
Inclination - 90°

1 : 200



Description

- Limonite bearing dark brown to black sideritic carb.
- Feld. br. bearing brown anker. sövite
- Fissure
- Feld. br. bearing manganiferous brown anker. sövite
- Seared
- Altered, sheared
- Mn vein bearing greenish gray fng anker. sövite
- Fng altered greenish gray
- Manganiferous dark brown anker. sövite with feld. br.
- Fng greenish gray altered
- Fissure (w:10cm)
- Black sideritic carb.
- Fng greenish gray altered
- Bastnaesite bearing black sideritic carb.
- Feld. br. bearing manganiferous anker. sövite with banded texture
- Buff altered anker. sövite with feld. br.
- Black
- Buff
- Black
- Limonitized brown to buff
- Feld. br. bearing, manganiferous
- Feld. br. bearing, manganiferous
- Sheared, altered greenish gray

Assay (ppm)

Sample No.	Depth (m)	Thickness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
	1.50											
C2101		3.20	1594	3597	1202	141.3	30.4	4.9	50	1736	246	1112
	4.70											
C2102		5.50	1806	3187	906	111.8	25.9	17.6	266	7227	150	5728
	10.20											
C2103		5.00	2652	6034	1892	250.6	49.3	21.7	302	6998	278	6763
	15.20											
C2104		6.40	1412	2512	723	98.9	22.5	25.9	466	9430	125	7690
	21.60											
C2105		5.00	2284	5237	1589	201.4	36.6	18.7	262	6554	207	5173
	26.60											
C2106		5.20	3289	7272	2059	249.0	45.2	21.0	98	2479	379	4184
	31.80											
C2107		4.90	2905	5629	1577	201.9	40.0	16.9	293	9220	226	7541
	36.70											
C2108		4.90	2330	4733	1328	173.5	34.1	<0.1	322	9973	216	7268
	41.60											
C2109		4.90	3610	6812	1753	214.2	38.5	7.1	426	9069	261	8892
	46.50											
C2110		3.80	1928	3541	1001	128.7	27.0	<0.1	410	10545	154	9920
	50.30											

LEGEND

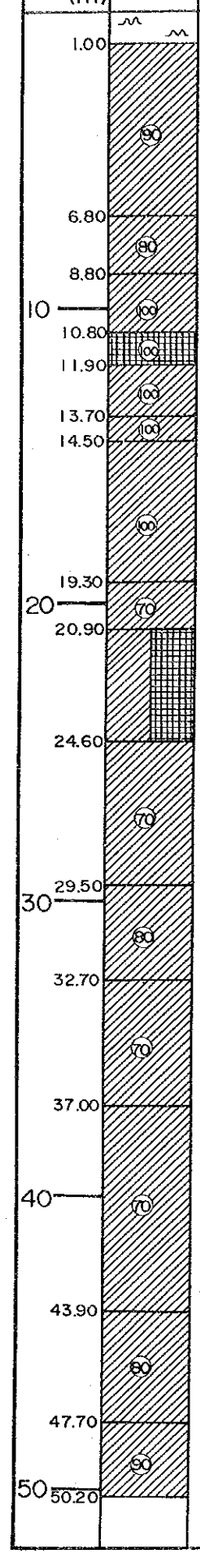
- Drift
- Sideritic carbonatite
- Ankeritic Sövite
- Sövite
- Carbonate - Silicate rock
- F:Feldspathic breccia, A:Agglomerate
- Syenite
- Nepheline syenite
- Dykes
  - T — Trachyte
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — lamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
- cal — Calcite
- Ap — Apatite

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE Ⅲ)

GEOLOGIC DRILL LOG
DDH JMC-22

Elevation 783.8m
Total Depth 50.2m
Inclination - 90°

1 : 200



Description	Sample No.	Depth (m)	Thickness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
		1.00											
Brecciated manganiferous brown to dark brown anker. sövite	C2201		5.80	3871	5711	1237	168.9	35.0	7.7	629	7733	264	5787
		6.80											
White & dark brown banded anker. sövite	C2202		4.00	1210	2180	556	82.0	16.0	1.5	464	6537	141	6265
		8.80											
Brecciated light brown fng anker. sövite													
		10.80											
Ankeritic & sideritic carb. with limonite	C2203		3.70	1431	2870	670	97.5	19.5	<0.1	320	11837	147	7911
		11.90											
Brecciated light brown fng anker. sövite													
		13.70											
White to brown anker. sövite													
		14.50											
Brown to dark brown anker. sövite	C2204		4.80	1591	3082	731	102.2	21.4	0.6	391	7950	142	5664
		19.30											
Altered feld. br. bearing brown anker. sövite	C2205		5.30	3951	6913	1758	227.1	40.0	14.5	450	10988	270	7409
		20.90											
White fng anker. sövite & sideritic carb. mixed zone													
		24.60											
Brecciated, hematite bearing anker. sövite	C2206		4.90	1256	2399	651	89.8	18.3	<0.1	667	9983	130	6756
		29.50											
White to greenish gray brecciated anker. sövite with magnetite and hematite	C2207		3.20	573	1298	294	47.5	9.4	2.6	273	10205	50	6986
		32.70											
Reddish brown feld. br. bearing white fng anker. sövite with pyrite and baryte	C2208		4.30	2414	4442	738	84.7	14.3	18.5	335	5054	166	2506
		37.00											
Greenish gray altered phonolite bearing anker. sövite with hematite pyrite and magnetite	C2209		6.90	1641	2709	696	97.2	18.5	2.7	595	6901	129	4457
		43.90											
Brecciated zone with hematite, pyrite, magnetite and fluorite	C2210		3.80	3322	4808	914	117.2	18.4	14.5	331	2214	108	952
		47.70											
Greenish gray fng anker. sövite	C2211		2.50	1972	2816	629	87.7	16.7	0.8	662	7183	119	5362
		50.20											

Assay (ppm)

LEGEND

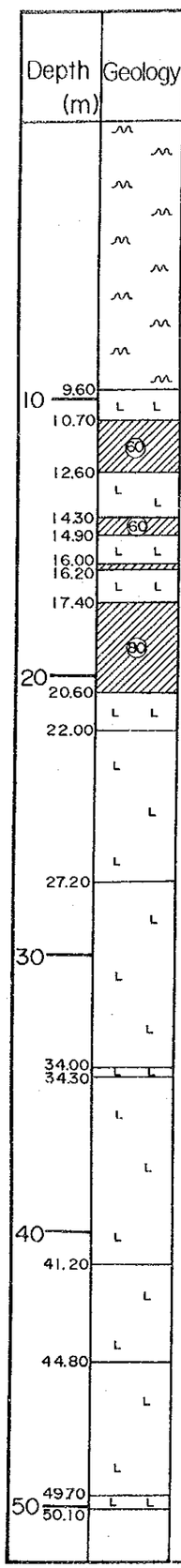
- Drift
- Sideritic carbonatite
- Ankeritic Sövite
- Sövite
- Carbonate – Silicate rock
- F:Feldspathic breccia, A:Agglomerate
- Syenite
- Nepheline syenite
- Dykes
  - T — Trachyte
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — Lamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
- cal — Calcite
- Ap — Apatite

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE Ⅲ)

GEOLOGIC DRILL LOG
DDH JMC-23

Elevation 786.6m
Total Depth 50.1m
Inclination - 90°

1 : 200



Description	Sample No.	Depth (m)	Thickness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
Dark gray compact lamprophyre Carbonate vein bearing lamprophyre and carbonatite	C2301	9.60–12.60	3.00	229	380	144	27.2	5.5	<0.1	152	1381	45	4231
Biotite, magnetite rich Altered brown anker. sövite Carbonate vein bearing lamprophyre	C2302	12.60–17.40	4.80	424	700	224	30.2	7.9	<0.1	152	2068	49	4460
Blueish gray altered lamprophyre	C2303	17.40–20.60	3.20	407	667	209	32.1	6.6	1.2	325	5038	35	3689
Carbonate vein rich lamprophyre	C2304	20.60–22.00	1.40	589	959	300	50.8	11.8	4.6	1935	3315	69	5430
Carbonate vein rich lamprophyre	C2305	22.00–27.20	5.20	370	584	198	36.5	8.2	6.2	177	6729	49	4174
Carbonate vein rich lamprophyre	C2306	27.20–34.00	6.80	581	971	280	44.3	9.6	<0.1	326	7013	57	3534
Biotite rich lamprophyre Carbonate vein poor	C2307	34.00–41.20	7.20	390	627	203	30.1	9.1	0.3	169	8085	49	3990
Carbonate vein rich	C2308	41.20–44.80	3.60	529	886	261	40.9	10.6	2.1	363	7042	56	4043
Carbonate vein poor	C2309	44.80–49.70	4.90	567	941	304	49.0	11.4	0.9	158	8976	56	4047
Biotite rich lamprophyre	~~C2310~~	~~49.70–50.10~~	~~0.40~~	~~577~~	~~946~~	~~258~~	~~33.3~~	~~7.9~~	~~<0.1~~	~~581~~	~~5487~~	~~43~~	~~981~~

LEGEND

- Drift
- Sideritic carbonatite
- Ankeritic Sövite
- Sövite
- Carbonate – Silicate rock
- F:Feldspathic breccia, A:Agglomerate
- Syenite
- Nepheline syenite

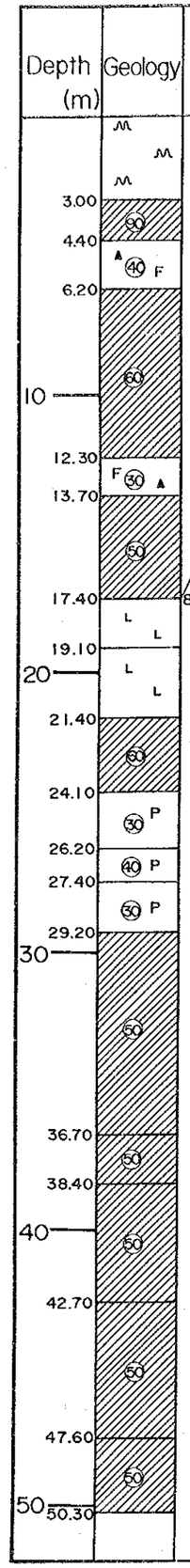
- Dykes
  - T — Trachyte
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — Lamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
- cal — Calcite
- Ap — Apatite

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE Ⅲ)

GEOLOGIC DRILL LOG
DDH JMC-24

Elevation 697.0m
Total Depth 50.3m
Inclination - 90°

1 : 200



Description	Sample No.	Depth (m)	Thickness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
		3.00											
Reddish brown anker. sövite Carbonatized feld. br.	C2401	6.20	3.20	500	921	474	144.1	35.0	<0.1	309	2404	124	1906
Reddish brown brecciated anker. sövite	C2402	12.30	6.10	638	1075	293	53.2	15.8	<0.1	332	4488	88	2330
Carbonatized feld. br.	C2403	17.40	5.10	1122	1712	375	73.5	17.6	5.2	349	1907	96	1753
Brown altered lamprophyre Greenish gray fng lamprophyre with calcite vein	C2404	21.40	4.00	78	149	57	16.9	3.4	<0.1	96	10079	30	5326
	C2405	24.10	2.70	1096	1439	247	41.1	9.9	<0.1	343	2752	77	2151
Carbonatized grayish green altered phonolite Siderite bearing altered phonolite with fluorite	C2406	29.20	5.10	536	809	206	28.7	10.2	5.8	408	1256	66	1745
Brown, pale green, dark brown brecciated anker. sövite	C2407	34.20	5.00	582	1158	356	69.4	17.4	3.6	328	733	97	1514
Fluorite bearing sideritic carb. (depth:35.3-35.4) Pale green altered phonolite and anker. sövite	C2408	39.20	5.00	384	770	256	59.8	17.0	3.5	298	8348	93	2295
Brown, pale green, dark brown brecciated anker. sövite	C2409	44.20	5.00	358	699	184	23.7	8.7	<0.1	291	4923	65	1371
Reddish brown brecciated Pale green to reddish brown altered phonolite and carbonatite	C2410	50.30	6.10	463	910	256	62.1	15.2	3.0	350	5383	87	1571

LEGEND

- Drift
- Sideritic carbonatite
- Ankeritic Sövite
- Sövite
- Carbonate – Silicate rock
- F:Feldspathic breccia, A:Agglomerate
- Syenite
- Nepheline syenite

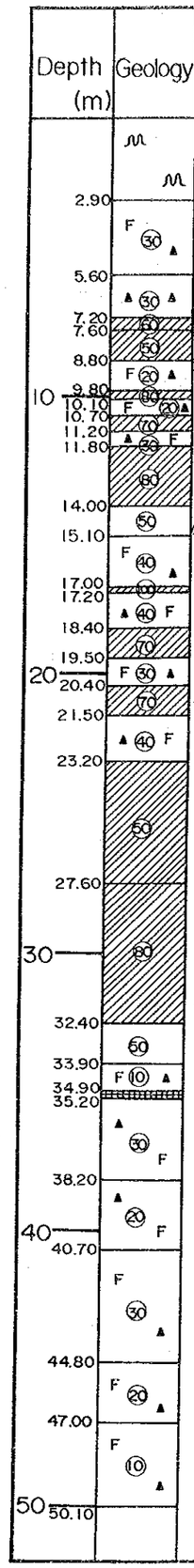
- Dykes
  - T — Trachyte
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — Lamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
- cal — Calcite
- Ap — Apatite

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE III)

GEOLOGIC DRILL LOG
DDH JMC-25

Elevation 683.7m
Total Depth 50.1m
Inclination - 90°

1 : 200



Description
Purplish brown deeply weathered anker. sövite bearing feld. br.
Reddish brown feld. br.
Dark brown fng anker. sövite
Weathered anker. sövite
Pale green altered feld. br.
Weatehered feld. br. bearing dark brown anker. sövite
Calcite vein (w:0.5cm)
Carbonate vein bearing feld. br.
Fluorite in carb.
Dark brown anker. sövite
Pale green altered feld. br.
Fluorite bearing anker. sövite
Altered anker. sövite with sideritic carb. and feld. br.
Limonitized brown anker. and sideritic carb. mixed zone
Limonitized anker. sövite
Sideritic carb. with fluorite
Reddish brown carb. bearing feld. br.
Pale green altered feld. br.
Reddish brown altered feld. br. with anker. sövite
brecciated feld. br.
Greenish gray altered feld. br. with carb.

Assay (ppm)

Sample No.	Depth (m)	Thickness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
	2.90											
C2501		4.30	1918	2751	771	147.4	36.2	4.5	417	7589	174	7048
	7.20											
C2502		4.60	1324	2017	741	156.4	39.8	2.1	378	5252	162	4343
	11.80											
C2503		3.30	3381	5139	1430	235.4	53.5	9.7	392	6389	268	5118
	15.10											
C2504		3.30	814	1535	728	155.0	37.9	15.4	418	4166	141	3373
	18.40											
C2505		4.80	685	1420	848	199.2	53.3	11.3	348	5527	208	3981
	23.20											
C2506		4.40	822	1512	633	127.5	33.7	7.4	537	3241	154	2052
	27.60											
C2507		6.30	1543	2905	1902	424.0	96.1	28.5	429	15334	290	14132
	33.90											
C2508		6.80	751	1344	527	122.9	32.6	6.3	507	4174	149	3190
	40.70											
C2509		6.30	1065	1978	838	203.8	52.5	10.2	311	3517	177	3593
	47.00											
C2510		3.10	1088	1794	633	125.7	29.8	9.2	508	4754	145	5592
	50.10											

LEGEND

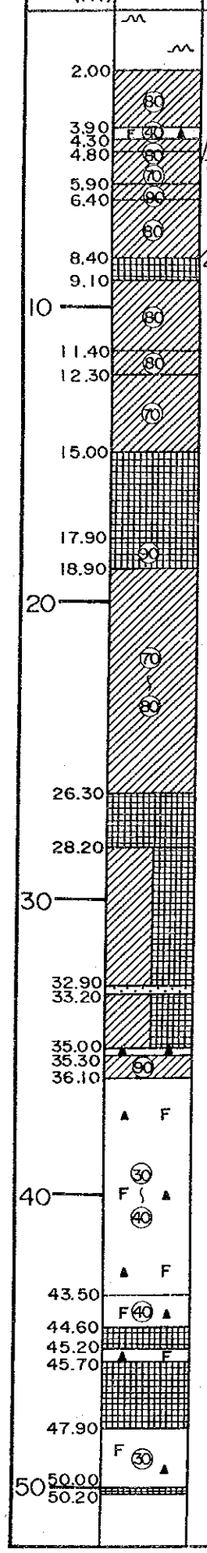
- Drift
- Sideritic carbonatite
- Ankeritic Sövite
- Sövite
- Carbonate - Silicate rock
- F:Feldspathic breccia, A:Agglomerate
- Syenite
- Nepheline syenite
- Dykes
  - T — Trachyte
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — Lamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
- cal — Calcite
- Ap — Apatite

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE III)

GEOLOGIC DRILL LOG
DDH JMC-26

Elevation 688.5m
Total Depth 50.2m
Inclination - 90°

1 : 200



Description

Depth (m)	Description
2.00	Reddish brown anker. sövite with feld. br.
3.90	Brecciated light brown anker. sövite
6.40	Weathered pinkish brown brecciated anker. sövite
8.40	Black to dark brown sideritic carb.
9.10	Pinkish brown brecciated anker. sövite
11.40	Dark brown anker. sövite
12.30	Pinkish brown to pale green
15.00	Dark brown
17.90	Limonitized
18.90	Reddish brown to dark brown brecciated anker. sövite with Mn mineral
26.30	Black sideritic carb. with fluorite
28.20	Anker. sövite & sideritic carb. mixed zone with clay
32.90	White mdg sövite
33.20	Fault br. with clay
35.30	Dark brown manganiferous anker. sövite vein and sideritic carb. bearing pinkish feld. br. Fluorite in sideritic carb.
43.50	Sideritic carb. bearing feld. br.
44.60	Dark brown to black sideritic carb. with fluorite
47.90	Sideritic carb. bearing feld. br.
50.00	

Assay (ppm)

Sample No.	Depth (m)	Thickness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
C2601	2.00–6.40	4.40	1936	3566	1944	373.2	86.7	21.9	266	8256	334	6111
C2602	6.40–11.40	5.00	1495	2727	1078	246.2	64.0	18.7	785	5971	316	4399
C2603	11.40–15.00	3.60	1878	3108	1053	226.4	57.1	17.3	613	7606	310	6192
C2604	15.00–18.90	3.90	1957	5822	3574	565.8	113.0	29.2	187	7286	422	5784
C2605	18.90–26.30	7.40	2622	4674	1705	291.6	77.0	19.9	469	6684	466	5509
C2606	26.30–28.20	1.90	999	3838	2219	309.1	52.4	4.0	<1	1295	180	534
C2607	28.20–33.20	5.00	2208	5622	2966	517.6	118.1	28.0	428	7320	470	5653
C2608	33.20–36.10	2.90	2440	4727	1957	358.6	86.2	8.8	406	9078	413	6740
C2609	36.10–43.50	7.40	2018	4759	2463	371.5	76.9	24.9	437	3357	361	2799
C2610	43.50–47.90	4.40	1131	4907	3612	443.9	77.3	18.7	36	2747	216	1858
C2611	47.90–50.20	2.30	664	2826	1881	241.2	42.6	5.9	364	2424	212	1800

LEGEND

- Drift
- Sideritic carbonatite
- Ankeritic Sövite
- Sövite
- Carbonate - Silicate rock
- F: Feldspathic breccia, A: Agglomerate
- Syenite
- Nepheline syenite
- Dykes
  - T — Trachyte
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  - L — Lamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
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THE COOPERATIVE MINERAL EXPLORATION
IN
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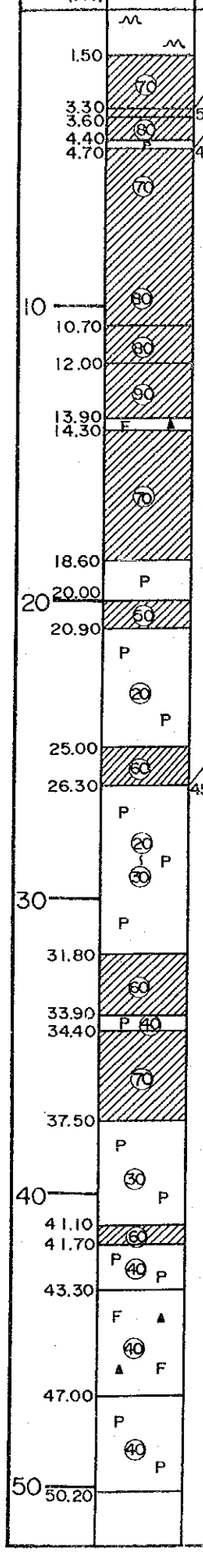
REPUBLIC OF MALAWI
(PHASE III)

GEOLOGIC DRILL LOG
DDH JMC-27

Elevation 703.7m
Total Depth 50.2m
Inclination - 90°

1 : 200



Description	Sample No.	Depth (m)	Thickness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
Limonitized brecciated pinkish brown to buff anker. sövite Fissure, clay Gray altered phonolite	C2701	1.50	5.00	1138	2014	664	124.4	34.2	10.0	118	5138	137	5760
Brown fng brecciated anker. sövite with feld. br.	C2702	6.50	4.20	754	1121	336	51.2	15.9	1.7	172	5544	83	5420
Limonitized crushed anker. sövite Brown fng brecciated Mn mineral bearing feld. br.	C2703	10.70	3.60	951	3111	1417	195.1	42.1	6.2	248	4147	119	4489
Feld. br. bearing anker. sövite	C2704	14.30	4.30	2096	3660	1047	210.5	62.5	18.7	182	7482	209	6597
Greenish gray porphyritic altered phonolite Brown anker. sövite with phonolite Carbonate vein bearing greenish gray altered phonolite	C2705	18.60	6.40	433	778	322	52.6	15.6	2.2	742	3496	76	5115
Dark brown and pale green anker. sövite with brecciated phonolite Carbonate vein bearing pale green dark brown altered phonolite	C2706	25.00	6.80	386	691	239	40.3	14.4	16.5	72	4597	52	4101
Dark brown ankeritic sövite with feld. br. and siderite Fluorite, baryte bearing anker. sövite	C2707	31.80	5.70	1063	4224	2224	294.4	59.2	29.3	54	2663	223	2058
Pale green altered phonolite	C2708	37.50	5.80	463	972	383	50.8	16.5	1.2	103	3988	82	3879
Pinkish brown feld. br. with pale green anker. sövite & fluorite, baryte patch	C2709	43.30	3.70	941	2712	1401	178.6	40.4	<0.1	14	6551	125	4263
Greenish gray pyrite bearing carbonatized phonolite	C2710	47.00	3.20	450	720	245	45.3	13.3	13.1	329	3343	57	2530
		50.20											

LEGEND

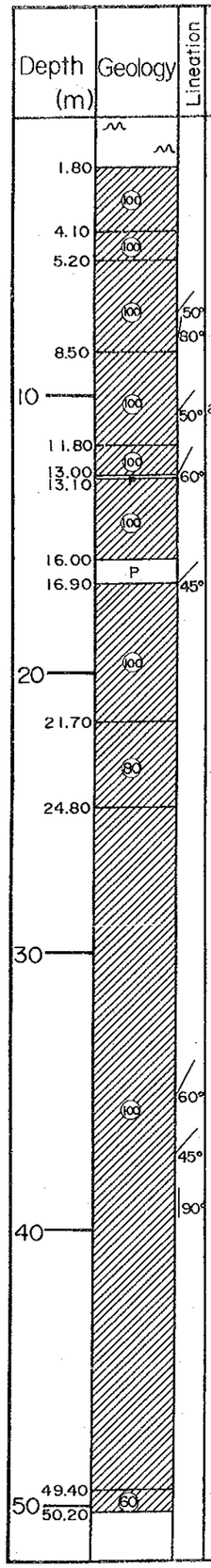
- Drift
- Sideritic carbonatite
- Ankeritic Sövite
- Sövite
- Carbonate - Silicate rock
- F: Feldspathic breccia, A: Agglomerate
- Syenite
- Nepheline syenite
- Dykes
  - T — Trachyte
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — Lamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
- cal — Calcite
- Ap — Apatite

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE III)

GEOLOGIC DRILL LOG
DDH JMC-28

Elevation 753.3m
Total Depth 50.2m
Inclination - 90°

1 : 200



Description

- Fng white anker. sövite
- Manganiferous anker. sövite
- Manganiferous carbonate vein (w:2cm)
- Calcite vein (w:1cm)
- Dark brown carb. bearing fng white anker. sövite
- Gray altered phonolite
- Fng white anker. sövite
- Gray altered phonolite
- Fng white, partly feld. br. patch bearing anker. sövite
- Feld. br. manganiferous mineral and siderite bearing fng white anker. sövite
- Fng pyrite bearing white anker. sövite with small amount of feld. br. and Mn mineral
- Foliation
- Foliation
- Foliation
- Feld. br. bearing anker. sövite

Assay (ppm)

Sample No.	Depth (m)	Thickness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
	1.80											
C2801		5.00	1462	3251	1516	247.6	63.5	15.0	372	7282	149	2177
	6.80											
C2802		5.00	1828	3808	1692	270.5	65.8	22.5	405	6426	137	2541
	11.80											
C2803		4.20	905	1756	730	104.4	31.0	7.4	386	695	93	407
	16.00											
	16.90											
C2804		4.80	1007	1991	833	115.8	32.6	8.3	86	2689	124	1740
	21.70											
C2805		5.00	1051	2700	1339	242.5	58.3	9.8	68	5634	178	5421
	26.70											
C2806		5.00	2224	5091	2431	386.5	89.3	32.6	298	6330	274	10134
	31.70											
C2807		5.00	998	2527	1264	189.6	48.1	12.4	100	6420	178	3907
	36.70											
C2808		5.00	1189	2864	1421	230.7	56.9	3.8	103	7061	231	3337
	41.70											
C2809		5.00	1197	2434	1001	150.7	44.2	20.0	304	6790	165	4238
	46.70											
C2810		3.50	1422	2718	1096	175.9	55.8	29.5	486	8471	629	52071
	50.20											

LEGEND

- Drift
- Sideritic carbonatite
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- Sövite
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- Nepheline syenite
- Dykes
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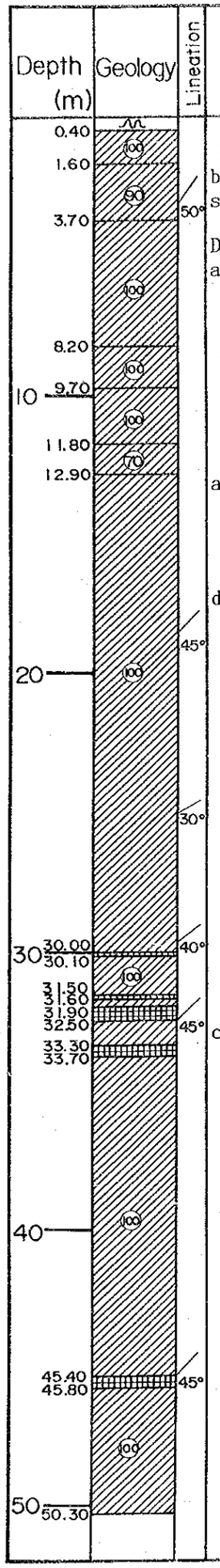
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — Lamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
- cal — Calcite
- Ap — Apatite

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE III)

GEOLOGIC DRILL LOG
DDH JMC-29

Elevation 883.2m
Total Depth 50.3m
Inclination - 90°

1 : 200



Description

- Fng white anker. sövite with brown brecciated manganiferous anker. sövite
- Dark brown and white mixed fng anker. sövite with calcite veinlet
- Dark brown anker. sövite
- Dark brown and light gray
- Feld. br. bearing dark brown drusy anker. sövite
- Fng light gray anker. sövite with dark brown manganiferous carbonate
- Dark brown sideritic carb.
- Dark brown manganiferous sideritic carb.

Assay (ppm)

Sample No.	Depth (m)	Thickness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
C2901	0.40	5.00	3246	4956	1445	219.1	50.0	16.6	117	5041	222	5410
C2902	5.40	5.00	3458	5547	1647	231.3	54.6	22.1	125	3657	199	2487
C2903	10.40	5.00	1600	2707	924	131.8	36.0	3.0	186	3321	229	7706
C2904	15.40	5.00	1725	3222	1371	207.8	50.0	5.4	22	4793	135	2125
C2905	20.40	5.00	1392	2548	891	118.8	29.7	2.0	39	3557	96	1735
C2906	25.40	5.00	2055	3457	1117	174.3	40.9	5.1	46	4964	163	4518
C2907	30.40	5.00	2410	4406	1678	323.8	75.8	14.7	91	3588	180	1736
C2908	35.40	5.00	2179	3771	1257	212.3	51.1	14.2	396	5051	168	4558
C2909	40.40	5.00	1892	3565	1337	238.0	61.1	23.0	120	4675	262	13403
C2910	45.40	4.90	1962	4111	1765	332.9	82.3	24.5	294	5797	255	6898
	50.30											

LEGEND

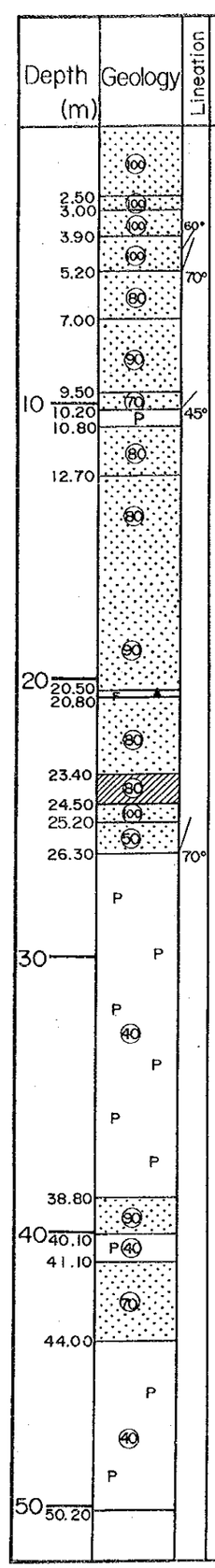
- Drift
- Sideritic carbonatite
- Ankeritic Sövite
- Sövite
- Carbonate - Silicate rock
- F: Feldspathic breccia, A: Agglomerate
- Syenite
- Nepheline syenite
- Dykes
  - T — Trachyte
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — Lamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
- cal — Calcite
- Ap — Apatite

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE Ⅲ)

GEOLOGIC DRILL LOG
DDH JMC-30

Elevation 825.2m
Total Depth 50.2m
Inclination - 90°

1 : 200



Description

Limonitized drusy light brown sövite
Drusy pinkish brown sövite
Fng brown sövite
Banded mdg limonitized sövite

Drusy silicified sövite

Csg white sövite bearing brown sövite

Carbonatized porphyritic phonolite

Limonitized csg white sövite with feld. br.

Feld. br. bearing limonitized csg sövite

Brown fng anker. sövite
White csg sövite
Sövite with fissure

Greenish gray carbonatized altered phonolite with pyrite

Feld. br. bearing white csg sövite

Greenish gray carbonatized porphyritic phonolite with biotite and magnetite

Assay (ppm)

Sample No.	Depth (m)	Thick-ness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
C3001	5.20	5.20	186	480	107	9.3	6.2	13.6	523	3607	18	10908
C3002	10.20	5.00	250	450	177	17.8	11.6	2.8	222	4133	112	4822
C3003	15.20	5.00	1098	1710	517	64.5	21.5	11.9	521	2428	161	6706
C3004	20.20	5.00	549	914	314	31.2	16.4	4.8	540	2286	141	4778
C3005	26.30	6.10	386	678	249	33.8	15.3	16.3	596	3124	146	10755
C3006	32.30	6.00	321	576	223	47.2	17.9	5.7	446	4036	107	9346
C3007	38.80	6.50	174	293	111	11.1	7.1	2.4	188	3620	57	5029
C3008	44.40	5.60	437	833	343	64.3	30.6	14.0	449	3813	252	9595
C3009	50.20	5.80	282	482	192	24.8	12.2	<0.1	234	2831	78	7156

LEGEND

- Drift
- Sideritic carbonatite
- Ankeritic Sövite
- Sövite
- Carbonate - Silicate rock
- F: Feldspathic breccia, A: Agglomerate
- Syenite
- Nepheline syenite

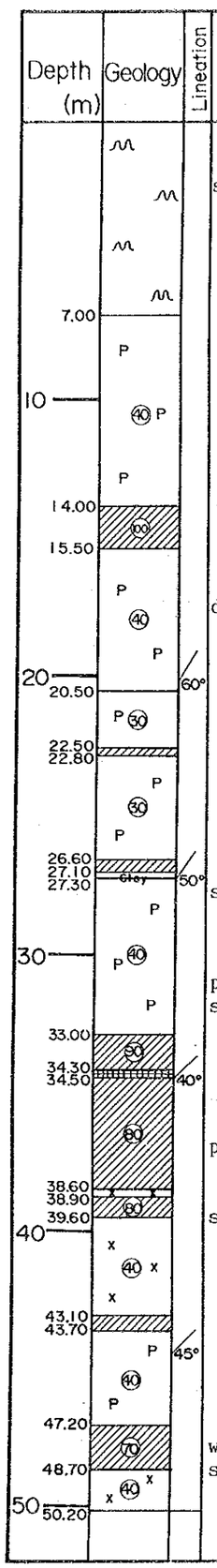
- Dykes
  - T — Trachyte
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — Lamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
- cal — Calcite
- Ap — Apatite

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE Ⅲ)

GEOLOGIC DRILL LOG
DDH JMC-31

Elevation 773.9m
Total Depth 50.2m
Inclination - 90°

1 : 200



Description	Sample No.	Depth (m)	Thickness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
				Assay (ppm)									
White csg sövite boulder bearing sludge and clay													
Limonitized, carbonatized phonolite		7.00											
Deeply weathered	C3101		7.00	199	356	139	36.7	14.1	0.2	300	1394	56	2329
Fng brown anker. sövite	C3102	14.00	1.50	670	1095	357	73.7	19.4	0.1	262	1904	93	10133
Carbonatized porphyritic phonolite, deeply weathered	C3103	15.50	5.00	237	404	129	29.8	8.4	<0.1	319	3104	55	2753
Fissure (w:2cm)													
	C3104	20.50	6.10	198	346	109	31.0	9.4	<0.1	282	1954	57	2493
Fluorite bearing dark brown anker. sövite	C3105	26.60	6.40	226	429	150	52.5	16.4	<0.1	275	2501	61	2293
Carbonatized phonolite with partly fluorite bearing anker. sövite	C3106	33.00	6.60	209	381	158	45.2	14.7	<0.1	257	2844	58	2536
Reddish brown anker. sövite	C3107	39.60	3.50	93	177	84	27.8	7.0	5.7	319	3201	23	3476
Reddish brown anker. sövite with phonolitic part and feld. br.	C3108	43.10	4.10	308	576	264	114.8	32.7	10.3	294	3718	72	2531
Greenish gray altered nepheline syenite	C3109	47.20	3.00	516	933	391	126.3	37.7	2.4	322	4029	103	4794
Altered nepheline syenite		50.20											
Fluorite bearing anker. sövite													
Brown to black anker. sövite with feld. br. and nepheline syenite													
Sphane bearing													

LEGEND

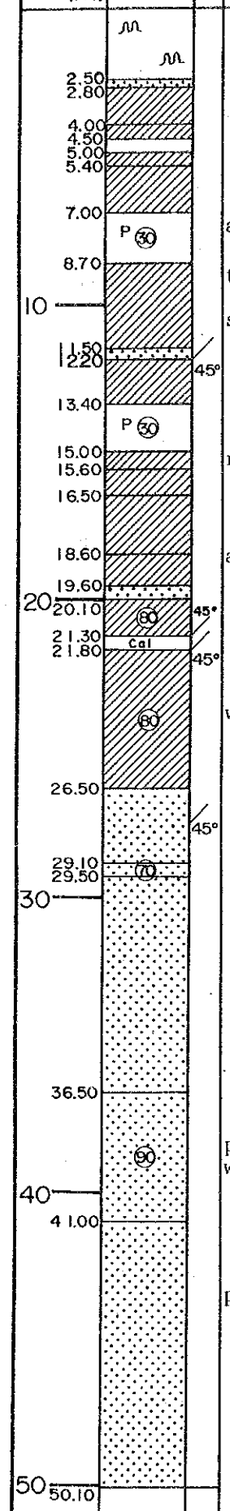
- Drift
- Sideritic carbonatite
- Ankeritic Sövite
- Sövite
- Carbonate - Silicate rock
- F:Feldspathic breccia, A:Agglomerate
- Syenite
- Nepheline syenite
- Dykes
  - T — Trachyte
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — Tamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
- cal — Calcite
- Ap — Apatite

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE III)

GEOLOGIC DRILL LOG
DDH JMC-32

Elevation 814.2m
Total Depth 50.1m
Inclination - 90°

1 : 200



Description

- Csg white sövite
- Fng gray anker. sövite
- Drusy
- Fng greenish gray pyrite bearing anker. sövite
- Biotite rich porphyritic carbonatized phonolite
- Fng pyrite bearing gray anker. sövite
- White sövite
- Biotite rich carbonatized porphyritic phonolite with pyrite
- Fissure, drusy
- Greenish gray fng pyrite bearing anker. sövite with mica
- Brown anker. sövite
- Feld. br. bearing anker. sövite
- Calcite vein
- Pyrite bearing ankeritic sövite with feld. br. and sövite
- 27.6m pyrite vein (w:1cm)
- Pyrite bearing csg white sövite
- Feld. br. bearing sovite
- Pyrite bearing csg white sövite
- Brown Mn mineral, iron oxide, pyrite and feld.br. bearing csg white sövite
- Dark gray to white csg sövite with pyrite and mica

Assay (ppm)

Sample No.	Depth (m)	Thickness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
	2.50											
C3201		4.50	124	212	55	28.3	10.5	12.9	280	4297	49	6310
	7.00											
C3202		1.70	291	527	171	33.8	8.4	<0.1	329	5201	50	4544
	8.70											
C3203		4.70	409	744	227	79.3	25.3	13.4	220	4463	127	5964
	13.40											
C3204		1.60	305	549	178	24.4	6.8	0.3	261	4804	59	2202
	15.00											
C3205		5.10	780	503	170	31.0	13.0	<0.1	404	4313	78	4443
	20.10											
C3206		6.40	1329	2272	645	122.2	35.5	5.9	5920	6058	190	20038
	26.50											
C3207		5.00	844	1589	457	105.1	35.5	7.5	3398	5697	185	9955
	31.50											
C3208		5.00	897	1524	469	52.2	19.0	5.2	1224	10163	138	13394
	36.50											
C3209		4.50	953	1697	496	88.6	31.0	5.0	957	6695	253	12365
	41.00											
C3210		5.00	46	73	15	24.2	16.4	7.6	654	5608	175	5652
	46.00											
C3211		4.10	503	1029	403	59.6	26.8	<0.1	737	13036	159	6323
	50.10											

LEGEND

- Drift
- Sideritic carbonatite
- Ankeritic Sövite
- Sövite
- Carbonate - Silicate rock
- F: Feldspathic breccia, A: Agglomerate
- Syenite
- Nepheline syenite
- Dykes
  - T — Trachyte
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — Lamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
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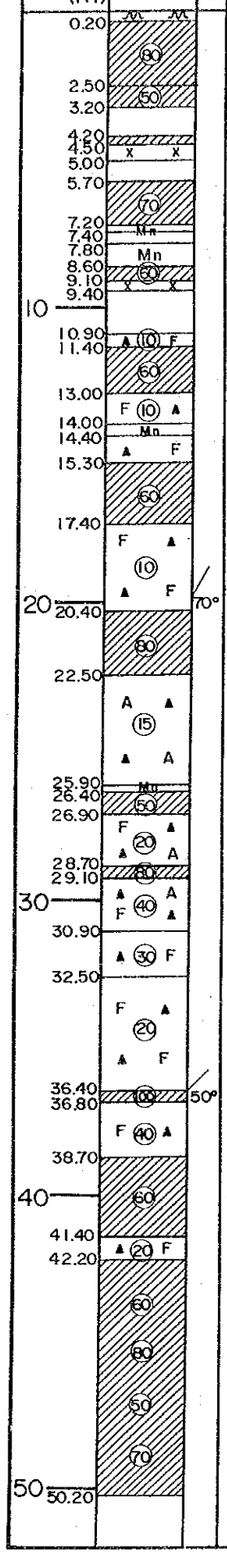
THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE III)

GEOLOGIC DRILL LOG
DDH JMS-12

Elevation 803.8m
Total Depth 50.2m
Inclination - 90°

1 : 200



Depth (m)	Description
0.20	Pinkish brown feld. br. bearing gray carb.
2.50	Mn-vein bearing carb.
3.20	Drusy
4.20	Limonitized nepheline syenite
4.50	Drusy (altered)
5.00	
5.70	
7.20	Drusy
7.40	Black Mn-oxide
7.80	Limonitized nepheline syenite
8.60	Drusy (altered)
9.10	
9.40	
10.90	Carb. bearing feld. br.
11.40	
13.00	
14.00	
14.40	
15.30	
17.40	Limonitized
20.40	Carb. bearing pinkish brown feld. br. with calcite vein (w:1cm)
22.50	Limonitized altered agglomerate breccia: carbonatite syenitic rock Mn-oxide with bastnaesite
25.90	
26.40	
26.90	
28.70	
29.10	
30.90	Mn-oxide bearing feld. br.
32.50	
36.40	
36.80	
38.70	Partly Mn-oxide bearing anker. sövite
41.40	
42.20	Reddish brown feld. br. bearing ankeritic sövite
50.20	

Assay (ppm)

Sample No.	Depth (m)	Thickness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
S1201	0.20–7.20	7.00	1638	3483	1414	273.0	76.0	21.8	1813	1770	405	9813
S1202	7.20–11.40	4.20	1574	3698	1793	364.2	83.4	17.4	1031	1807	310	5110
S1203	11.40–16.40	5.00	1233	2671	1104	226.0	58.3	16.3	1292	1438	283	5849
S1204	16.40–21.40	5.00	1183	2508	1046	212.2	60.1	19.2	1542	1647	367	9846
S1205	21.40–26.40	5.00	1473	3165	1282	254.7	64.7	21.7	1960	1659	262	6443
S1206	26.40–31.40	5.00	1812	3501	1205	238.9	64.0	16.4	1112	1944	291	5179
S1207	31.40–36.40	5.00	1082	2333	889	172.9	41.8	10.5	1211	2326	135	1611
S1208	36.40–41.40	5.00	1585	3391	1328	241.3	63.4	17.4	1160	2795	315	2738
S1209	41.40–46.40	5.00	1396	2869	1081	220.3	60.2	17.7	1191	1834	279	2736
S1210	46.40–50.20	3.80	1260	2556	971	195.2	51.7	11.2	986	1525	236	4266

LEGEND

- Drift
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- Ankeritic Sövite
- Sövite
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- Syenite
- Nepheline syenite
- Dykes
  - T — Trachyte
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — Tamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
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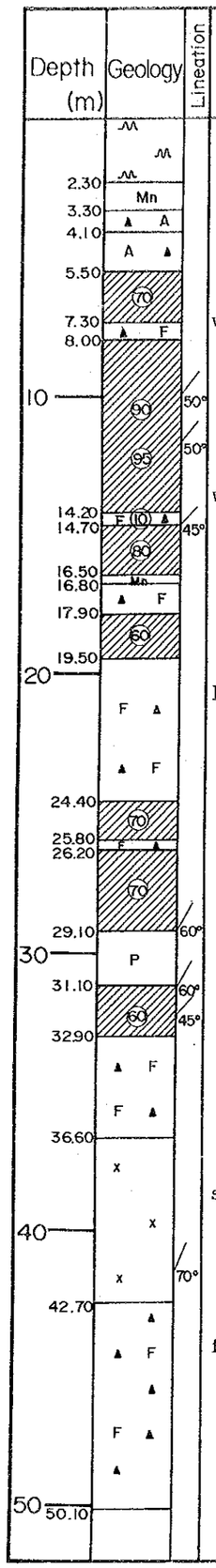
- Ap — Apatite

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE III)

GEOLOGIC DRILL LOG
DDH JMS-13

Elevation 842.1m
Total Depth 50.1m
Inclination - 90°

1 : 200



Description
Black Mn-mineral
Limonitized altered agglomerate
Carbonatized feld. br.
Feld. br. bearing anker. sövite with bastnaesite
Feld. br. vein (w:10cm)
Calcite veinlet
Gray-reddish brown massive carb. with Mn-mineral
Pinkish brown feld. br. (carbonatized)
Reddish brown compact phonolite
Massive feld. br. (carbonatized)
Carbonatized altered nepheline syenite
Calcite vein (w:1cm)
Mn-mineral bearing reddish brown feld. br.
Bastnaesite

Assay (ppm)

Sample No.	Depth (m)	Thick-ness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
	2.30											
S1301		5.00	2440	4574	1715	298.9	74.3	16.4	1130	1988	496	7197
	7.30											
S1302		5.00	1402	3171	1364	272.6	77.7	22.3	1607	4214	407	3723
	12.30											
S1303		5.00	2080	4201	1646	311.9	82.2	24.0	1134	7252	509	4657
	17.30											
S1304		5.00	2523	5021	1805	349.1	81.6	24.8	894	943	288	3552
	22.30											
S1305		5.00	1572	3500	1522	300.7	73.6	17.5	1199	3408	339	827
	27.30											
S1306		1.80	1557	3594	1536	305.2	82.2	23.1	1184	7353	451	525
	29.10											
	31.10											
S1307		1.80	1390	3084	1186	218.0	60.8	18.3	1042	5384	468	4882
	32.90											
	42.70											
S1308		5.00	1751	3365	1201	249.4	62.8	13.9	604	838	192	471
	47.70											
S1309		2.40	1662	3842	1541	330.7	72.5	16.1	448	1216	224	1468
	50.10											

LEGEND

- Drift
- Sideritic carbonatite
- Ankeritic Sövite
- Sövite
- Carbonate – Silicate rock
- F:Feldspathic breccia, A:Agglomerate
- Syenite
- Nepheline syenite

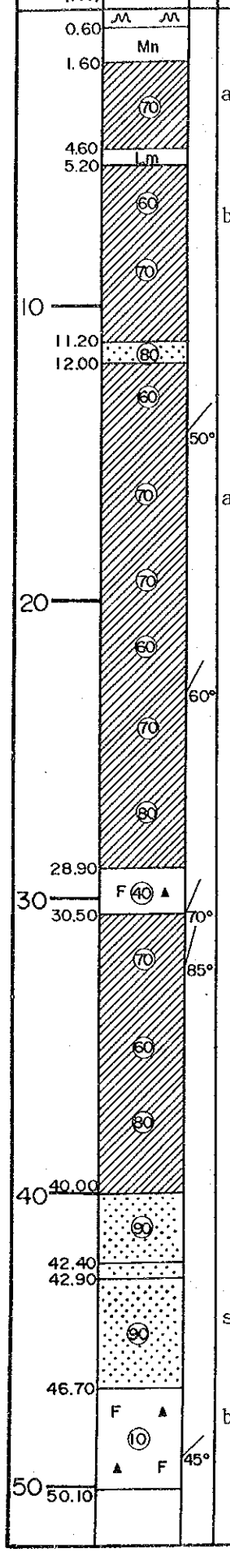
- Dykes
  - T — Trachyte
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — Lamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
- cal — Calcite
- Ap — Apatite

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE III)

GEOLOGIC DRILL LOG
DDH JMS-14

Elevation 871.8m
Total Depth 50.1m
Inclination - 90°

1 : 200



Description

- 0.60–1.60: Black massive Mn mineral
- 1.60–4.60: Limonitized feld. br. bearing anker. sövite with Mn mineral
- 4.60–5.20: Brown limonite
- 5.20–11.20: Manganiferous, carbonatized feld. br. bearing anker. sövite
- 11.20–12.00: Gray sövite, manganiferous
- 12.00–28.90: Fissure with calcite (w:1cm) (50°); Reddish brown agglomerate bearing anker. sövite; breccia: feldspathic rock, sövite, Mn-mineral, syenitic rock; Mn vein (w:5cm) (60°)
- 28.90–30.50: Carbonatized feld. br.; Calcite vein (w:1cm) (70°); " " (w:2cm) (85°)
- 30.50–40.00: Manganiferous anker. sövite
- 40.00–42.40: Black to dark brown compact
- 42.40–46.70: Manganiferous sövite; Limonite & brown feld. br. bearing sövite
- 46.70–50.10: Reddish brown carbonatized feld. br., partly manganiferous (45°)

Assay (ppm)

Sample No.	Depth (m)	Thickness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
S1401	0.60–5.00	4.40	3028	5300	1774	377.0	96.7	23.7	1132	2834	384	8042
S1402	5.00–10.00	5.00	2428	4534	1651	325.2	80.6	18.6	1375	3658	210	9008
S1403	10.00–15.00	5.00	2878	5101	1756	329.1	77.3	20.0	1337	2517	237	8033
S1404	15.00–20.00	5.00	2356	4222	1469	293.2	79.9	18.8	1400	1844	480	7702
S1405	20.00–25.00	5.00	2550	4925	1687	313.5	81.2	28.2	1891	1711	443	6897
S1406	25.00–30.00	5.00	2102	4363	1605	328.6	88.7	30.3	1549	1927	609	11066
S1407	30.00–35.00	5.00	2155	4476	1748	332.9	92.9	28.3	936	2074	622	10682
S1408	35.00–40.00	5.00	3566	7373	2753	531.9	126.6	34.6	2833	2328	424	7817
S1409	40.00–46.70	6.70	2784	5650	2106	398.4	90.8	21.0	2307	2032	275	4891
S1410	46.70–50.10	3.40	914	1964	867	188.4	45.9	12.2	602	1532	169	3189

LEGEND

- Drift
- Sideritic carbonatite
- Ankeritic Sövite
- Sövite
- Carbonate – Silicate rock
- F: Feldspathic breccia, A: Agglomerate
- Syenite
- Nepheline syenite

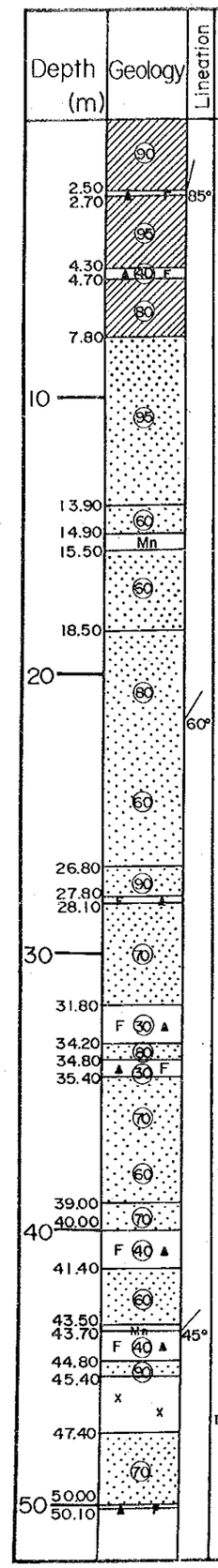
- Dykes
  - T — Trachyte
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — Tamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
- cal — Calcite
- Ap — Apatite

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE III)

GEOLOGIC DRILL LOG
DDH JMS-15

Elevation 890.8m
Total Depth 50.1m
Inclination - 90°

1 : 200



Depth (m)	Description
2.50–2.70	Feldspar patch bearing manganiferous anker. sövite
2.70–4.30	Manganiferous anker. sövite
4.30–4.70	
4.70–7.80	Limonite, Mn mineral bearing anker. sövite with feld. br.
7.80–13.90	Pinkish white to gray sövite with pyrite
13.90–15.50	Mn mineral & feld. patch bearing sövite
15.50–18.50	
18.50–26.80	Dark gray & brown compact sövite with Mn mineral & feld. br. (w:1cm)
26.80–28.10	Light gray, compact sövite Carbonatized feld. br.
28.10–31.80	Mn mineral bearing gray to dark brown compact sövite
31.80–34.20	Carbonatized feld. br.
34.20–35.40	
35.40–39.00	Carbonatized feld. br. bearing gray to dark brown sövite
39.00–40.00	Gray sövite
40.00–43.50	Feld. br. bearing gray sövite
43.50–43.70	Mn mineral vein (w:20cm)
43.70–47.40	Carbonatized pinkish brown nepheline syenite
47.40–50.10	

Assay (ppm)

Sample No.	Depth (m)	Thickness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
S1501	5.00	5.00	2318	5167	2179	424.9	110.6	35.1	1636	7344	694	10112
S1502	10.00	5.00	2499	5658	2486	418.3	109.1	24.1	1277	12471	592	12337
S1503	15.00	5.00	1638	3442	1491	247.2	70.2	22.0	714	13113	557	17783
S1504	20.00	5.00	1818	3969	1799	320.2	82.9	27.5	449	11354	530	11434
S1505	25.00	5.00	1316	2931	1277	228.0	65.2	19.5	487	9357	465	15477
S1506	30.00	5.00	1668	3406	1441	235.5	64.3	25.8	898	5946	439	13152
S1507	35.00	5.00	995	2244	1049	189.9	51.8	10.0	525	2177	327	7918
S1508	40.00	5.00	1324	2838	1204	231.7	66.2	21.0	690	3398	410	8616
S1509	45.00	5.00	1255	2842	1341	276.4	78.3	16.4	560	1987	301	1967
S1510	50.10	5.10	1048	2332	1015	201.5	58.1	17.0	547	2530	374	6488

LEGEND

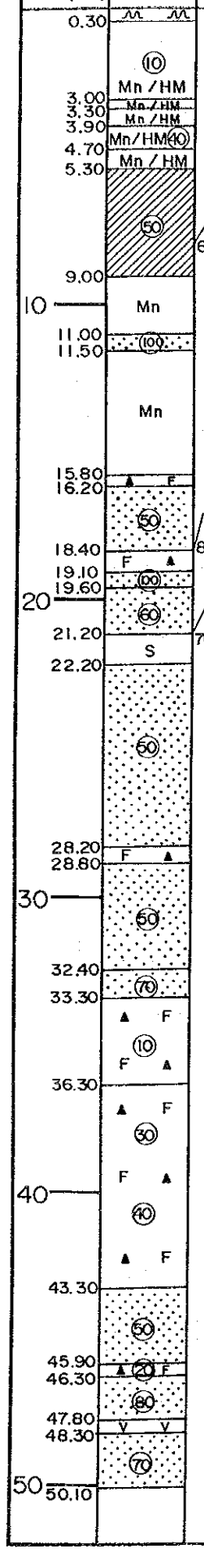
- Drift
- Sideritic carbonatite
- Ankeritic Sövite
- Sövite
- Carbonate - Silicate rock
- F:Feldspathic breccia, A:Agglomerate
- Syenite
- Nepheline syenite
- Dykes
  - T — Trachyte
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — Lamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
- cal — Calcite
- Ap — Apatite

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE III)

GEOLOGIC DRILL LOG
DDH JMS-16

Elevation 897.3m
Total Depth 50.1m
Inclination - 90°

1 : 200



Description	Sample No.	Depth (m)	Thickness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
		0.30											
Dark brown Mn mineral & hematite with calcite Feldspar patch & quartz bearing Sövite bearing	S1601		5.00	1956	4543	2022	364.3	97.1	27.9	5042	9930	598	9077
		5.30											
Brown Mn mineral & hematite bearing anker. sövite with feld. br. vein (w:2cm)	S1602		3.70	2217	5075	2208	408.9	107.7	32.4	2828	4572	454	2646
		9.00											
Dark brown	S1603		2.50	6111	9664	2611	434.7	99.6	24.3	806	3368	321	2022
		11.50											
Brownish gray, compact Feldspar & sövite bearing Mn mineral with concentric banded texture	S1604		4.30	9444	15020	3248	498.2	93.3	50.1	1037	2984	310	3465
		15.80											
Mn-mineral bearing sövite Carbonatized feld. br. Feld. br. bearing sövite	S1605		3.30	2485	5237	2251	452.9	125.8	51.1	4206	4192	744	12272
		19.10											
	S1606		2.10	2002	4526	1983	332.1	88.5	44.9	5122	12449	509	9137
		21.20											
Sövite xenolith bearing sölvsbergite	S1607		1.00	1224	2740	1150	233.6	61.6	22.0	2112	2595	218	1330
		22.20											
Dark brown Mn mineral bearing buff colored sövite with feld. br.	S1608		5.00	4308	7901	2972	542.3	135.1	48.6	1999	2451	562	5515
		27.20											
Pink feld.br.	S1609		6.10	1940	4351	2063	425.6	114.8	39.1	2060	2085	589	6738
		33.30											
Limonitized feld. br. with Mn mineral & sövite	S1610		5.00	1405	3576	2036	460.6	111.0	27.4	791	1738	366	3310
		38.30											
Carbonatized feld. br.	S1611		5.00	2542	5435	2248	414.6	100.8	58.1	1228	4787	329	1889
		43.30											
Pinkish white compact calc-silicate rock & pinkish brown feld. br. bearing white sövite Mn mineral patch bearing gray sövite	S1612		5.00	2300	4729	1909	346.7	90.1	12.5	1619	13310	561	13310
		48.30											
Gray compact calc-silicate rock	S1613		1.80	1808	3933	1784	381.0	100.7	29.3	919	2918	665	19163
		50.10											

LEGEND

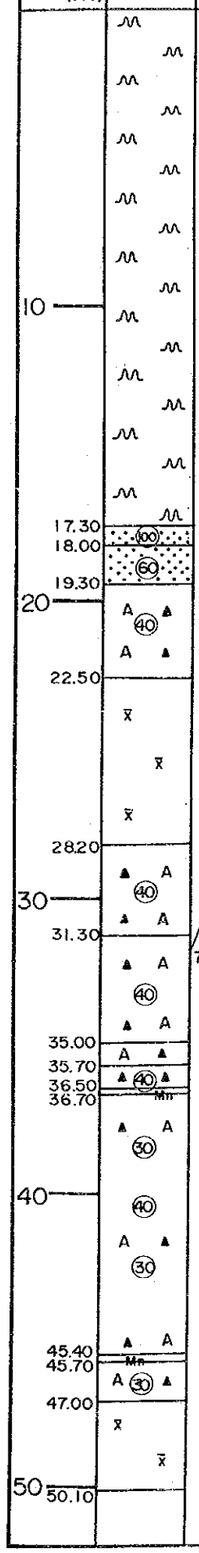
- Drift
- Sideritic carbonatite
- Ankeritic Sövite
- Sövite
- Carbonate - Silicate rock
- F:Feldspathic breccia, A:Agglomerate
- Syenite
- Nepheline syenite
- Dykes
  - T — Trachyte
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — Tamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
- cal — Calcite
- Ap — Apatite

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE Ⅲ)

GEOLOGIC DRILL LOG
DDH JMS-17

Elevation 810.0m
Total Depth 50.1m
Inclination - 90°

1 : 200



Description
Drift
Mn mineral & feld. br. bearing sövite.
Carbonatized agglomerate breccia: carbonatite feld. br. Mn mineral
Pinkish brown altered syenitic rock, limonitized, core crushed
Limonitized, carbonatized
Clay bearing fissure (w:2cm)
Mn mineral bearing pinkish brown agglomerate
Carbonatized agglomerate
Carbonatized agglomerate breccia: sövite syenitic rock feld. br. Mn mineral
Limonitized brown to dark brown altered syenitic rock core crushed

Assay (ppm)

Sample No.	Depth (m)	Thickness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
S1701	7.00	7.00	6958	13755	5002	865.5	204.5	77.7	5390	3039	1799	38023
S1702	17.30	2.00	2295	4642	1745	269.2	68.9	15.5	1417	25807	576	12902
S1703	19.30	3.20	1065	2165	814	146.1	40.3	<0.1	1144	5130	316	12646
S1704	22.50	5.70	374	779	356	85.6	25.0	47.7	852	724	136	3657
S1705	28.20	3.10	846	1650	615	113.4	33.2	32.1	476	1700	441	9064
S1706	31.30	4.40	653	1323	541	109.4	32.8	15.4	349	1890	183	3546
S1707	35.70	5.00	2734	4176	1197	192.4	44.7	21.9	677	2599	201	5035
S1708	40.70	6.30	1085	2174	779	135.5	37.0	3.7	590	1633	225	5569
S1709	47.00	3.10	1175	1890	524	109.0	29.3	2.2	861	1125	182	5020
	50.10											

LEGEND

- Drift
- Sideritic carbonatite
- Ankeritic Sövite
- Sövite
- Carbonate - Silicate rock
- F:Feldspathic breccia, A:Agglomerate
- Syenite
- Nepheline syenite

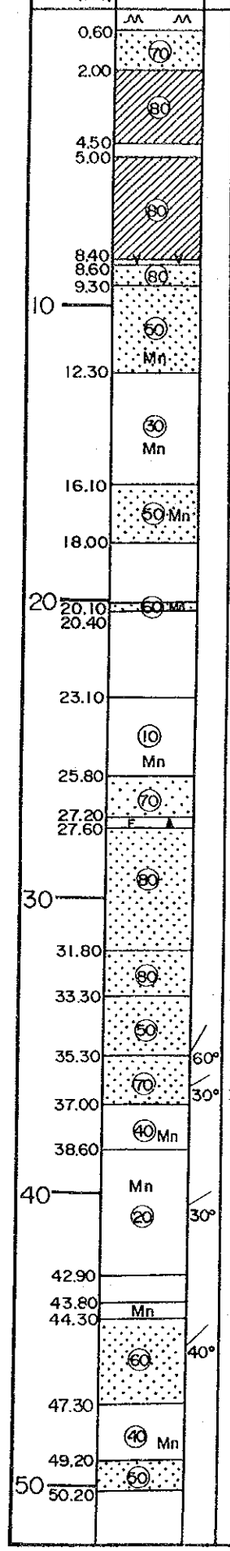
- Dykes
  - T — Trachyte
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — Lamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
- cal — Calcite
- Ap — Apatite

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE Ⅲ)

GEOLOGIC DRILL LOG
DDH JMS-18

Elevation 789.1m
Total Depth 50.2m
Inclination - 90°

1 : 200



Depth (m)	Description
0.60	Brown manganiferous compact sövite with light gray calc-silicate rock
2.00	Mn, feld. rock bearing dark brown anker. sövite
4.50	Drusy
5.00	
8.40	Gray compact calc-silicate rock
8.60	White compact sövite
9.30	Mn mineral & sövite
12.30	Gray carb. bearing Mn mineral with concentric texture
16.10	
18.00	Drusy
20.10	
20.40	Drusy
23.10	Calcite veinlet bearing Mn mineral & sövite
25.80	
27.20	White calc-silicate rock bearing sövite with feldspar & pyroxene
27.60	
31.80	Mn mineral bearing sövite with pyrite
33.30	Mn mineral vein (w:1cm)
35.30	Banded Mn mineral & sövite with feld. rock
37.00	
38.60	Gray sövite bearing Mn mineral
40	Banded Mn mineral & sövite
42.90	Drusy
43.80	
44.30	Sövite & Mn mineral
47.30	
49.20	
50.20	

Assay (ppm)

Sample No.	Depth (m)	Thick-ness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
S1801	0.60 – 5.60	5.00	4663	8299	2935	413.6	101.9	30.5	3909	15394	623	31068
S1802	5.60 – 10.60	5.00	2953	6139	2276	367.9	89.9	40.4	1257	10671	419	14873
S1803	10.60 – 15.60	5.00	5921	10187	3382	503.2	114.7	21.3	1756	4734	465	15846
S1804	15.60 – 25.80	10.20	12162	16758	4400	592.5	119.2	31.7	398	19468	388	7519
S1805	25.80 – 30.80	5.00	4258	7212	2473	362.5	85.9	26.6	1628	25649	395	13184
S1806	30.80 – 35.80	5.00	12163	16962	4388	605.1	120.0	4.8	1678	43873	492	16109
S1807	35.80 – 40.80	5.00	10753	15212	4230	641.8	135.0	40.6	1130	31665	547	24816
S1808	40.80 – 45.80	5.00	8275	13921	4448	650.3	138.5	45.4	1213	17758	662	25194
S1809	45.80 – 50.20	4.40	8657	13421	4104	568.1	122.6	39.5	658	33061	543	23312

LEGEND

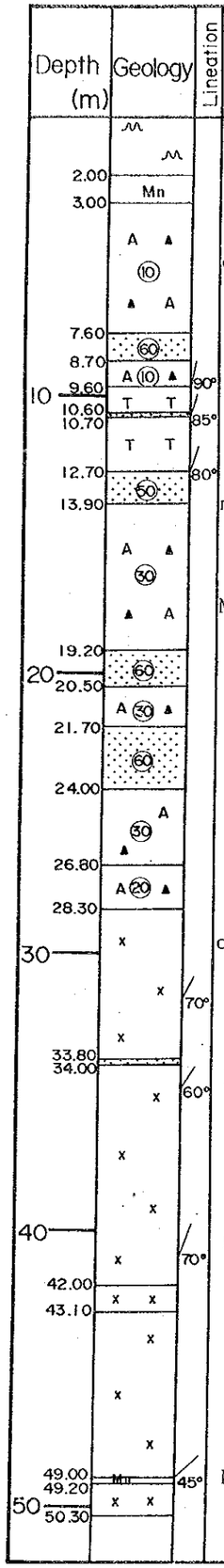
- Drift
- Sideritic carbonatite
- Ankeritic Sövite
- Sövite
- Carbonate – Silicate rock
- F: Feldspathic breccia, A: Agglomerate
- Syenite
- Nepheline syenite
- Dykes
  - T — Trachyte
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — Lamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
- cal — Calcite
- Ap — Apatite

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE III)

GEOLOGIC DRILL LOG
DDH JMS-19

Elevation 785.7m
Total Depth 50.3m
Inclination - 90°

1 : 200



Description	Sample No.	Depth (m)	Thickness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
				Assay (ppm)									
Dark brown Mn mineral & magnetite	S1901	2.00–3.00	1.00	2886	5884	2324	405.6	97.2	27.8	2773	1539	455	3142
Dark brown Mn mineral bearing carbonatized agglomerate	S1902	3.00–7.60	4.60	5342	8578	2903	395.0	81.2	19.9	1254	9119	362	4100
Breccia bearing gray sövite	S1903	7.60–9.60	2.00	3824	6233	1783	321.0	77.3	14.6	1043	17313	337	6926
Reddish brown altered trachyte		9.60–12.70											
Breccia bearing sövite with Mn mineral	S1904	12.70–17.70	5.00	3263	5278	1596	259.7	69.8	19.7	981	1616	371	6243
Carbonatized agglomerate with Mn mineral	S1905	17.70–22.70	5.00	2131	3389	1057	175.4	51.3	14.1	620	4141	265	6827
Carbonatized agglomerate	S1906	22.70–28.30	5.60	2836	4432	1324	216.9	61.2	8.5	745	2212	378	7103
Pinkish brown to buff colored carbonatized nepheline syenite Mn vein (w:1cm)	S1907	28.30–33.30	5.00	505	911	331	61.6	23.2	4.5	716	976	100	1028
Sövite xenolith in Mn mineral Mn vein (w:0.5cm)	S1908	33.30–38.30	5.00	1127	2064	681	113.5	30.4	7.6	710	874	107	1729
Mn vein (w:1cm)	S1909	38.30–43.30	5.00	593	1150	425	75.3	27.1	10.3	826	887	90	1786
core crushed	S1910	43.30–48.30	5.00	360	778	366	67.6	25.5	1.9	737	708	105	3049
Mn vein (w:20cm)	S1911	48.30–50.30	2.00	1567	2753	1017	188.6	50.8	10.5	648	1117	171	6972

LEGEND

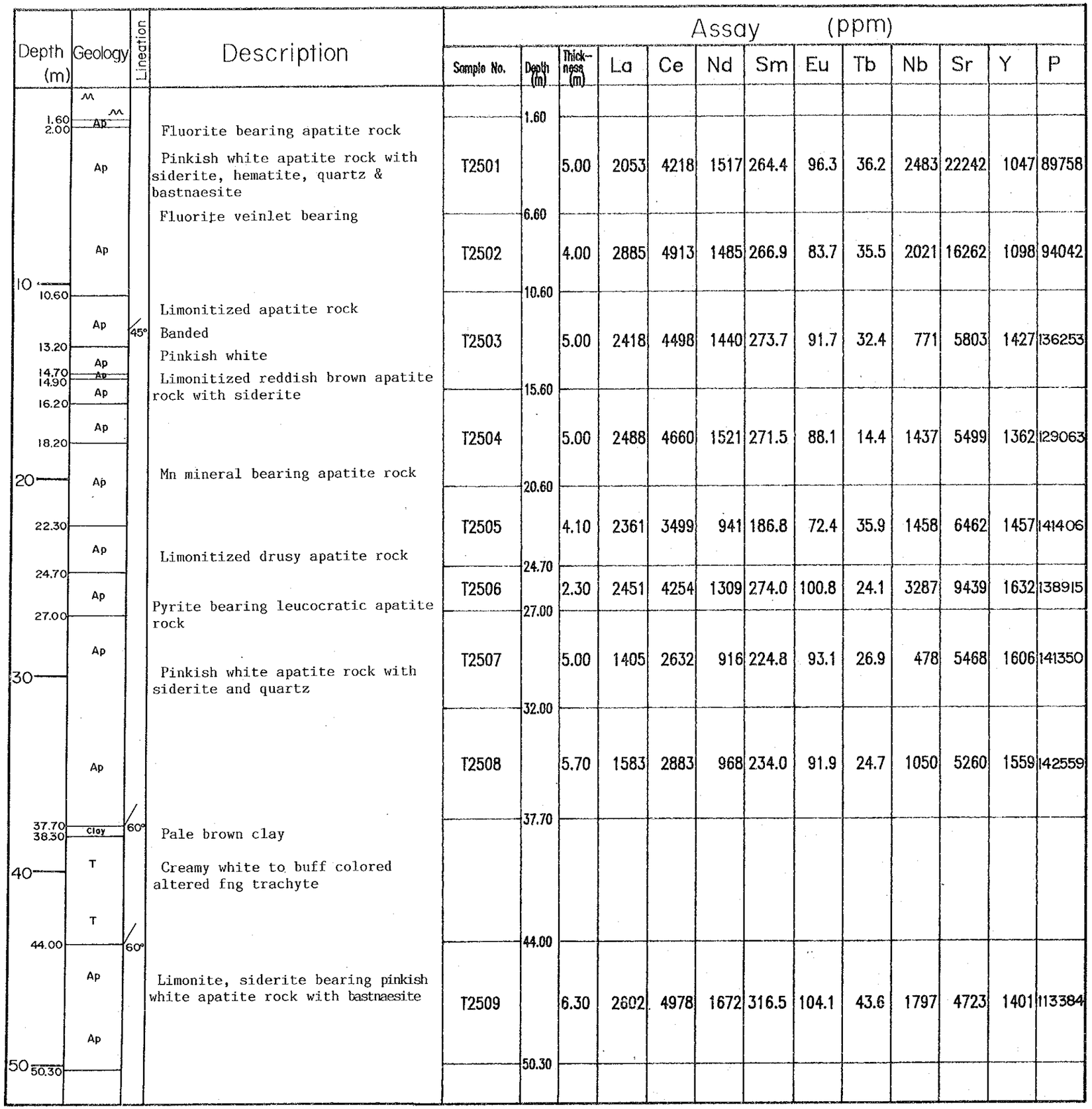
- Drift
- Sideritic carbonatite
- Ankeritic Sövite
- Sövite
- Carbonate – Silicate rock
- F:Feldspathic breccia, A:Agglomerate
- Syenite
- Nepheline syenite
- Dykes
  - T — Trachyte
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — lamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
- cal — Calcite
- Ap — Apatite

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE III)

GEOLOGIC DRILL LOG
DDH JMT-25

Elevation 765.2m
Total Depth 50.3m
Inclination - 90°

1 : 200



Assay (ppm)

Sample No.	Depth (m)	Thickness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
	1.60											
T2501		5.00	2053	4218	1517	264.4	96.3	36.2	2483	22242	1047	89758
	6.60											
T2502		4.00	2885	4913	1485	266.9	83.7	35.5	2021	16262	1098	94042
	10.60											
T2503		5.00	2418	4498	1440	273.7	91.7	32.4	771	5803	1427	136253
	15.60											
T2504		5.00	2488	4660	1521	271.5	88.1	14.4	1437	5499	1362	129063
	20.60											
T2505		4.10	2361	3499	941	186.8	72.4	35.9	1458	6462	1457	141406
	24.70											
T2506		2.30	2451	4254	1309	274.0	100.8	24.1	3287	9439	1632	138915
	27.00											
T2507		5.00	1405	2632	916	224.8	93.1	26.9	478	5468	1606	141350
	32.00											
T2508		5.70	1583	2883	968	234.0	91.9	24.7	1050	5260	1559	142559
	37.70											
	44.00											
T2509		6.30	2602	4978	1672	316.5	104.1	43.6	1797	4723	1401	113384
	50.30											

LEGEND

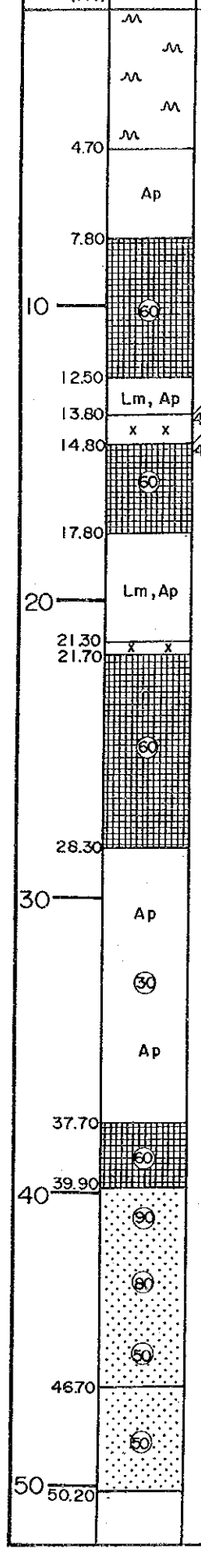
- Drift
- Sideritic carbonatite
- Ankeritic Sövite
- Sövite
- Carbonate - Silicate rock
- F:Feldspathic breccia, A:Agglomerate
- Syenite
- Nepheline syenite
- Dykes
  - T — Trachyte
  - P — Phonolite
  - S — Sölvsbergite
  - D — Dolerite
  - L — Lamprophyre
- Joint, Fissure
- (60) % of carbonatite content
- Mn — Manganese mineral
- HM — Hematite
- cal — Calcite
- Ap — Apatite

THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE Ⅲ)

GEOLOGIC DRILL LOG
DDH JMT-26

Elevation 749.0m
Total Depth 50.2m
Inclination - 90°

1 : 200



Description	Sample No.	Depth (m)	Thick-ness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
Drift, boulder													
Brown limonitized apatite rock with Mn mineral	T2601	4.70	3.10	1779	3947	1430	263.1	82.1	24.8	3232	4114	878	78724
Dark brown sideritic carb. with apatite, bastnaesite, pyrochlore and quartz	T2602	7.80	4.70	1405	2893	1175	177.3	62.4	13.3	2924	3147	640	42474
Limonitized brown apatie rock	T2603	12.50	1.30	2496	5151	1734	289.1	84.1	28.4	5198	4690	755	47295
Altered kaolinized nephelin syenite		13.80											
	T2604	14.80	3.00	2316	4045	1291	200.4	66.8	17.1	945	4135	645	48168
Limonitized apatite rock	T2605	17.80	3.50	4287	6253	1671	234.2	65.9	19.4	1402	31602	513	30519
Dark brown sideritic carb. with pinkish apatite, pale yellowish green bastnaesite & gray pyrochlore?	T2606	21.30 21.70	6.60	5395	7460	1694	270.4	75.9	54.1	1668	3950	684	68280
Dark brown sideritic carb. bearing pinkish white apatite rock	T2607	28.30	5.00	1971	3653	1295	238.9	78.0	31.6	745	22528	787	47773
	T2608	33.30	4.40	3790	5919	1854	315.6	92.7	28.1	714	52372	857	52865
	T2609	37.70	2.20	1603	3017	1055	171.7	53.6	1.2	1648	6538	495	28838
Apatite and siderite bearing csg sövite	T2610	39.90	6.80	1752	2989	1082	165.8	50.6	21.2	432	4522	417	26887
Melanocratic biotite rich sövite Biotite crystal is partly large than 1cm in length.	T2611	46.70	3.50	111	175	12	8.1	1.2	8.8	222	1362	12	1243
		50.20											

LEGEND

- Drift
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- Ankeritic Sövite
- Sövite
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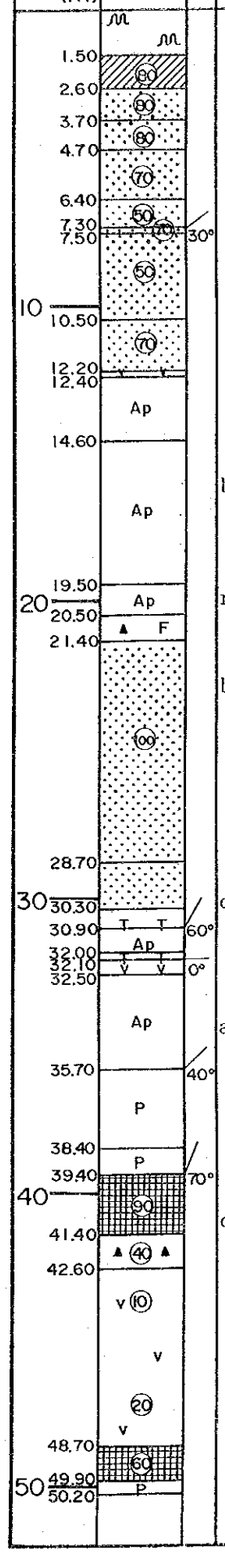
THE COOPERATIVE MINERAL EXPLORATION
IN
THE CHILWA ALKALINE AREA
REPUBLIC OF MALAWI
(PHASE III)

GEOLOGIC DRILL LOG
DDH JMT-27

Elevation 742.7m
Total Depth 50.2m
Inclination - 90°

1 : 200



Depth (m)	Description
1.50	Apatite bearing anker. sövite
2.60	Biotite rich sövite
3.70	Buff altered sövite
4.70	Apatite, biotite bearing sövite
6.40	Biotite rich melanocratic sövite
7.30	
7.50	
10.50	Altered buff sövite with biotite
12.20	Pyroxene bearing calc-silicate rock
12.40	
14.60	Biotite, quartz, feldspar, siderite bearing weathered apatite rock
19.50	Siderite, apatite, fluorite, feldspar rich hydrothermal altered rock
20.50	Feld. altered rock
21.40	Apatite, siderite, bastnaesite bearing sövite
28.70	Kaolinized hydrothermal altered carbonate rock
30.30	Siderite bearing apatite rock
30.90	
32.00	Siderite, feldspar, quartz bearing apatite rock
32.10	
32.50	
35.70	Blueish gray altered rock
38.40	Pinkish buff colored altered Apatite, feld.br. bearing sideritic carb.
39.40	
41.40	
42.60	Siderite bearing calc-silicate rock
48.70	Sideritic carb. with calc-silicate rock
49.90	
50.20	

Assay (ppm)

Sample No.	Depth (m)	Thickness (m)	La	Ce	Nd	Sm	Eu	Tb	Nb	Sr	Y	P
	1.50											
T2701		4.90	41	150	51	5.4	6.3	3.2	221	15693	72	8361
	6.40											
T2702		4.10	52	137	22	6.6	3.8	1.2	190	8095	33	6718
	10.50											
T2703		1.90	25	129	66	31.6	19.4	15.8	195	2238	201	19741
	12.40											
T2704		5.00	1332	2666	1039	152.8	45.3	12.7	314	2565	350	26032
	17.40											
T2705		4.00	1887	3132	959	151.0	48.8	18.6	372	2615	408	25967
	21.40											
T2706		5.00	1797	3399	1194	209.5	72.8	26.4	1169	2598	727	53748
	26.40											
T2707		4.10	1349	2595	943	167.9	58.2	23.8	414	3218	545	48249
	30.50											
T2708		5.20	1965	3433	1191	219.4	71.2	13.3	1259	24576	624	41173
	35.70											
	39.40											
T2709		3.20	3186	5086	1509	228.1	52.5	24.5	969	24200	246	14542
	42.60											
T2710		7.30	3713	5308	1332	186.1	42.0	11.4	1196	28671	196	11995
	49.90											

LEGEND

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