

Appendix C-6: Historical Electrical Conductivity Data

Shouldice Wetland													Glen Management Wetland					
Date	s8	s9	s13	Dugout pond (SG1)	Culvert 4	Culvert 5	Culvert 5a	Culvert 6	Culvert 6a	Culvert 7	Beaver Dam	Sinkhole	s1	s2	s3	Channel A	Channel B	D.U. Dam
16-Mar-09	379	389	342	353	-	-	-	-	-	-	344	341	++	361	373	-	-	-
24-Mar-09	417	426	368	380	-	-	-	-	-	-	-	353	++	368	377	-	-	-
19-Jun-09	438	*	465	440	-	-	-	-	-	-	-	346	411	409	399	-	-	-
8-Jul-09	470	*	579	592	520	521	*	386	*	370	-	440	437	437	432	451	497	373
20-Aug-09	494	*	690	-	-	-	-	-	-	-	446	**	-	481	490	501	**	354
16-Sep-09	385	**	**	**	514	580	473	450	**	413	490	**	527	522	532	539	**	363
20-Oct-09	359	348	745	590	494	743	397	386	*	347	**	**	506	502	515	520	**	366
27-Nov-09	522	-	718	457	565	510	-	359	356	356	453	453	502	493	507	517	*	475
29-Mar-10	391	439	395	405	*	399	*	314	*	328	387	385	396	388	390	404	427	409
30-Apr-10	449	*	469	472	506	495	*	386	*	390	430	434	465	465	463	484	**	403
25-May-10	461	467	505	519	483	565	*	427	*	424	383	399	441	434	442	455	**	377
25-Jun-10	534	561	598	590	382	381	*	331	*	404	418	394	470	475	492	500	537	379
26-Jul-10	591	597	681	690	425	422	*	431	*	460	434	405	527	530	515	534	551	368
26-Aug-10	595	630	595	675	550	465	*	369	*	484	595	*	560	562	570	582	681	386
4-Oct-10	584	627	597	628	492	408	386	363	426	510	534	538	529	532	531	539	704	547
1-Nov-10	562	615	654	732	573	537	433	418	413	429	528	526	545	542	550	547	675	497
6-Dec-10	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4-May-11	428	453	-	-	463	410	370	359	360	368	371	372	396	399	402	415	414	449
24-May-11	426	460	467	450	477	421	399	368	371	392	440	435	410	420	435	461	438	477
27-Jun-11	580	**	594	608	484	421	408	414	441	440	444	441	499	478	489	432	510	**
26-Jul-11	636	**	622	725	**	471	458	445	456	486	469	**	543	550	552	431	569	**
30-Aug-11	454	491	597	633	290	369	368	369	335	312	475	**	484	485	503	318	-	**
22-Sep-11	455	588	696	712	545	420	412	410	388	356	519	**	514	515	515	584	529	639
26-Oct-11	627	576	559	560	548	477	442	493	404	410	440	444	464	459	470	568	472	588
29-Nov-11	584	545	595	605	550	491	436	444	396	398	442	445	402	394	418	489	442	501
22-Dec-11	-	-	532	532	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11-Jan-12	570	562	542	545	++	++	++	++	++	++	538	532	534	538	541	553	585	528
27-Feb-12	560	555	560	599	++	++	++	++	++	++	583	532	570	585	571	578	586	539
29-Mar-12	522	534	495	525	470	431	419	430	404	400	577	568	511	496	495	533	**	496
25-Apr-12	540	544	550	585	472	421	412	410	394	398	436	433	477	475	477	493	508	474
29-May-12	564	552	620	653	531	552	500	477	478	469	416	**	515	521	551	561	**	535
13-Jun-12	574	**	738	803	540	562	505	486	481	473	402	**	502	505	528	542	**	566
11-Jul-12	**	**	769	921	**	468	**	443	**	**	394	**	498	494	503	495	**	503
30-Aug-12	**	**	1016	1028	**	620	446	428	440	427	556	550	622	618	617	639	**	354
25-Sep-12	**	**	1046	1046	580	564	400	389	411	353	550	**	632	628	642	683	**	500
23-Oct-12	658	657	688	742	788	681	490	430	430	341	579	566	616	593	594	710	618	618
27-Nov-12	645	662	637	677	692	597	488	452	422	386	521	516	523	521	528	539	603	619
19-Dec-12	610	603	571	590	++	++	++	++	++	++	485	485	498	502	503	520	644	527
28-Jan-13	589	576	534	545	++	++	++	++	++	++	501	505	478	478	460	517	620	515
26-Feb-13	540	656	490	503	++	++	++	++	++	++	520	518	500	502	508	510	594	509
26-Mar-13	513	520	465	473	++	392	397	++	396	418	458	456	455	457	468	475	572	493
23-Apr-13	423	450	465	389	422	392	350	324	324	354	346	337	377	378	393	391	455	356
27-May-13	512	518	528	488	492	466	387	383	378	396	432	427	440	440	442	454	466	445
17-Jun-13	543	557	606	652	507	481	401	394	393	410	476	469	433	439	440	457	476	385

Appendix C-6: Historical Electrical Conductivity Data

Shouldice Wetland													Glen Management Wetland					
Date	s8	s9	s13	Dugout pond (SG1)	Culvert 4	Culvert 5	Culvert 5a	Culvert 6	Culvert 6a	Culvert 7	Beaver Dam	Sinkhole	s1	s2	s3	Channel A	Channel B	D.U. Dam
30-Jul-13	440	441	687	672	**	466	467	426	485	504	418	**	527	528	535	545	**	359
13-Aug-13	-	-	-	-	-	-	-	-	-	-	426	**	**	576	575	572	**	368
19-Sep-13	**	**	1098	1238	**	632	441	402	**	451	455	460	581	580	583	598	**	446
25-Oct-13	644	630	716	777	654	388	358	358	357	355	-	-	-	-	-	-	-	-
30-Nov-13	604	605	569	600	++	++	++	++	++	++	483	491	491	491	492	506	635	540
15-Mar-14	468	-	-	-	++	++	++	++	++	++	492	493	488	486	473	502	563	420
28-Apr-14	-	-	425	434	479	448	346	338	330	378	356	355	374	371	387	392	422	432
24-May-14	495	492	506	505	498	472	378	378	377	375	423	424	436	433	442	454	474	-
27-Jun-14	542	610	664	675	503	517	391	390	391	395	430	431	453	438	436	460	**	366
15-Jul-14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12-Sep-14	401	576	1005	1056	-	-	-	-	-	-	489	**	583	585	575	596	**	415
23-Oct-14	309	634	367	-	650	495	387	365	364	358	491	491	-	-	-	-	-	-
29-Jan-15	503	499	609	++	-	-	-	-	-	-	-	-	579	571	511	589	++	595
13-Mar-15	585	565	636	646	-	-	-	-	-	-	573	568	571	578	578	600	++	537
27-Apr-15	518	518	500	520	523	473	402	391	392	344	440	443	458	460	465	476	529	481
29-May-15	543	542	608	596	563	589	443	438	429	432	499	506	513	528	525	536	**	432
29-Jun-15	576	582	753	774	574	574	413	408	403	382	503	499	419	498	491	414	**	430
28-Jul-15	595	**	687	951	**	571	452	406	Dry	409	495	**	570	566	576	577	**	356
26-Aug-15	452	**	1016	1172	634	495	437	450	438	427	510	**	610	606	605	622	**	368
28-Sep-15	639	**	1054	1064	589	546	458	454	444	408	550	**	605	602	604	608	**	567
22-Oct-15	650	508	1028	1048	**	618	470	462	460	409	555	**	615	622	623	635	**	415
17-Nov-15	615	604	636	665	**	410	380	362	356	352	508	**	520	516	510	519	**	537
23-Dec-15	582	567	548	566	639	452	404	376	368	364	447	**	443	445	461	462	**	454
Min	309	348	342	353	290						344	337	374	361	373	318	414	354
Max	658	662	1098	1238	788						595	568	632	628	642	710	704	639
Avg	523	545	631	656	442						472	457	501	498	501	518	542	462

Notes:

units = $\mu\text{S/cm}$

values are compensated to 20 degrees Celsius

* = no flow observed

** = dry

++ = frozen

- = not measured



APPENDIX C7

TEMPERATURE MEASUREMENTS

Appendix C-7: Historical Temperature Data

Shouldice Wetland													Glen Managment Area					
Date	s8	s9	s13	Dugout pond (SG1)	Culvert 4	Culvert 5	Culvert 5a	Culvert 6	Culvert 6a	Culvert 7	Beaver Dam	Sinkhole	s1	s2	s3	Channel A	Channel B	D.U. Dam
16-Mar-09	6.6	6.4	4.7	6.5	-	-	-	-	-	-	1.0	1.3	++	2.1	1.3	-	-	-
24-Mar-09	6.2	5.8	4.2	6.0	-	-	-	-	-	-	-	3.5	++	2.6	2.8	-	-	-
19-Jun-09	7.7	*	9.0	18.0	-	-	-	-	-	-	-	19.4	10.2	10.4	11.7	-	-	-
8-Jul-09	8.6	*	8.5	11.8	17.5	17.7		16.5	*	17.2	-	17.2	11.7	11.8	13.6	14.9	16.7	20.6
20-Aug-09	15.6	*	16.6	-	-	-	-	-	-	-	21.9	**	**	11.6	12.9	14.5	**	23.7
16-Sep-09	13.8	**	**	**	21.8	19.2	20.3	19.9	**	14.9	8.2	**	11.3	12.6	12.6	12.5	**	17.1
20-Oct-09	8.9	8.2	9.3	-	11.2	9.0	9.4	8.4	*	9.3	**	**	11.6	12.1	12.1	12.7	**	10.3
27-Nov-09	9.1	-	8.0	-	6.4	5.8	-	5.6	6.1	5.5	6.0	6.6	10.0	10.0	10.0	9.4	*	6.0
29-Mar-10	6.7	6.6	5.3	5.3	*	5.7	*	6.4	*	8.0	6.9	6.9	5.1	5.0	5.0	6.2	7.6	7.9
30-Apr-10	8.0	-	7.1	9.7	21.0	15.5	*	18.8	*	17.2	22.2	17.2	7.3	7.5	7.6	11.5	**	19.5
25-May-10	8.0	9.2	9.6	18.7	22.5	17.8	*	21.6	*	21.1	22.5	21.1	9.0	10.2	10.2	16.1	**	27.4
25-Jun-10	9.3	10.0	10.4	10.8	17.4	17.8	*	18.1	*	18.2	22.8	23.4	11.2	12.0	13.6	13.4	19.2	25.5
26-Jul-10	10.5	18.3	22.5	23.2	20.5	21.1	*	22.2	*	21.2	19.4	21.4	11.7	12.8	15.2	15.0	20.2	24.7
26-Aug-10	20.3	21.2	24.6	23.1	26.9	24.7	*	24.4	*	24.2	23.4	*	13.2	14.9	16.1	18.6	22.0	28.3
4-Oct-10	10.8	11.3	12.6	15.1	15.3	13.5	15.3	13.6	15.6	16.2	16.3	14.7	13.3	13.7	13.5	14.4	15.1	13.8
1-Nov-10	10.1	9.7	7.6	8.8	7.2	8.0	5.8	4.5	4.8	5.1	4.4	4.6	11.1	11.3	10.6	10.8	10.6	4.4
6-Dec-10	1.2	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.4
4-May-11	6.3	6.3	-	-	11.3	12.1	12.5	12.8	12.7	12.7	12.8	12.3	8.3	9.1	9.1	9.0	9.3	11.0
24-May-11	7.0	8.2	7.5	9.2	11.8	12.9	13.0	13.1	13.1	12.9	16.9	16.6	11.2	12.2	11.7	11.8	11.5	9.0
27-Jun-11	9.1	**	15.2	23.2	28.5	25.5	25.5	23.3	25.4	25.2	18.1	18.0	13.6	15.6	15.2	18.2	**	26.6
26-Jul-11	16.2	**	19.0	27.9	**	21.7	25.8	26.2	23.2	22.8	22.3	**	12.7	15.0	14.3	14.5	**	24.0
30-Aug-11	22.2	25.5	16.5	21.7	20.6	21.5	21.0	21.5	20.8	19.5	21.6	**	12.4	14.7	14.4	-	**	22.5
22-Sep-11	13.0	20.7	13.8	23.7	19.8	13.9	18.4	20.5	19.1	18.4	17.0	**	13.9	14.7	14.0	14.2	13.0	8.8
26-Oct-11	10.8	8.1	10.9	9.8	9.1	9.7	8.0	8.3	8.2	9.0	8.0	8.0	9.6	9.5	9.4	9.6	9.6	5.9
29-Nov-11	10.8	9.8	8.8	8.0	4.9	5.0	4.9	4.9	5.0	5.0	3.7	3.6	5.7	5.6	5.6	5.5	5.6	5.1
22-Dec-11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11-Jan-12	8.6	8.4	6.9	6.8	++	++	++	++	++	++	1.8	1.1	4.3	3.5	3.6	4.1	4.9	4.8
27-Feb-12	6.9	6.7	4.8	3.0	++	++	++	++	++	++	0.6	1.0	3.3	3.1	2.7	3.4	3.1	3.7
29-Mar-12	7.5	7.1	5.5	6.6	4.9	5.1	5.0	5.3	4.9	5.9	5.5	5.6	7.2	7.8	8.0	7.0	**	4.6
25-Apr-12	8.0	8.1	7.2	16.5	12.1	12.1	12.7	10.4	13.7	10.1	8.0	8.5	7.8	8.0	8.1	7.9	7.1	10.2
29-May-12	13.5	12.8	19.0	23.9	16.7	16.7	16.5	18.6	15.0	17.7	20.5	**	9.1	9.0	9.4	17.1	**	27.3
13-Jun-12	13.4	**	14.8	26.2	22.1	21.4	21.8	22.1	23.0	20.1	19.8	**	10.5	10.2	10.0	16.4	**	28.1
11-Jul-12	**	**	18.8	32.5	**	28.0	**	27.2	**	**	22.5	**	12.2	13.1	12.7	22.8	**	29.2
30-Aug-12	**	**	15.3	19.4	**	23.7	23.8	23.0	23.1	22.6	21.5	23.0	10.7	12.1	12.1	16.5	**	26.7
25-Sep-12	**	**	11.2	12.2	11.8	13.2	13.4	14.6	12.2	12.4	13.2	**	10.9	12.0	11.9	13.2	**	14.6
23-Oct-12	10.8	11.4	11.3	11.2	10.8	11.5	11.2	11.6	11.4	11.6	12.9	12.9	11.1	11.9	11.8	12.8	14.5	15.1
27-Nov-12	9.6	9.3	8.7	8.8	1.8	2.1	3.0	2.4	3.6	2.9	10.0	9.8	7.4	7.0	6.6	6.5	5.3	8.5
19-Dec-12	9.1	9	8.1	7.1	++	++	++	++	++	++	2.2	2.6	5.3	4.5	4.4	5.2	6.7	7.4
28-Jan-13	7.9	7.5	6.5	6.2	++	++	++	++	++	++	2.1	2.0	4.5	3.2	3.8	3.9	3.6	4.1
26-Feb-13	7.1	6.9	5.3	5.3	++	++	++	++	++	++	1.1	1.3	2.3	2.8	1.8	2.3	3.2	3.0
26-Mar-13	6.8	6.9	5.1	4.1	++	1.0	0.9	+	0.9	1.2	1.1	1.2	2.2	1.7	1.8	2.7	4.1	6.2
23-Apr-13	6.5	7.0	5.1	10.7	8.4	6.8	7.1	7.3	7.1	7.6	10.6	10.4	6.5	6.6	6.4	8.3	9.6	11.8
27-May-13	7.4	7.8	7.8	16.2	11.7	13.4	14.2	16.9	15.2	14.5	20.4	19.7	12.0	13.0	13.0	12.7	12.7	15.8
17-Jun-13	8.9	9.6	9.6	10.4	33.1	25.8	23.3	23.9	23.8	20.6	23.4	22.9	14.6	15.3	15.3	15.0	16.8	25.6

Appendix C-7: Historical Temperature Data

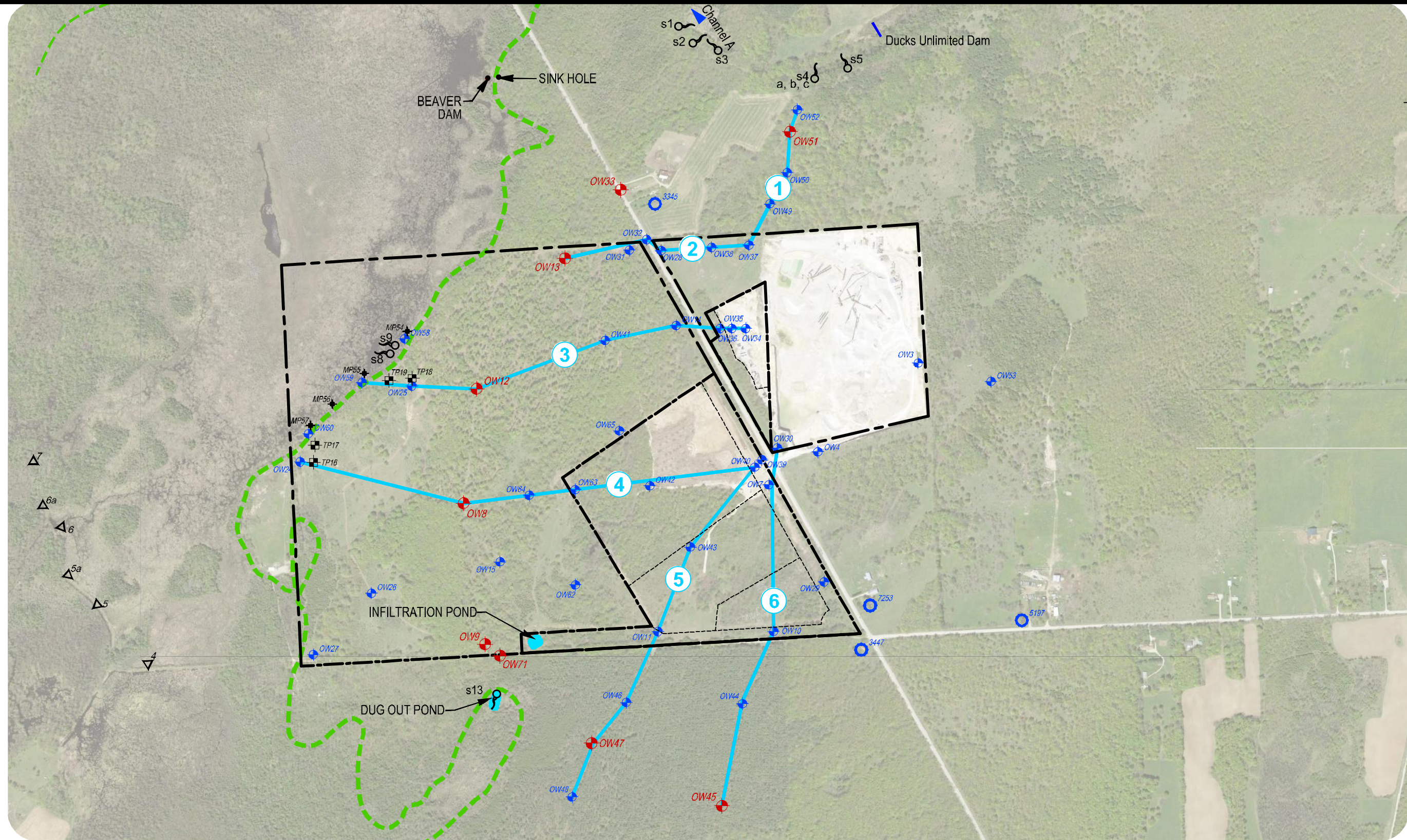
Shouldice Wetland													Glen Managment Area					
Date	s8	s9	s13	Dugout pond (SG1)	Culvert 4	Culvert 5	Culvert 5a	Culvert 6	Culvert 6a	Culvert 7	Beaver Dam	Sinkhole	s1	s2	s3	Channel A	Channel B	D.U. Dam
30-Jul-13	15.8	19.8	15.2	27.0	**	24.8	25.1	26.6	26.8	22.6	25.6	**	12.3	14.7	13.7	17.2	**	24.4
13-Aug-13	-	-	-	-	-	-	-	-	-	-	19.2	**	**	14.6	12.9	18.2	**	25.2
19-Sep-13	**	**	12.3	17.4	**	27.4	26.0	22.3	**	23.1	17.0	17.1	12.9	13.0	11.7	15.1	**	16.8
25-Oct-13	10.3	10.3	10.6	10.4	5.8	5.5	5.3	5.2	5.0	5.1	-	-	-	-	-	-	-	-
30-Nov-13	9.3	8.4	8.2	8.2	++	++	++	++	++	++	1.1	1.1	4.6	4.0	4.0	4.6	5.1	3.9
15-Mar-14	6.4	-	-	-	-	-	-	-	-	-	2.1	2.1	2.4	1.9	2.1	3.0	4.9	7.3
28-Apr-14	-	-	6.0	5.7	19.7	16.0	14.0	13.7	13.7	14.7	10.3	10.1	8.2	8.6	8.3	8.5	8.6	9.2
24-May-14	7.0	8.0	8.1	13.8	18.5	15.9	18.0	17.1	17.1	17.4	17.7	17.1	11.3	12.3	12.3	12.3	14.0	-
27-Jun-14	11.4	18.3	14.0	19.0	20.8	21.3	20.9	20.9	21.0	19.2	19.2	19.1	12.0	13.4	13.5	5.0	**	5.0
15-Jul-14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12-Sep-14	13.7	12.7	13.7	13.8	-	-	-	-	-	-	19.4	**	11.3	12.7	12.8	11.8	**	21.2
23-Oct-14	10.4	10.9	10.5	11.6	11.0	8.1	8.3	10.0	8.3	10.0	11.7	11.3	-	-	-	-	-	-
29-Jan-15	8.1	7.6	5.3	++	-	-	-	-	-	-	-	-	4.0	2.9	2.8	3.3	++	2.7
13-Mar-15	6.9	7.3	5.1	4.8	-	-	-	-	-	-	0.7	0.8	3.8	3.0	2.8	3.6	++	3.3
27-Apr-15	6.7	10.1	6.0	6.4	10.4	8.2	8.5	8.7	8.4	8.1	9.9	9.9	7.4	7.6	7.5	7.6	6.3	8.5
29-May-15	7.9	9.3	11.4	12.7	32.4	27.9	23.5	24.7	23.9	24.2	22.7	20.6	11.3	10.7	11.5	Dry	24.6	13.5
29-Jun-15	8.6	9.6	10.3	9.7	15.9	20.1	17.2	17.4	17.6	15.6	17.2	17.0	11.7	13.8	13.9	12.8	**	16.4
28-Jul-15	16.3	**	15.7	19.3	**	18.8	19.7	23.1	**	21.2	21.5	**	10.7	13.3	13.0	19.3	**	28.9
26-Aug-15	14.7	**	12.9	11.4	19.6	19.2	19.5	20.3	19.1	19.6	20.9	**	11.0	13.0	12.5	12.3	**	22.0
28-Sep-15	15.7	**	16.5	22.5	18.1	17.0	17.9	17.6	17.8	17.9	18.9	**	11.9	13.1	13.2	15.7	**	16.2
22-Oct-15	11.2	12.1	11.2	11.2	**	10.7	11.4	11.3	11.2	10.7	11.8	**	11.3	12.3	12.3	11.0	**	11.3
17-Nov-15	10.5	10.4	10.1	10.4	**	5.7	5.3	5.0	5.0	4.9	8.8	**	10.2	10.2	10.1	10.3	**	8.1
23-Dec-15	9.3	9.2	8.4	8.5	3.4	3.5	3.8	2.6	2.6	2.7	3.7	**	5.2	5.1	5.5	5.8	**	5.0
Min	1.2	1.7	4.2	3.0	0.9						0.6	0.8	2.2	1.7	1.3	2.3	3.1	2.7
Max	22.2	25.5	24.6	32.5	33.1						25.6	23.4	14.6	15.6	16.1	22.8	24.6	29.2
Avg	10.0	10.2	10.6	13.4	14.7						13.3	11.0	9.3	9.7	9.7	11.0	10.5	14.3

Notes:
 values are compensated to 20 degrees Celsius
 * = no flow observed
 ** = dry
 ++ = frozen
 - = not measured



APPENDIX C8

DISTANCE-ELEVATION PLOTS



LEGEND

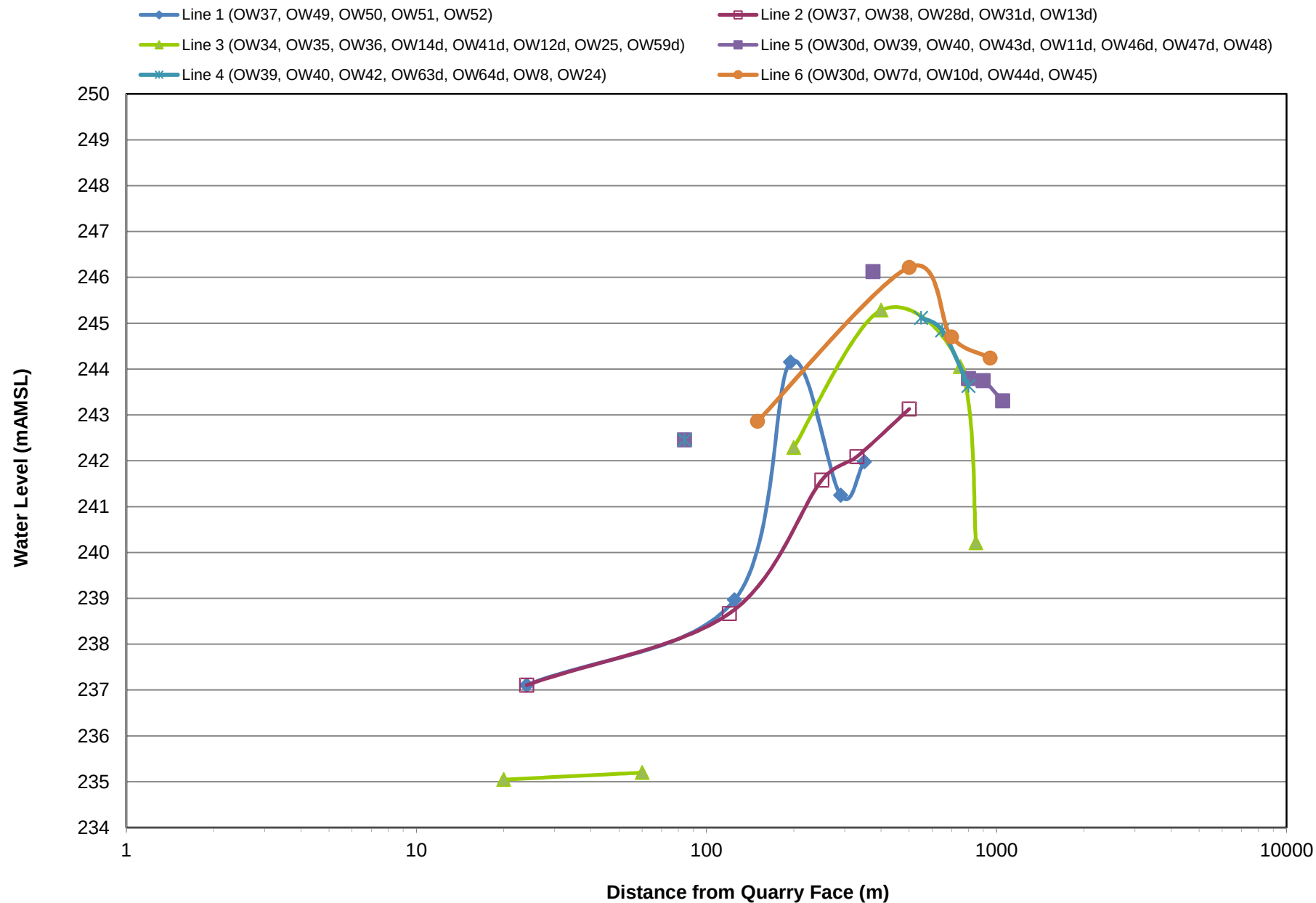
- Extraction Area
- Licensed Boundary
- HSCL owned lands
- Δ⁴ Surface Water Monitoring Locations
- Wetland Boundary
- ③ Sentry Well
- OW47 Sentry Well
- OW15 Monitoring Well
- 3447 Proposed Monitoring Well
- 3447 Private Well
- TP18 Test Pit
- MP55 Mini Piezometer



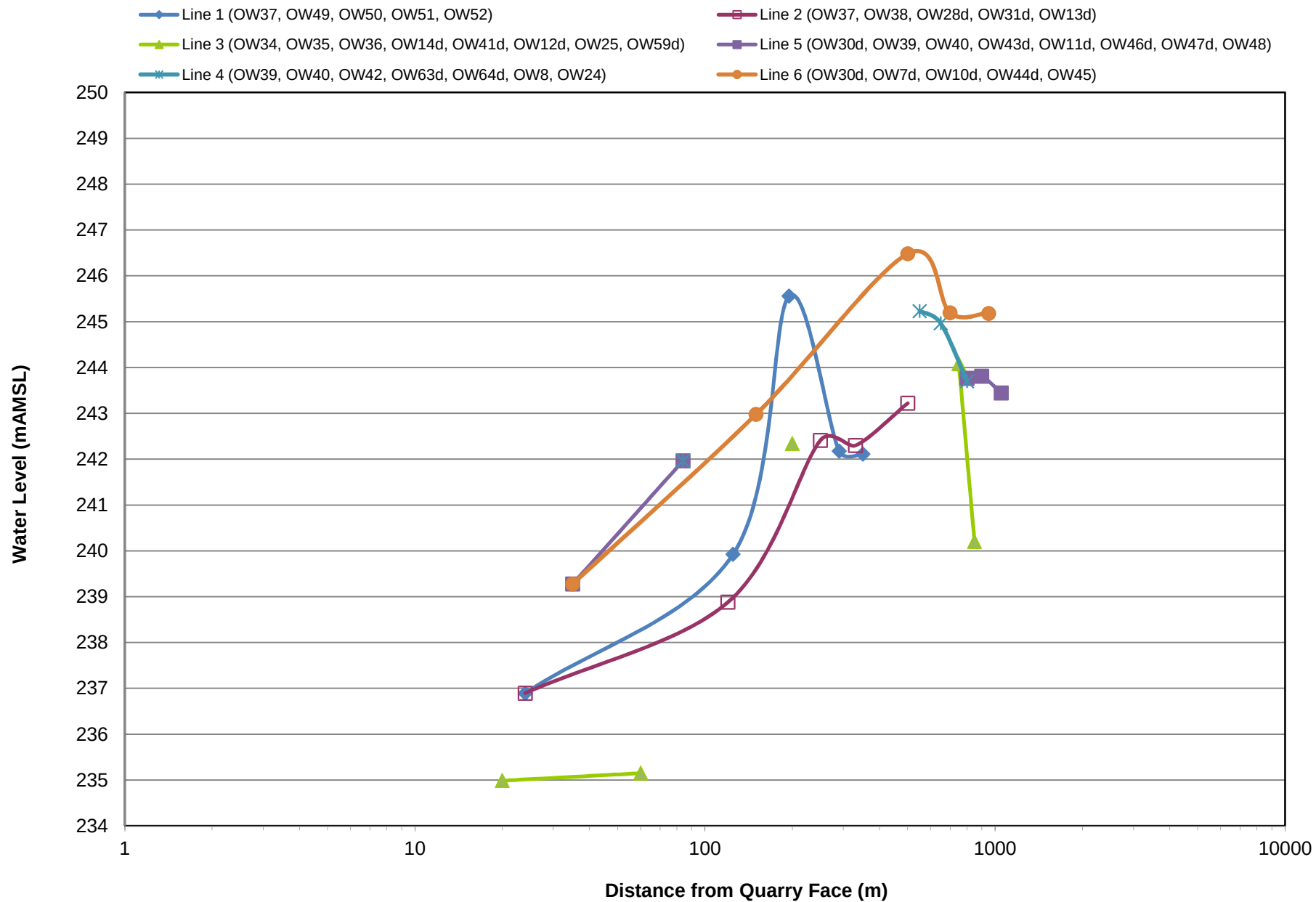
Figure C-9.1 DISTANCE - ELEVATION ASSESSMENT LINES

Project Name			
Keppel Quarry			
Site		Client	
Georgian Bluffs, Ontario		Harold Sutherland Construction Limited	
Scale	MTE Project No.	Date	Layout No.
1:10,000	33862-100	May 2017	EV4.1

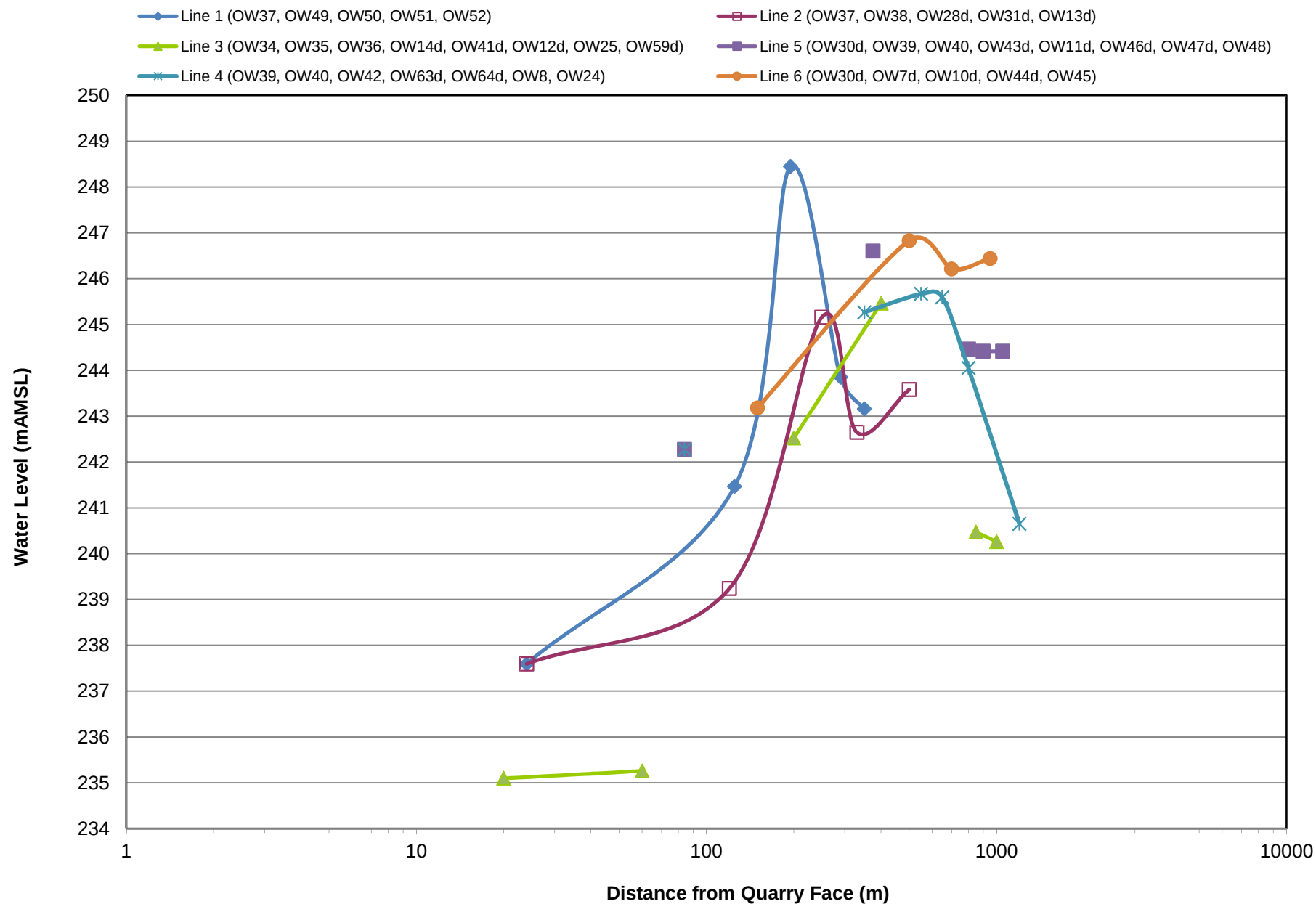
Hydrograph C-8.1: Distance-Water Elevation (Jan-29-16)



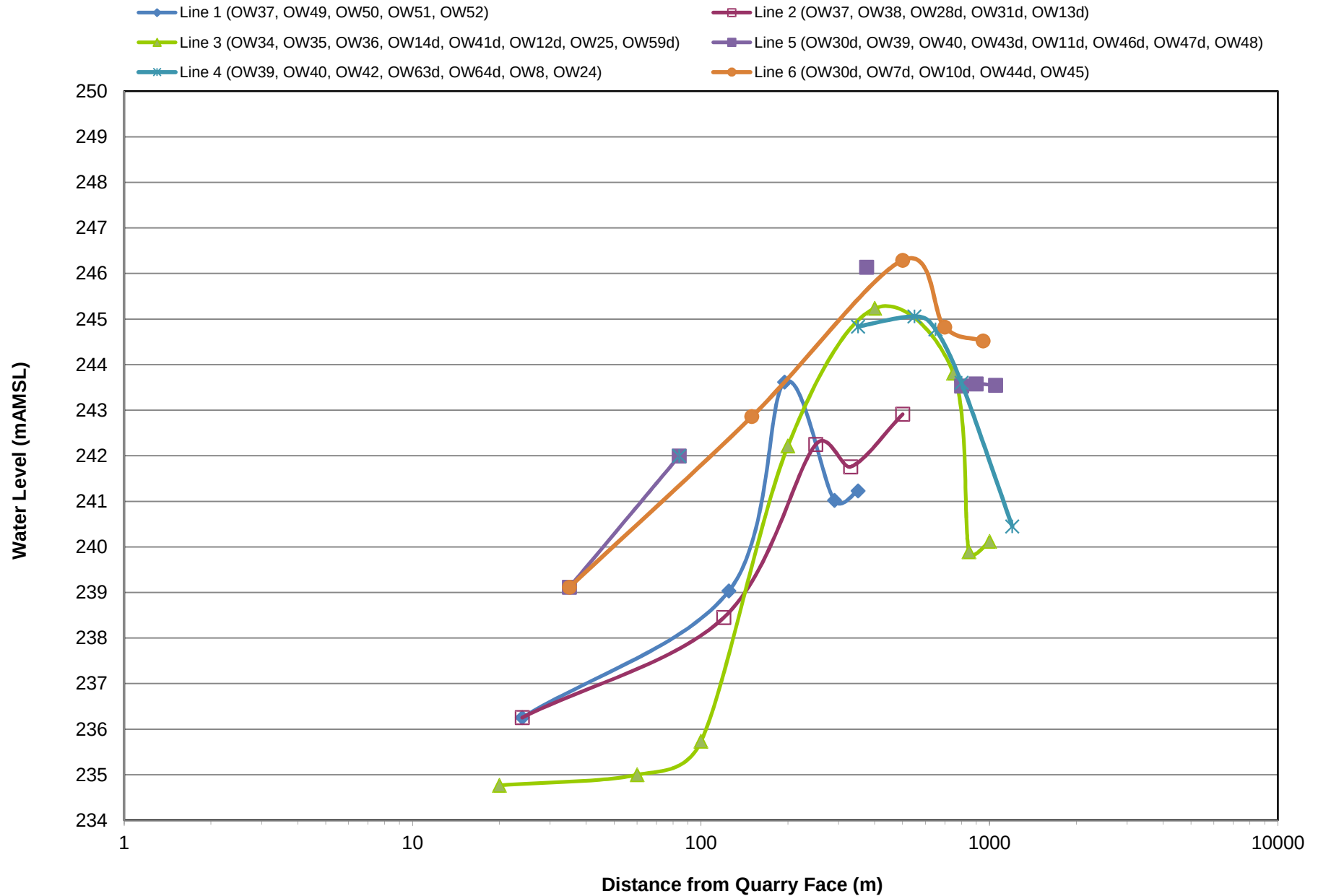
Hydrograph C-8.2: Distance-Water Elevation (Feb-23-16)



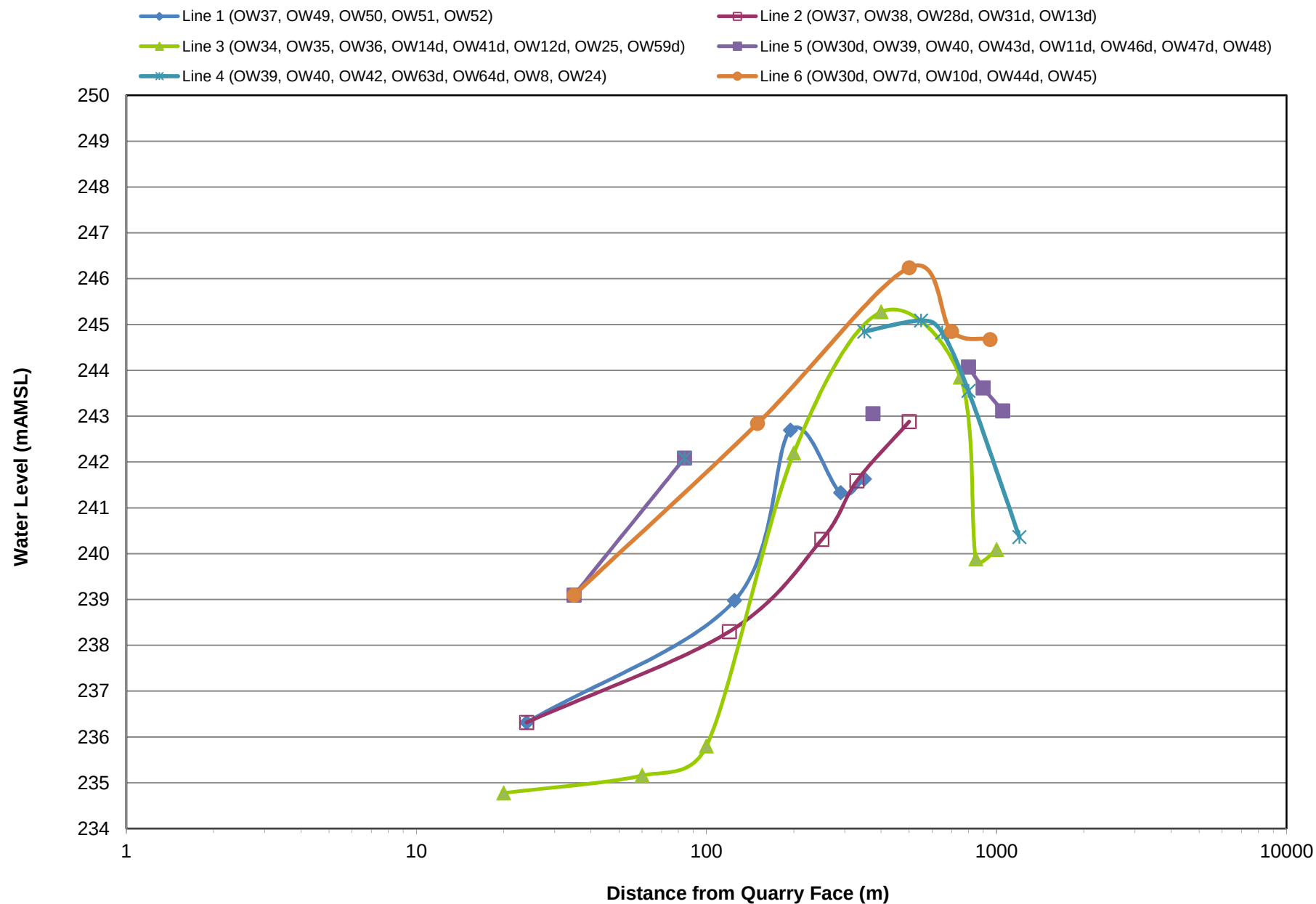
Hydrograph C-8.3: Distance-Water Elevation (March-30-16)



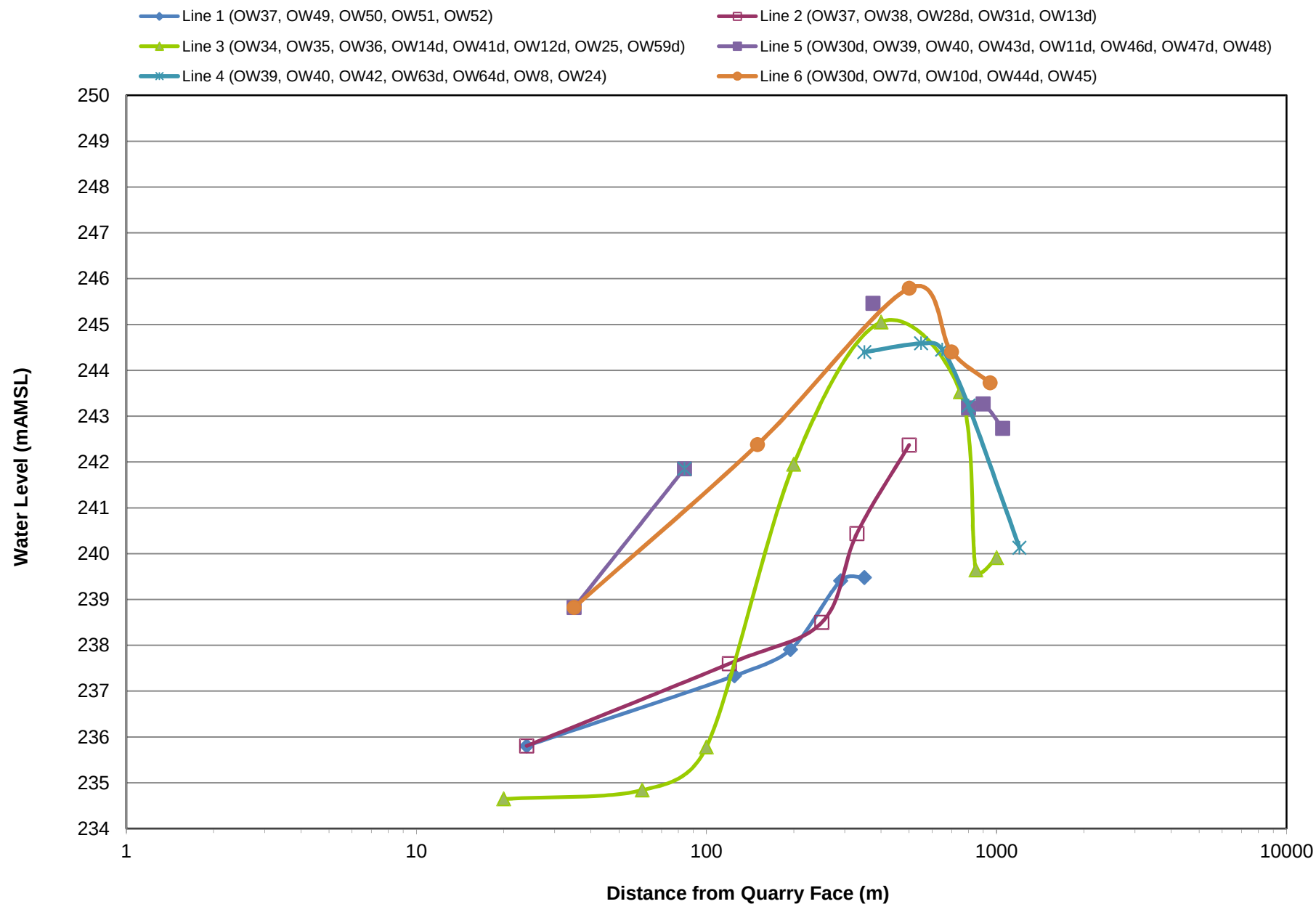
Hydrograph C-8.4: Distance-Water Elevation (April-28-16)



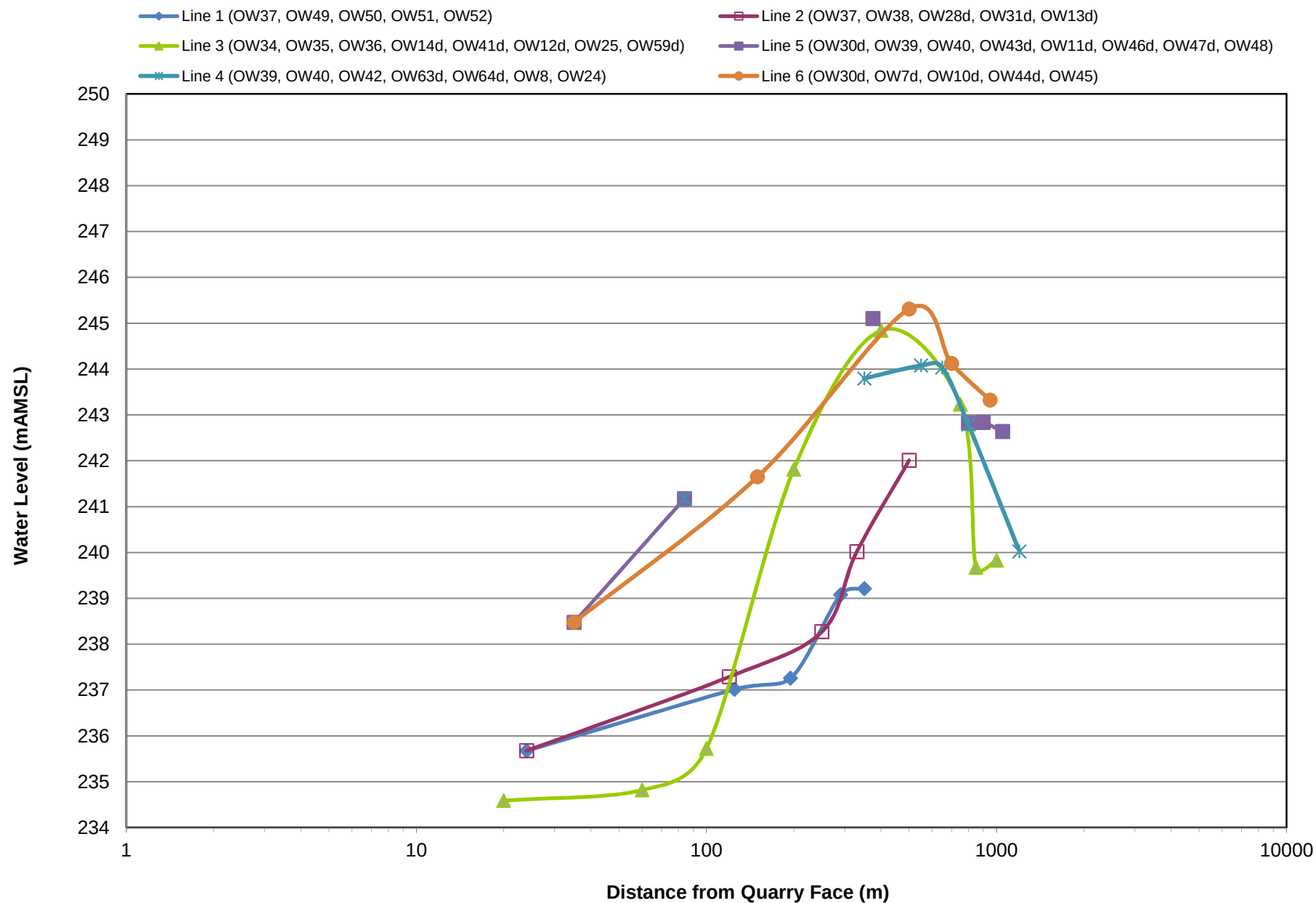
Hydrograph C-8.5: Distance-Water Elevation (May-17-16)



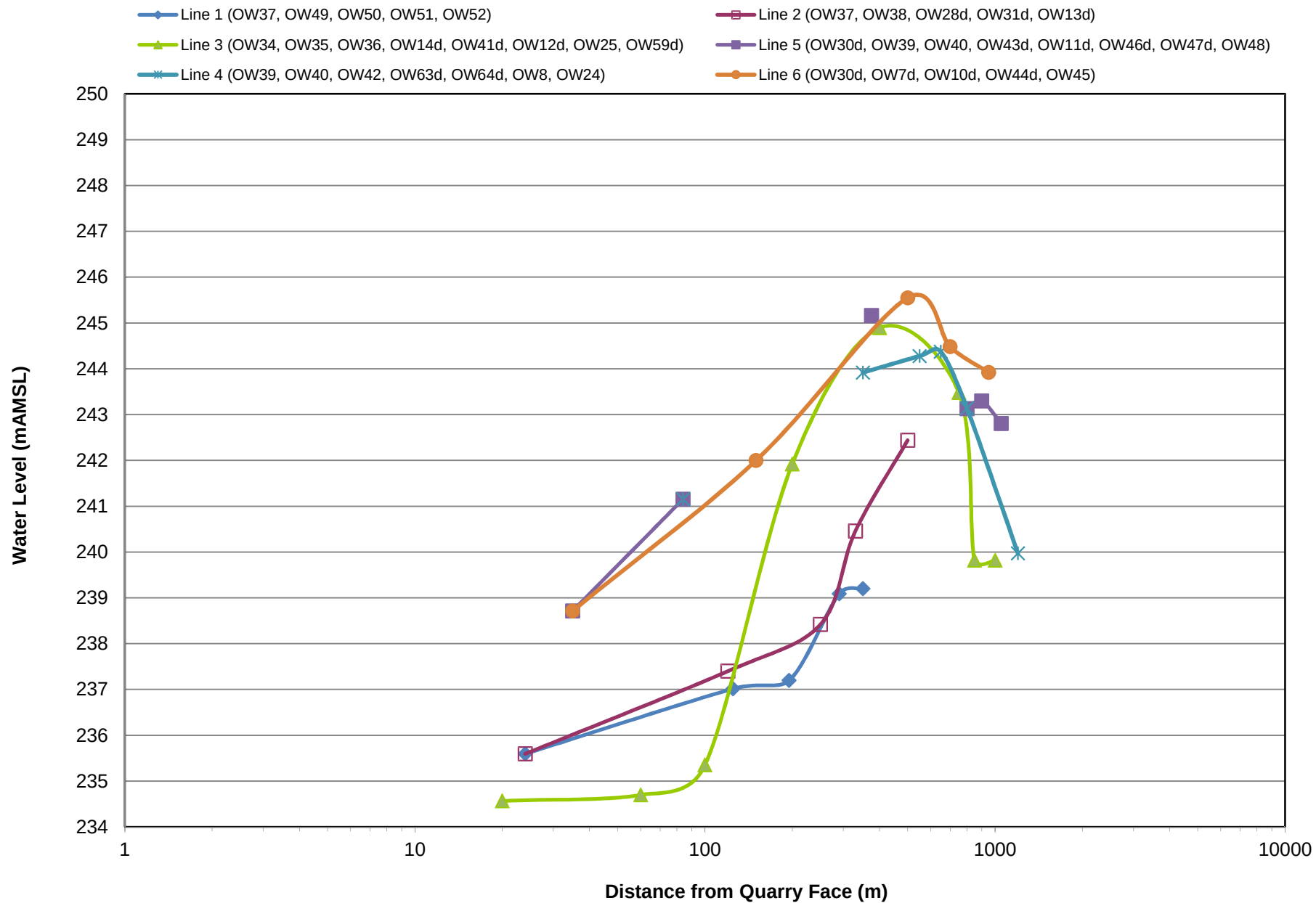
Hydrograph C-8.6: Distance-Water Elevation (June-22-16)



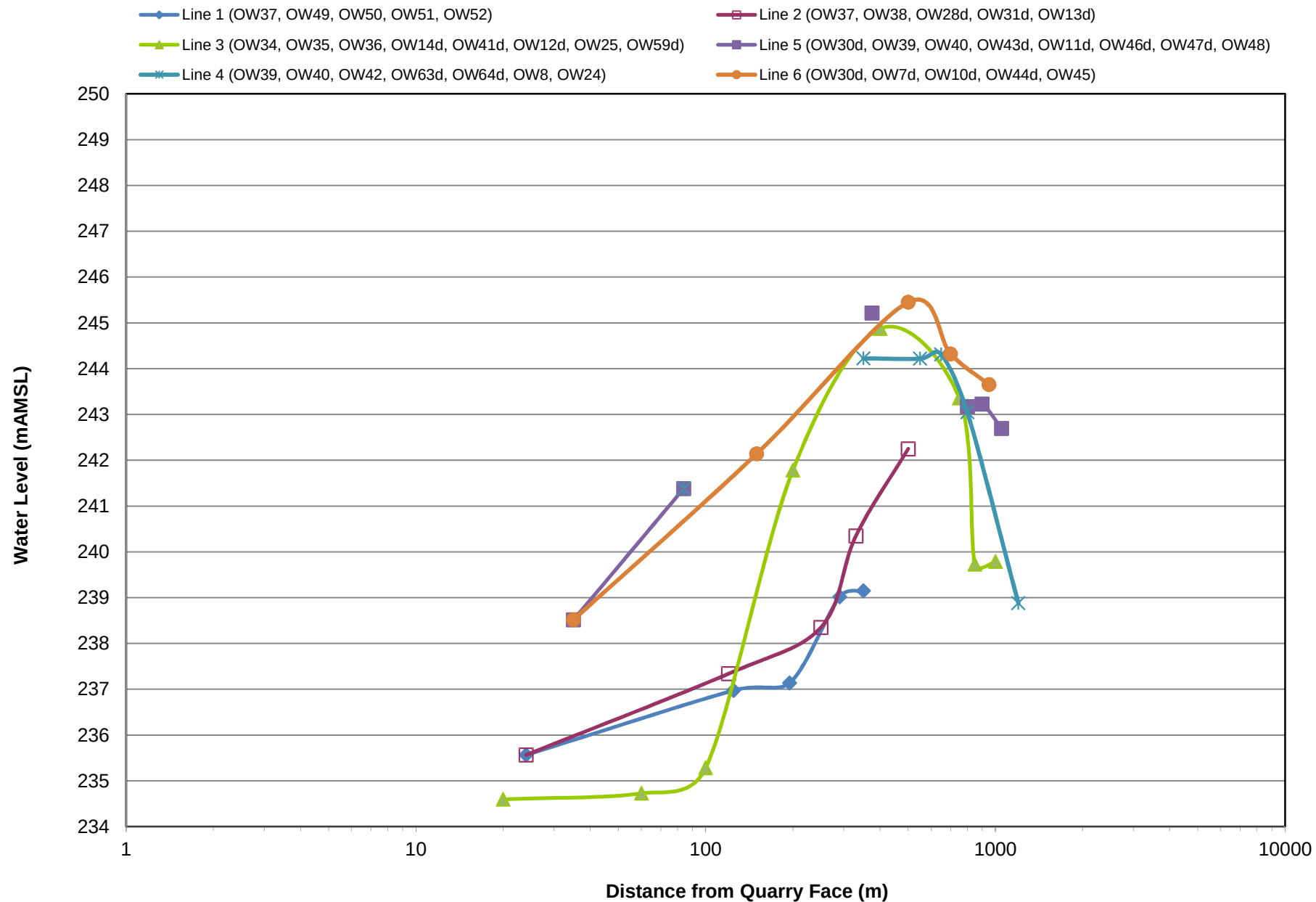
Hydrograph C-8.7: Distance-Water Elevation (Jul-27-16)



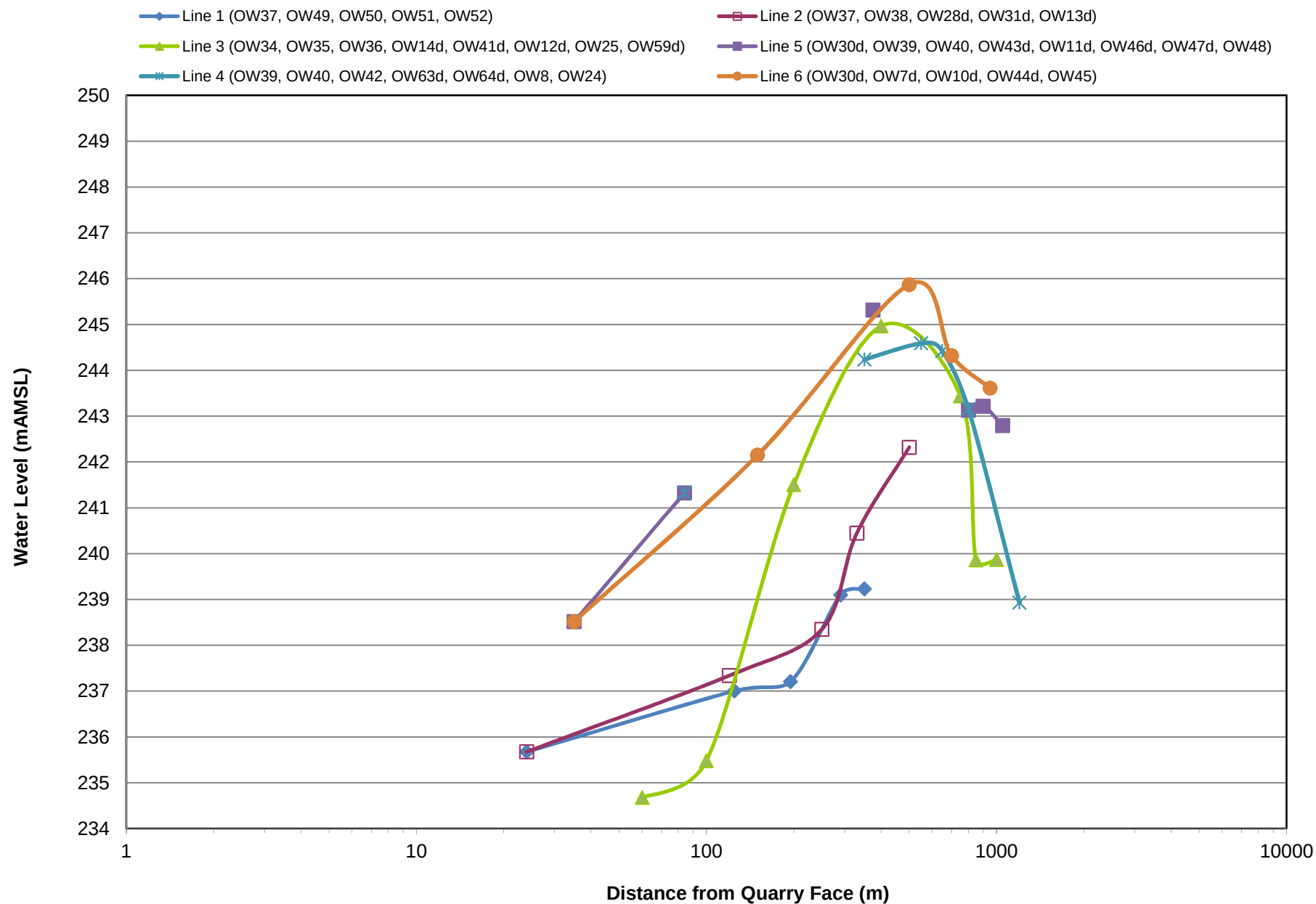
Hydrograph C-8.8: Distance-Water Elevation (Aug-31-16)



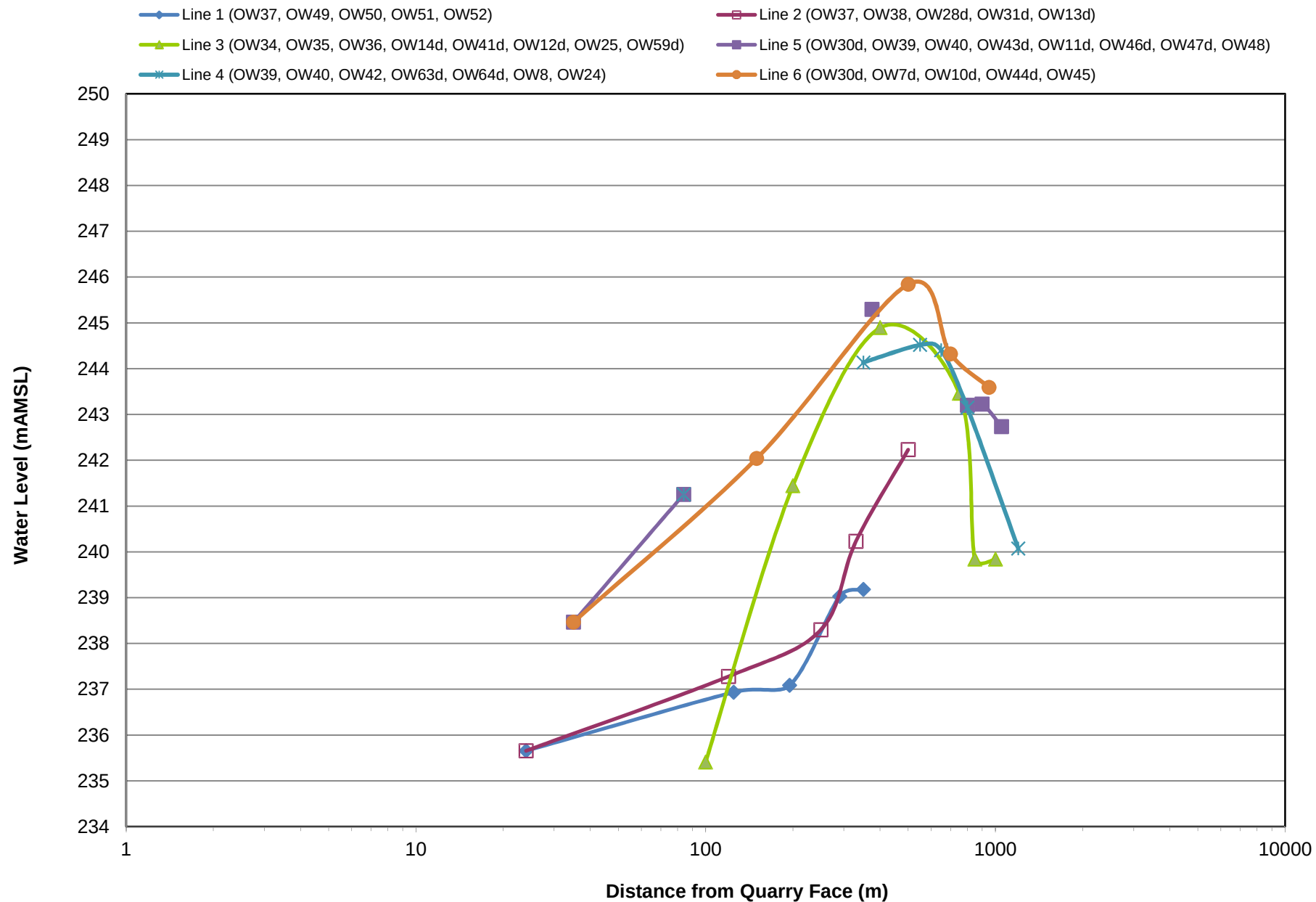
Hydrograph C-8.9: Distance-Water Elevation (Sept-29-16)



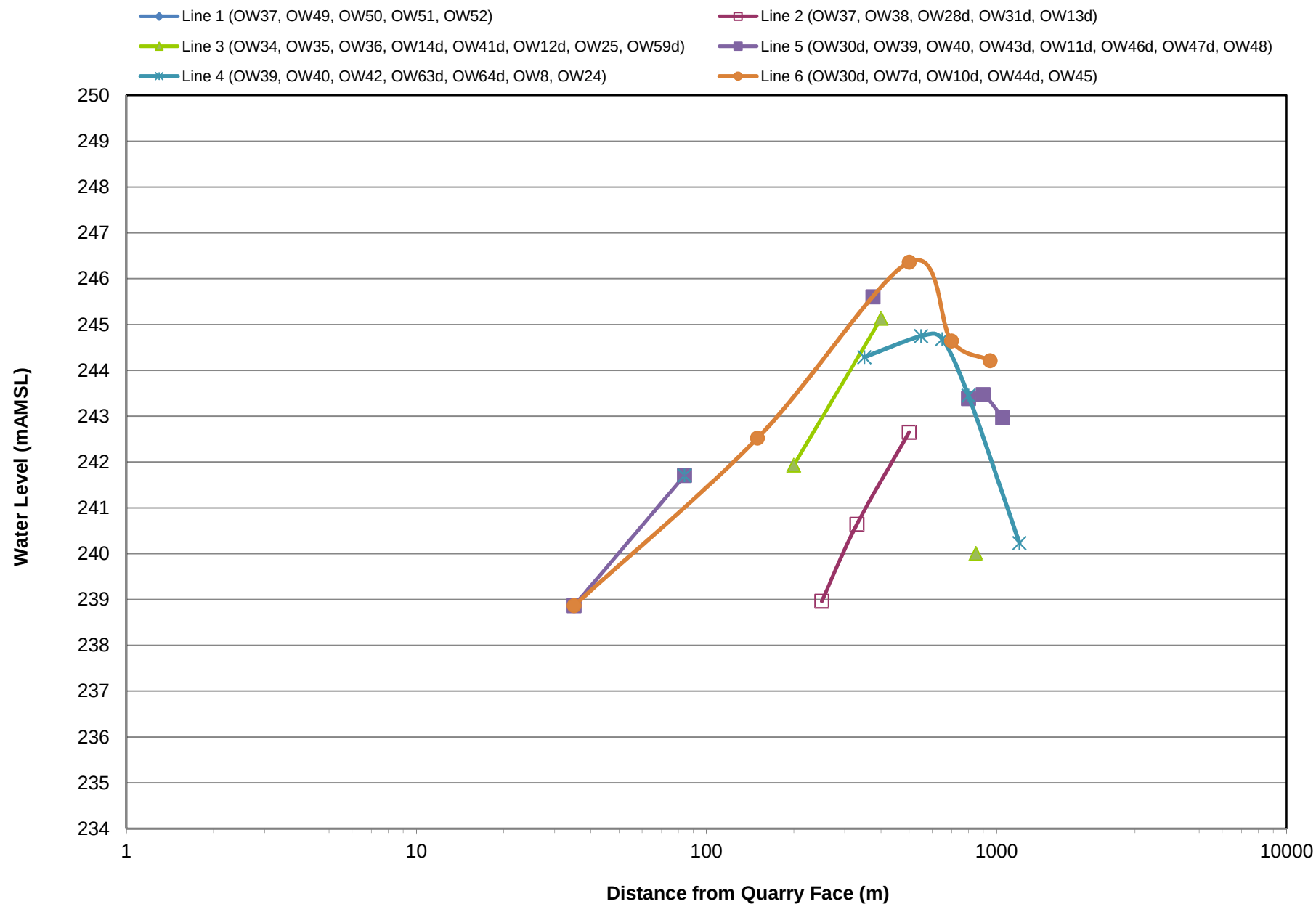
Hydrograph C-8.10: Distance-Water Elevation (Oct-31-16)



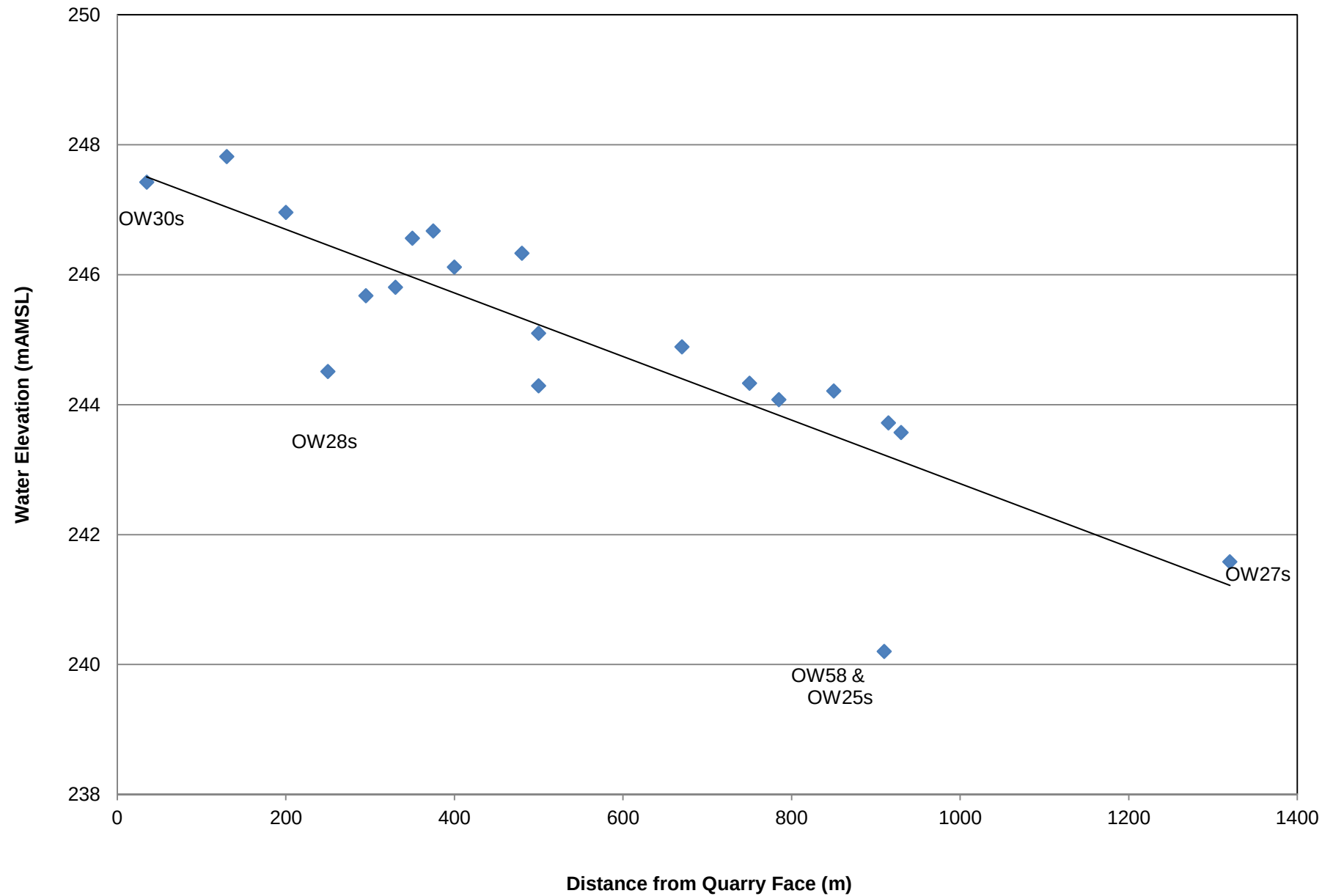
Hydrograph C-8.11: Distance-Water Elevation (Nov-17-16)



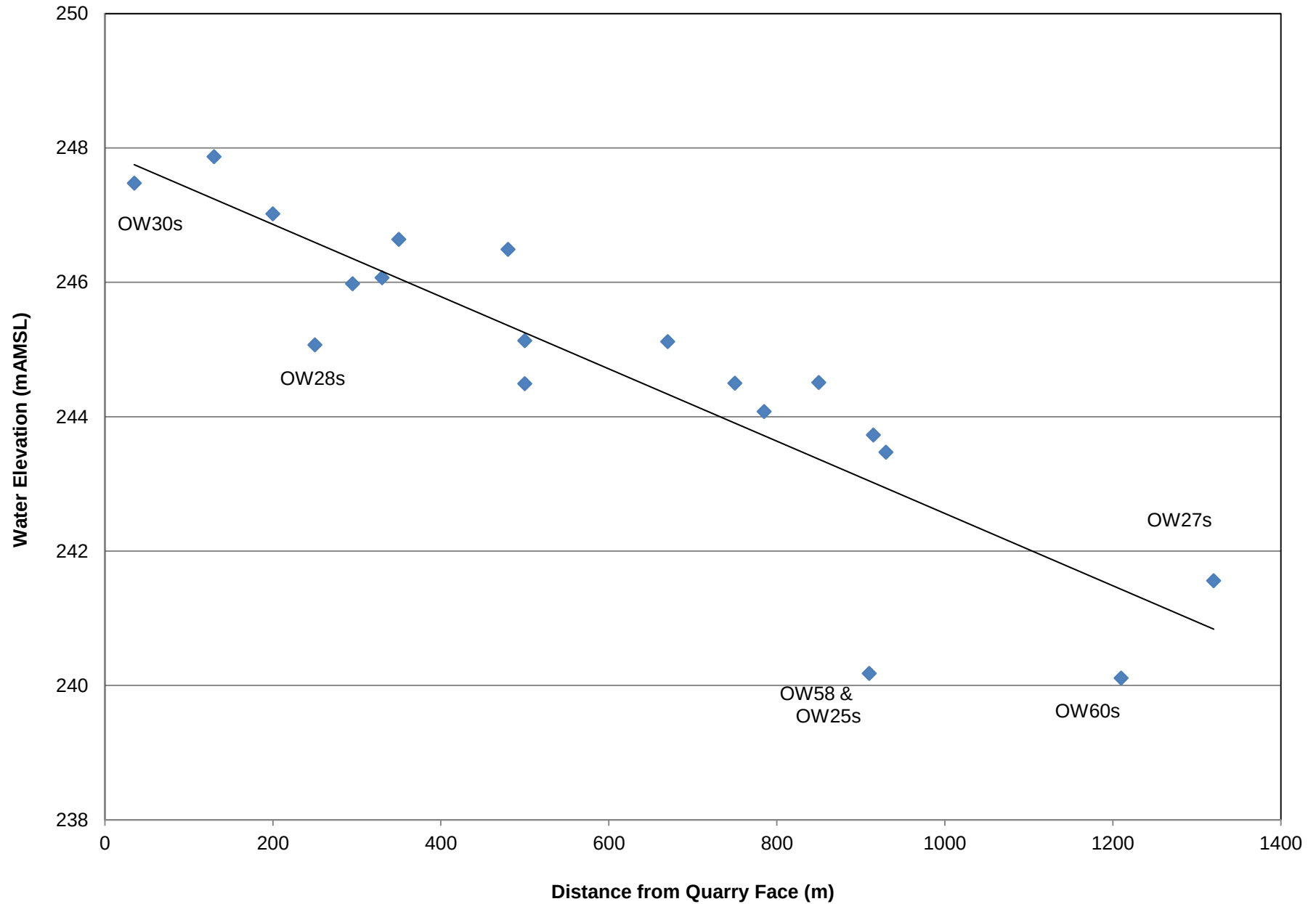
Hydrograph C-8.12: Distance-Water Elevation (Dec-23-16)



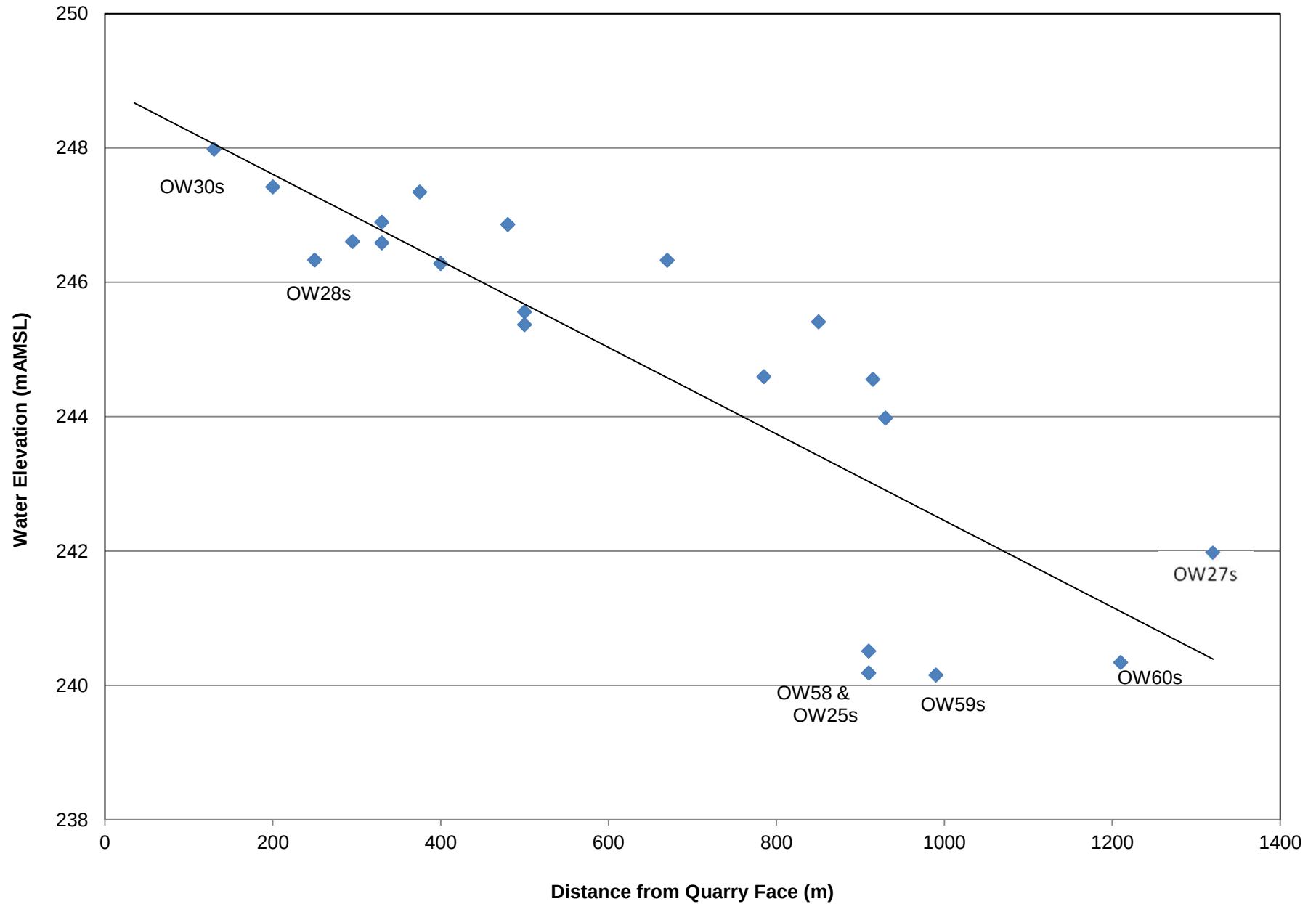
Hydrograph C-8.13: Distance-Water Elevation Shallow Bedrock (Jan- 29-16)



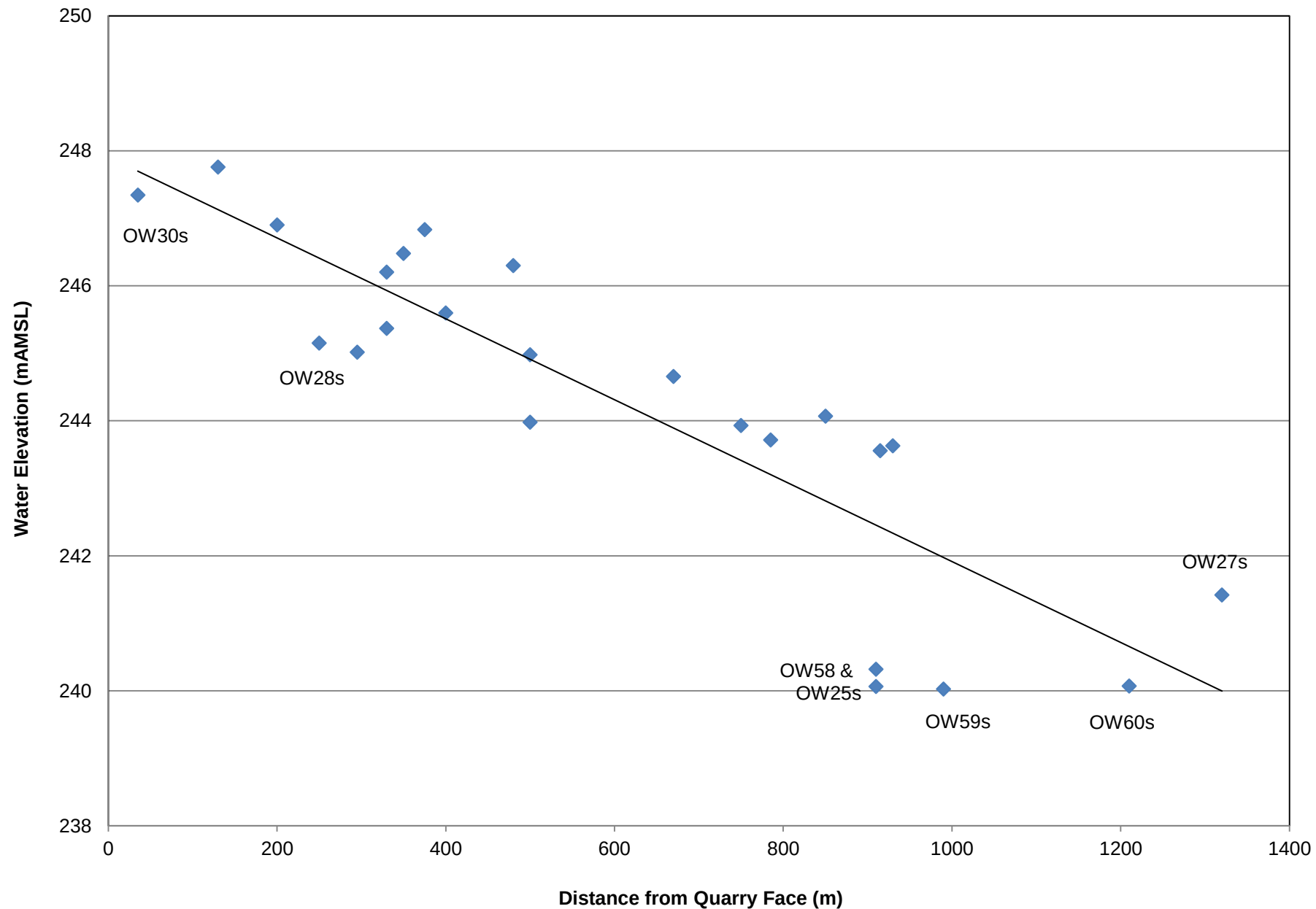
Hydrograph C-8.14: Distance-Water Elevation Shallow Bedrock (Feb- 23-16)



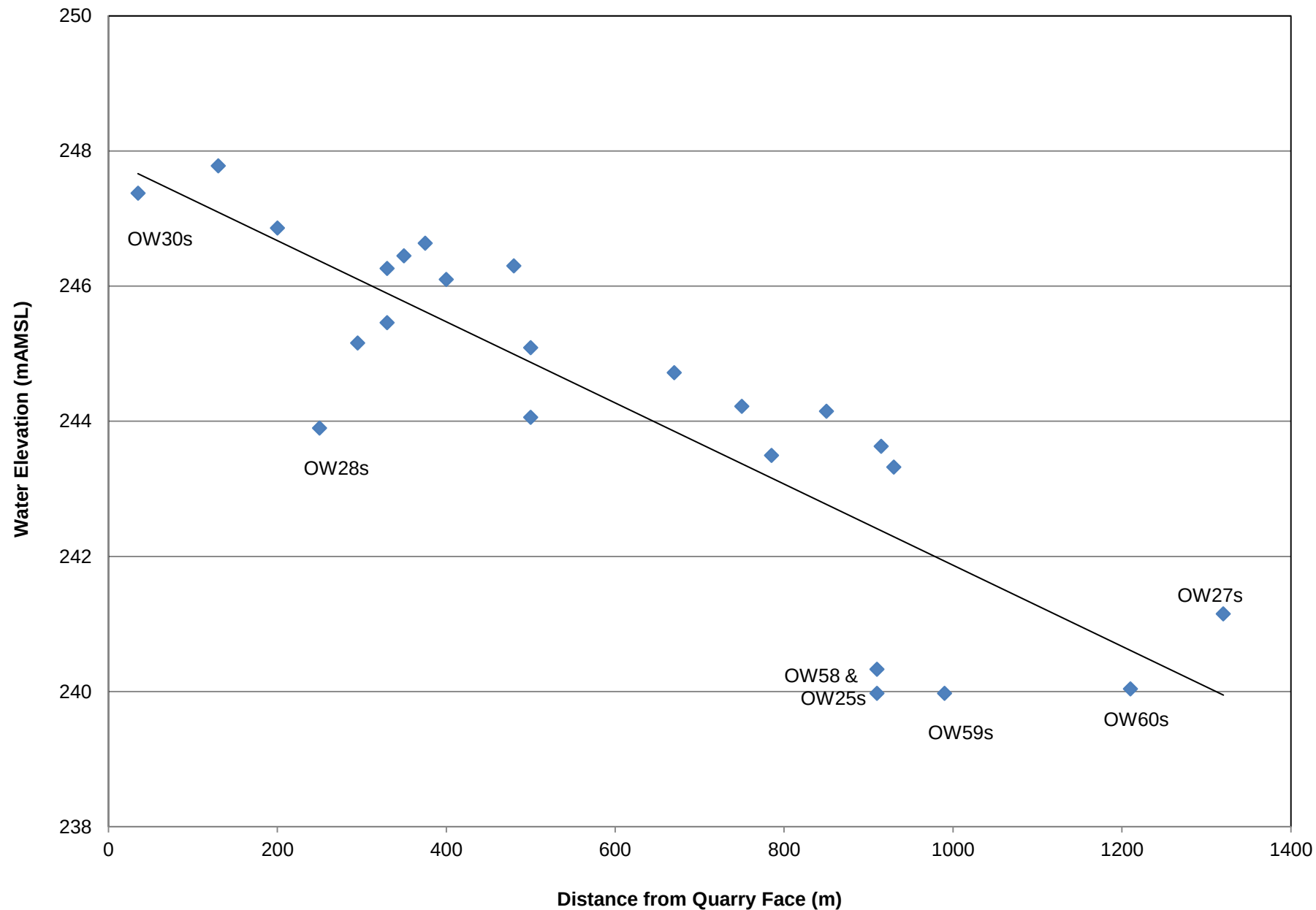
Hydrograph C-8.15: Distance-Water Elevation Shallow Bedrock (Mar- 30-16)



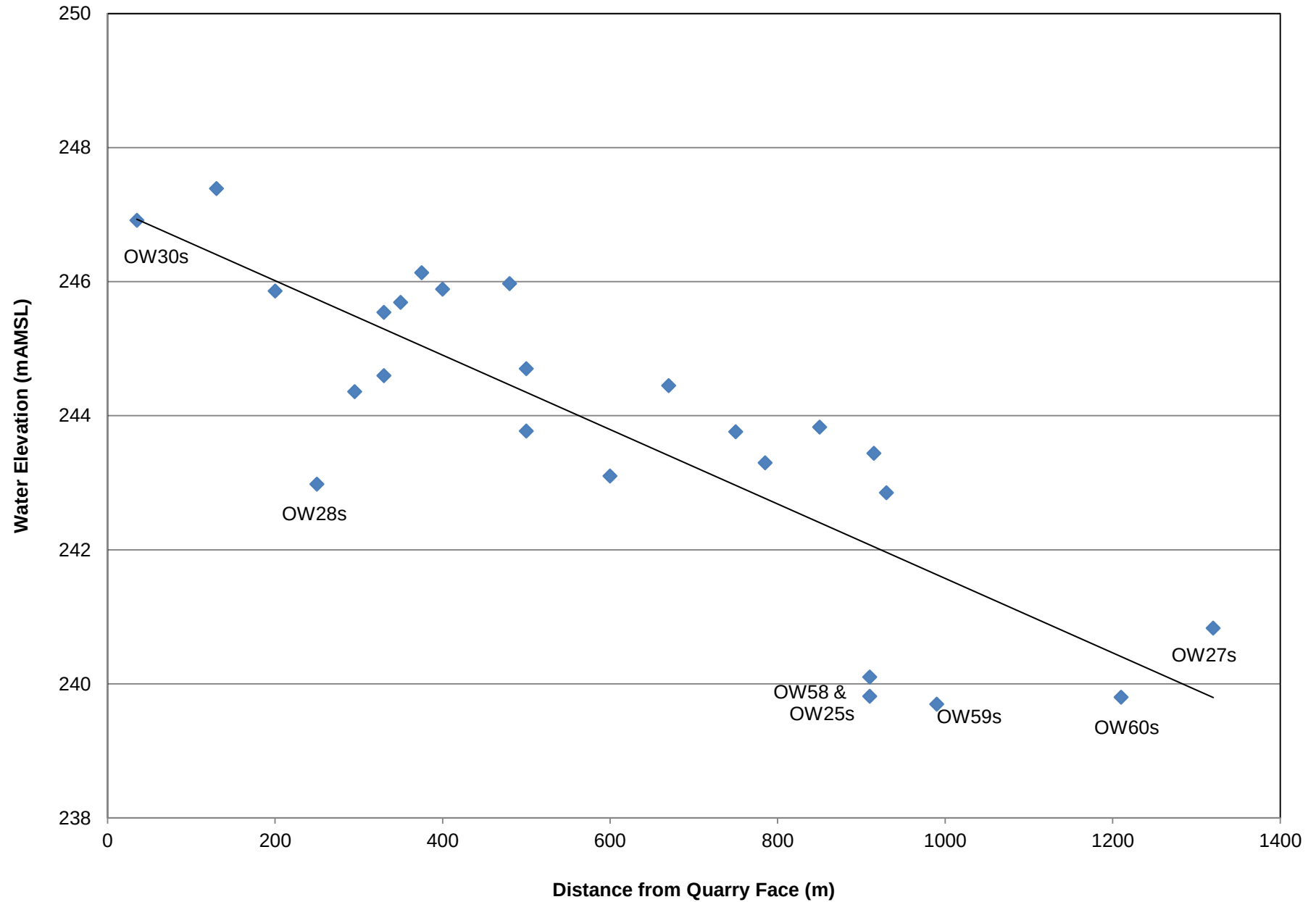
Hydrograph C-8.16: Distance-Water Elevation Shallow Bedrock (April-28-16)



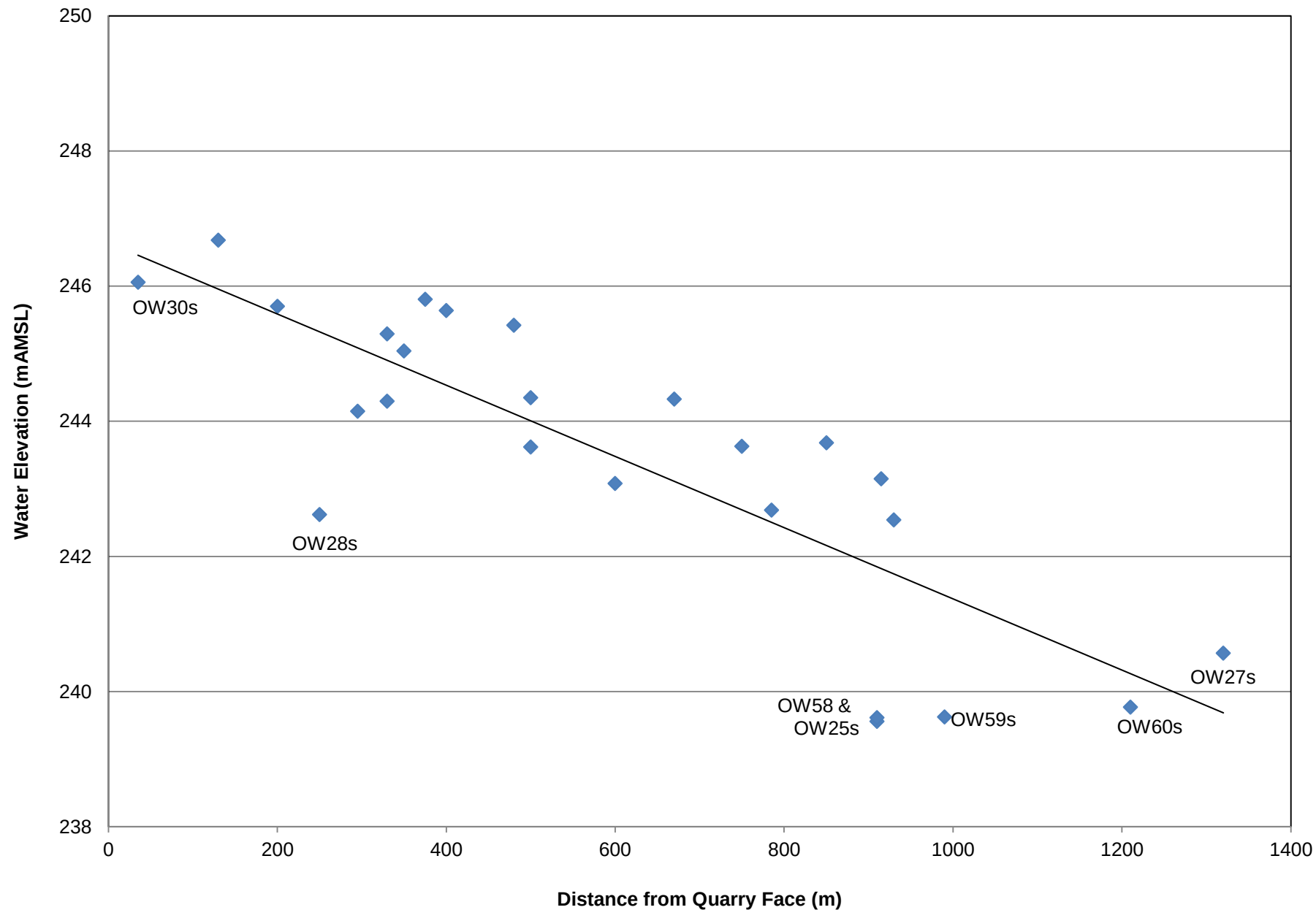
Hydrograph C-8.17: Distance-Water Elevation Shallow Bedrock (May-17-16)



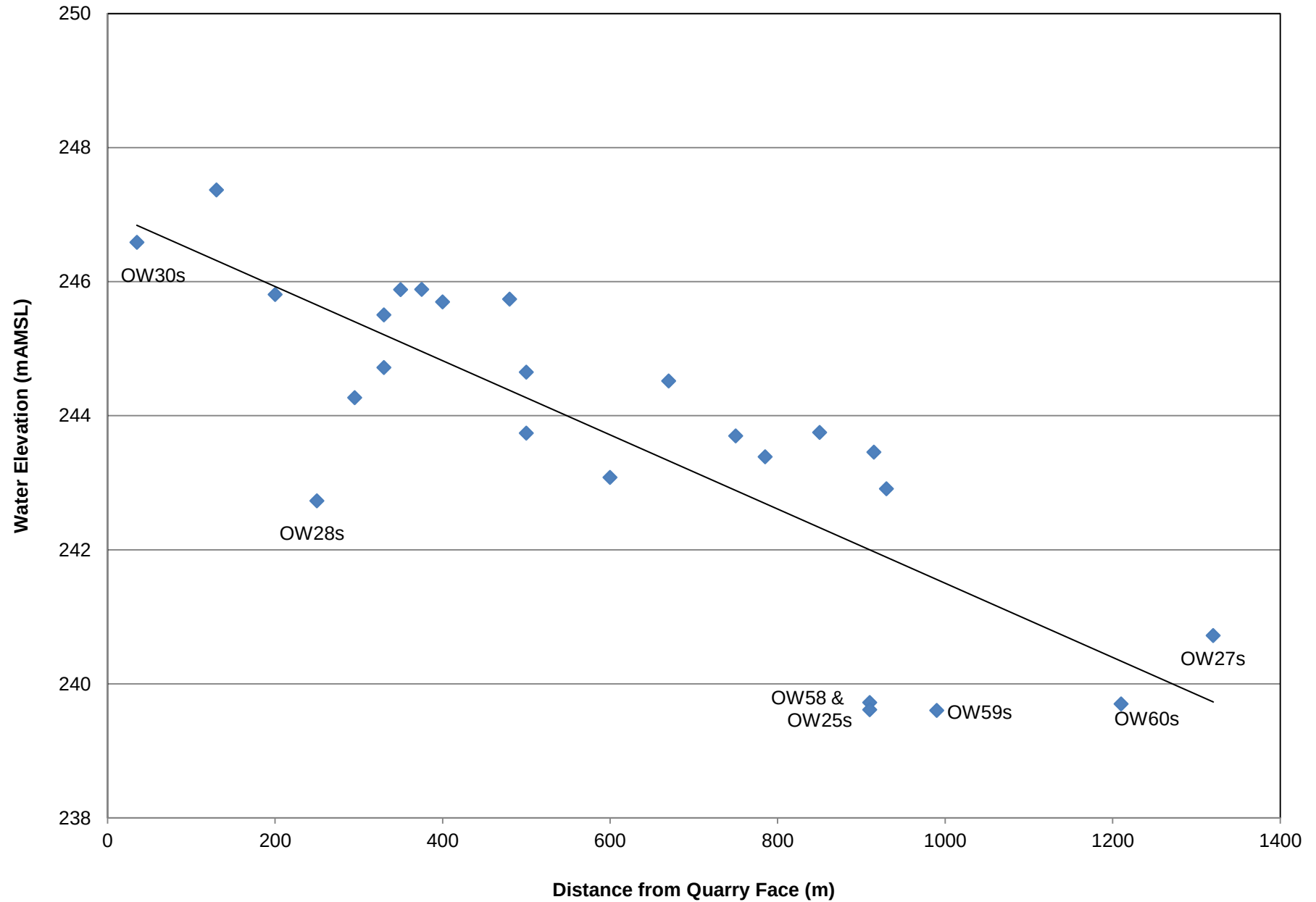
Hydrograph C-8.18: Distance-Water Elevation Shallow Bedrock (June-22-16)



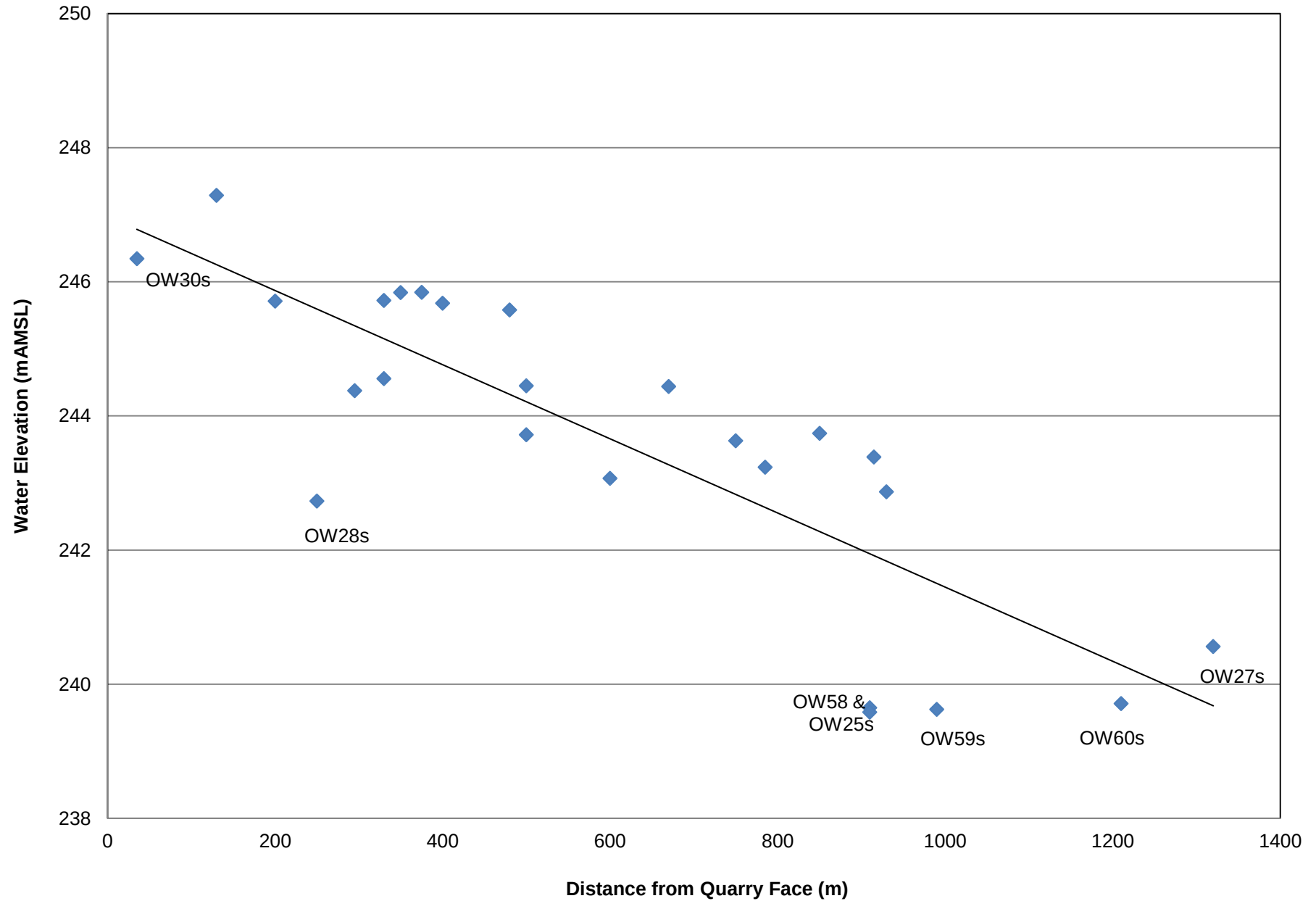
Hydrograph C-8.19: Distance-Water Elevation Shallow Bedrock (July-27-16)



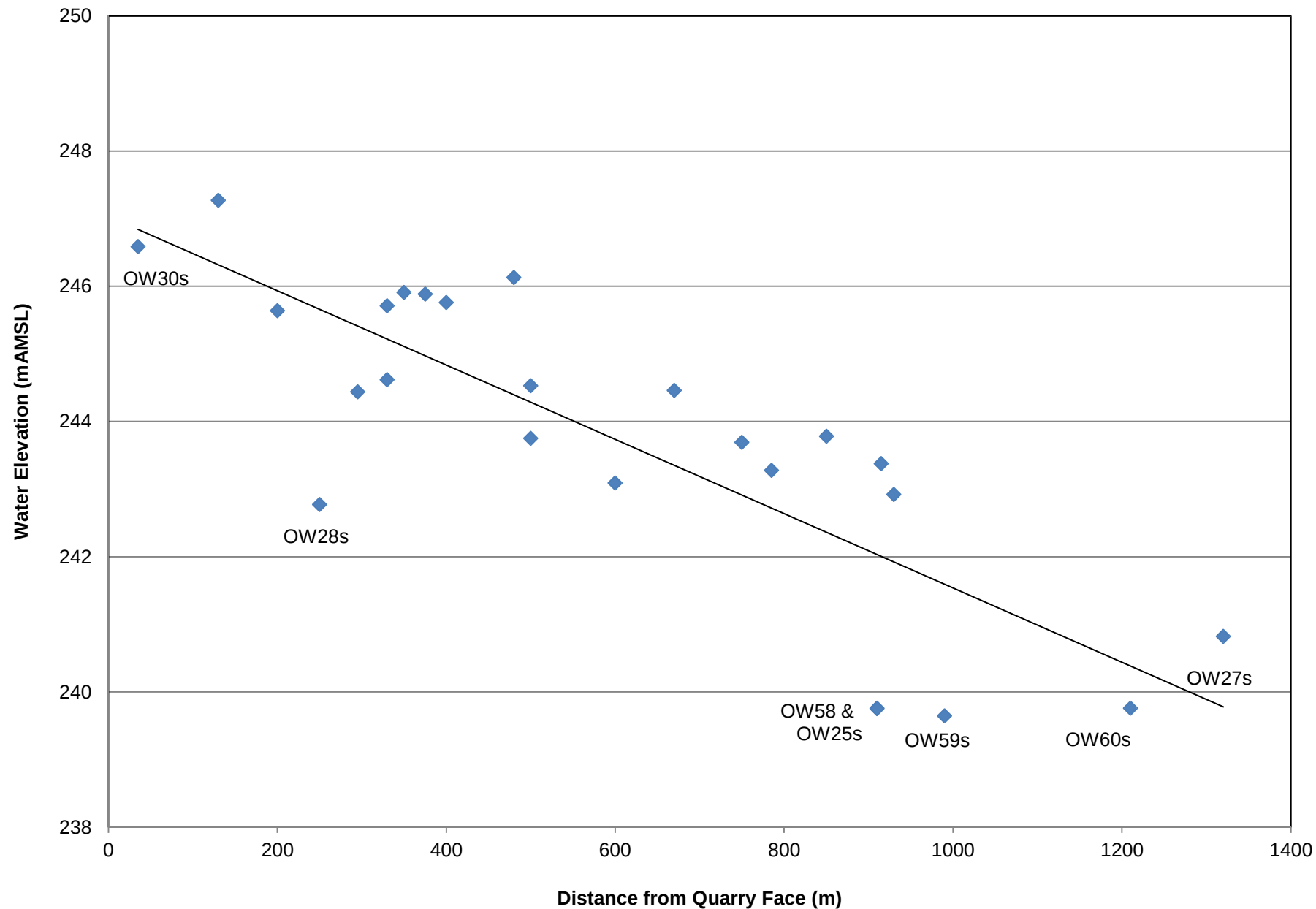
Hydrograph C-8.20: Distance-Water Elevation Shallow Bedrock (August-31-16)



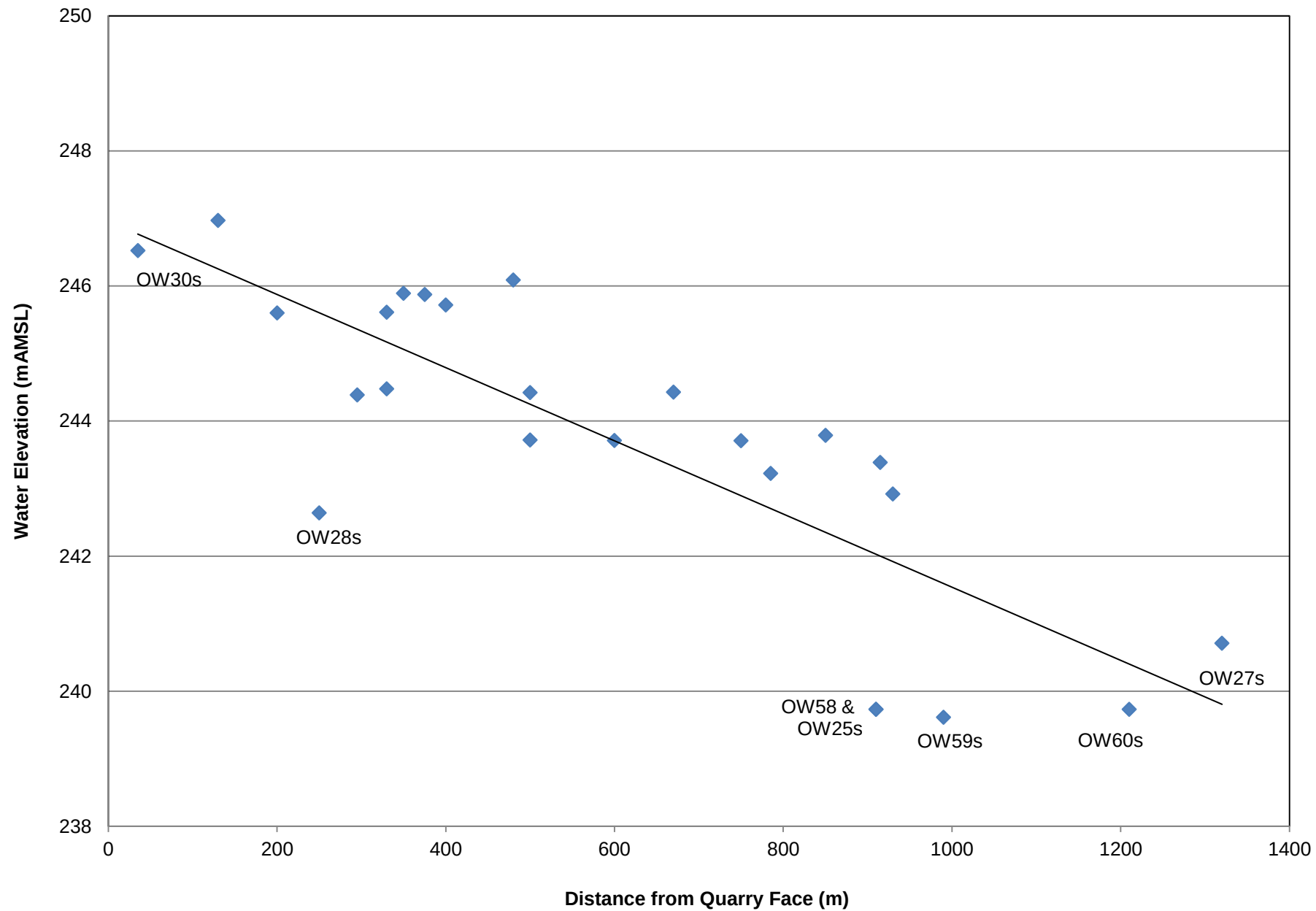
Hydrograph C-8.21: Distance-Water Elevation Shallow Bedrock (Sept-29-16)



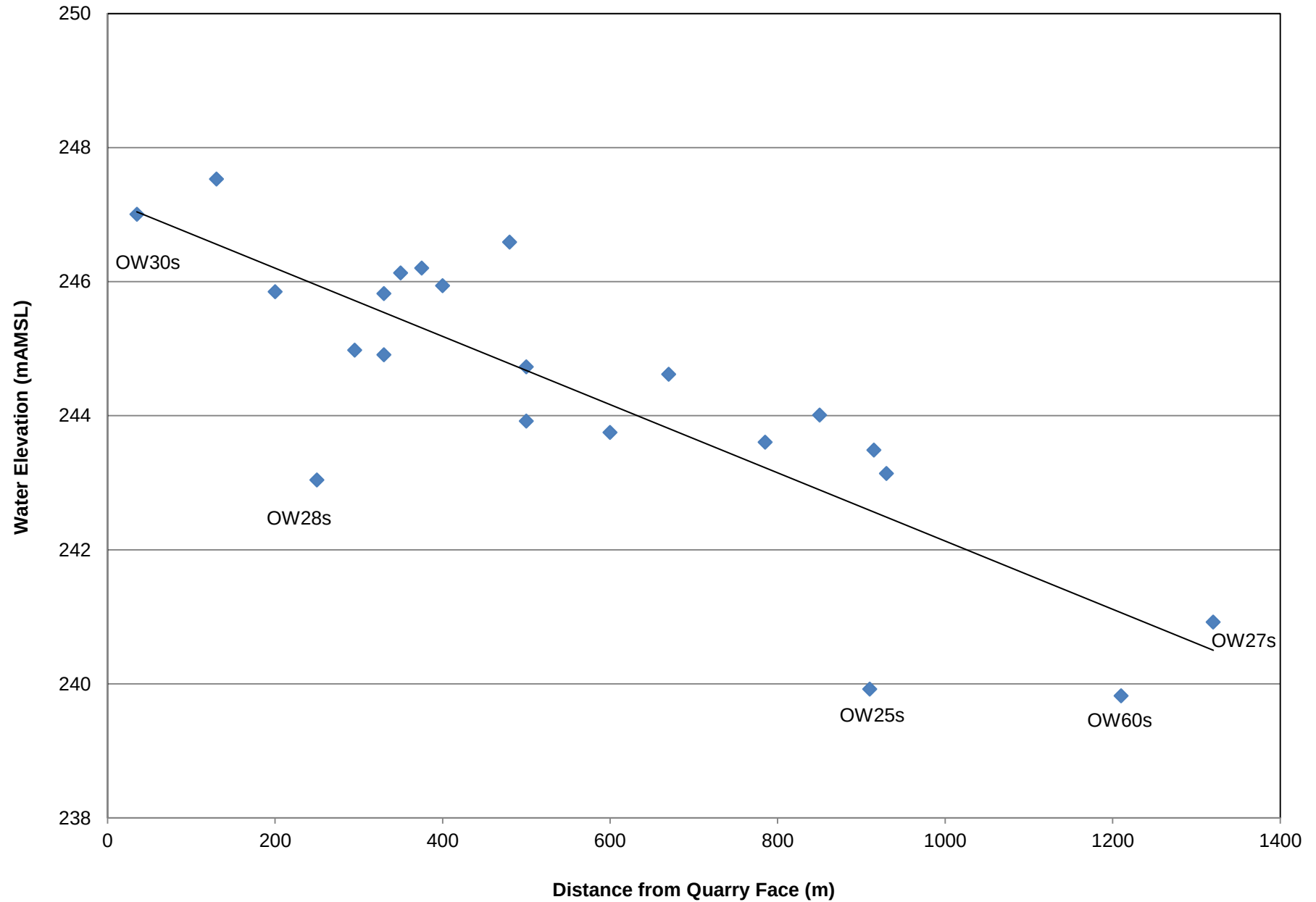
Hydrograph C-8.22: Distance-Water Elevation Shallow Bedrock (Oct- 31-16)



Hydrograph C-8.23: Distance-Water Elevation Shallow Bedrock (Nov-17-16)



Hydrograph C-8.24: Distance-Water Elevation Shallow Bedrock (Dec-23-16)





APPENDIX C9

INTERIM REPORTS AND NOTIFICATIONS

Jay B. Flanagan

From: Jay B. Flanagan
Sent: Wednesday, September 14, 2016 1:30 PM
To: 'jason.mclay2@ontario.ca'
Cc: 'ken.mott@ontario.ca'; 'heather.pollard@ontario.ca'; 'Watt, Rick (MNR)'; 'doran.ritchie'; 'Jennifer Prentice'; Dave Munro; Bruin Belisle; Peter A. Gray; Fraser Cummings
Subject: 33862-100 - Keppel Quarry - Groundwater Monitoring - Notification
Attachments: Table 1.pdf; Hydrographs - August Exceedences.pdf; Figure 2 WATER RESOURCES MONITORING NETWORK.pdf

@AfterMailServer: <http://archivemanager>
@Attachments: <?xml version="1.0" encoding="utf-8"?>
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 </attachment>
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@OriginalMessageClass: IPM.Note

Hi Jason,

As you know, MTE has been retained by HSCL to track groundwater levels at the Keppel Quarry and compare them to the trigger values according to the AMP. After reviewing the data, we observed that some of the trigger values for certain sentry wells were exceeded (breached) in July and August. Table 1 (attached) summarizes the exceedences. As per Condition 4.6 of the AMP, Green Actions are required to determine the reason for the breach. To this end, we have assessed water levels and flows against historical patterns, seasonal lows, trigger values, pumping records and precipitation records.

I am attaching a set of hydrographs that compares water levels to trigger values and precipitation records. The results show that the breach is related to climatological factors (dry summer). Specifically, you will see a downward trend in precipitation throughout the summer followed by a large precipitation event in mid August which has caused water levels to rebound. This increase, along with the fact that there was no pumping during the breach period, further supports the conclusion that the exceedances are related to climatological factors.

As per Condition 10.3 and Appendix B of the AMP, no yellow or red actions are required if it can be shown through Green Actions that the breached trigger values are related to climate influences. As such, no further actions are recommended at this time. We will continue to monitor the ongoing trends.

Despite this conclusion, Condition 10.1 and Appendix B of the AMP requires that the MNRF, MOECC, NEC and SON be notified if trigger values are exceeded. As such, I have Cc'd the following people on this email. Please let me know if there are others in these agencies that should be included on this list:

- MNRF - Ken Mott - District Planner;
- MOECC - Heather Pollard - Supervisor;
- NEC - Rick Watt - Senior Planning Coordinator; and
- SON – Doran Ritchie - Land use Planning Coordinator.

If you have any questions, do not hesitate to contact me.

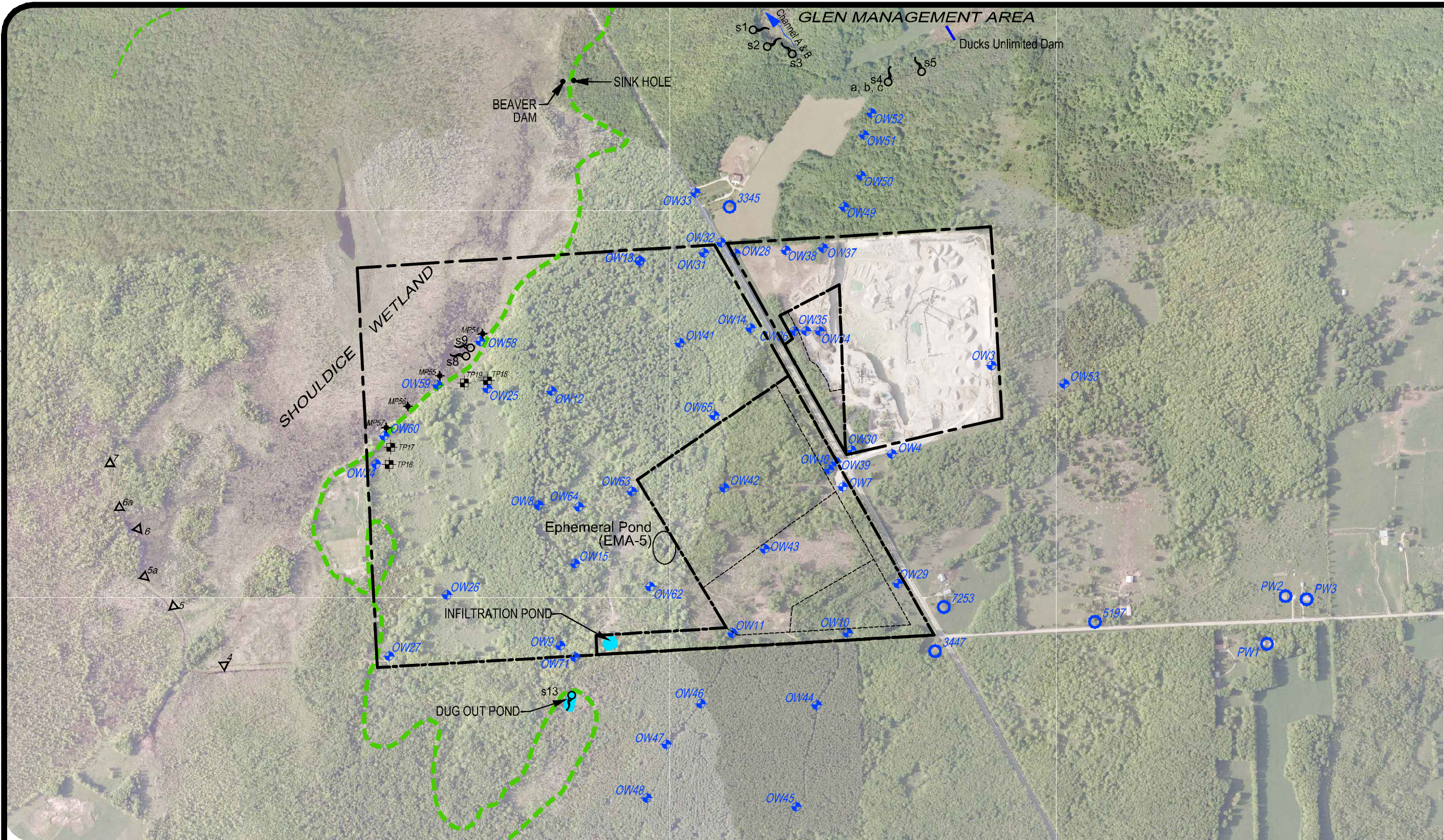
Jay

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Jay Flanagan, B.E.S., B.Ed.

Project Manager

Kitchener x1289



LEGEND

- Extraction Area
- Wetland Boundary
- Licensed Boundary
- HSCL owned lands
- Δ⁴ Surface Water Monitoring Locations

- OW15 Monitoring Well
- 3447 Private Well (Category A)
- PW1 Private Well (Category B)
- TP18 Test Pit
- MP55 Mini Piezometer



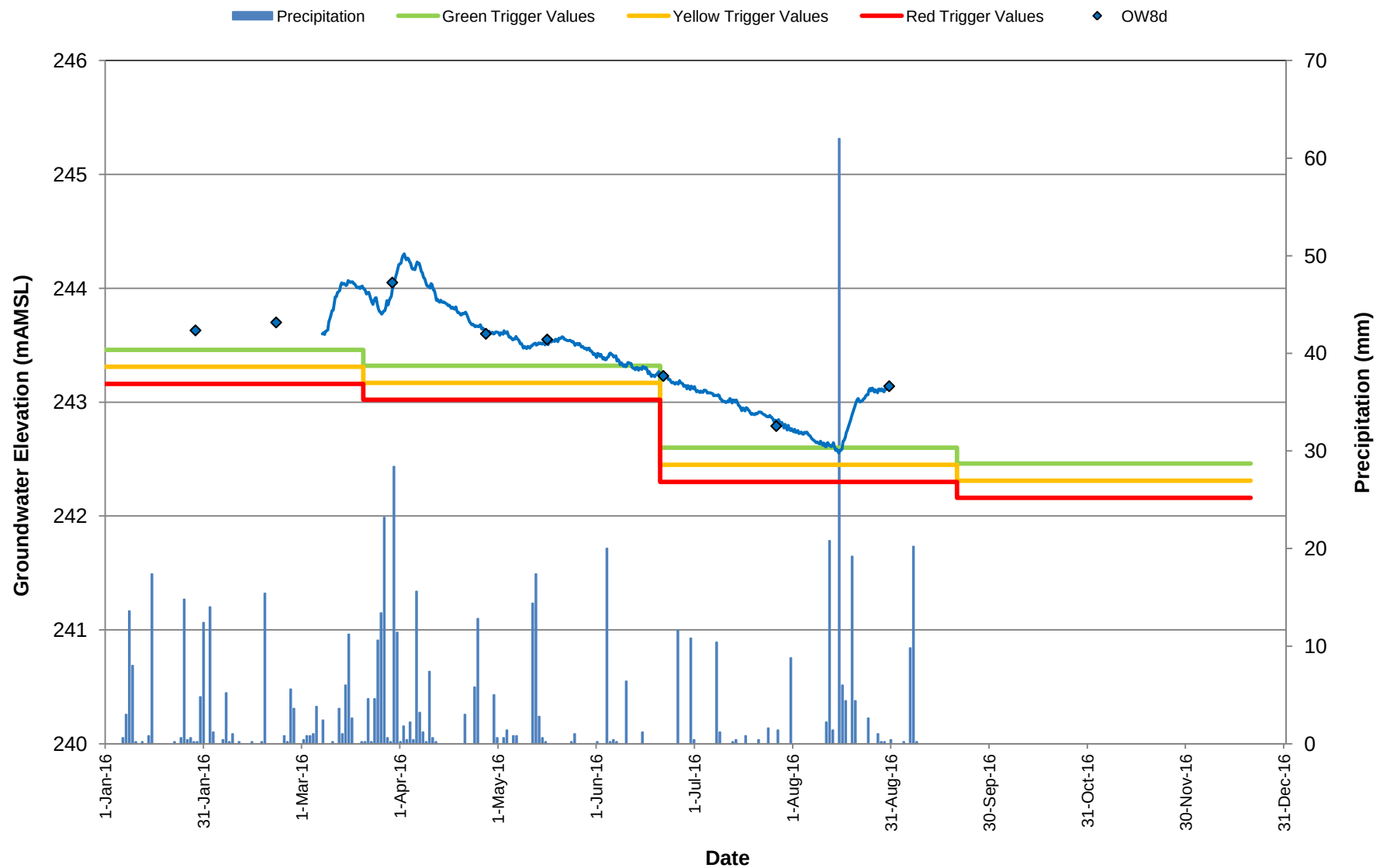
Figure 2 WATER RESOURCES MONITORING NETWORK

Project Name			
Keppel Quarry			
Site		Client	
Georgian Bluffs, Ontario		Harold Sutherland Construction Limited	
Scale	MTE Project No.	Date	Layout No.
1:10,000	33862-100	April 2016	EV30.3

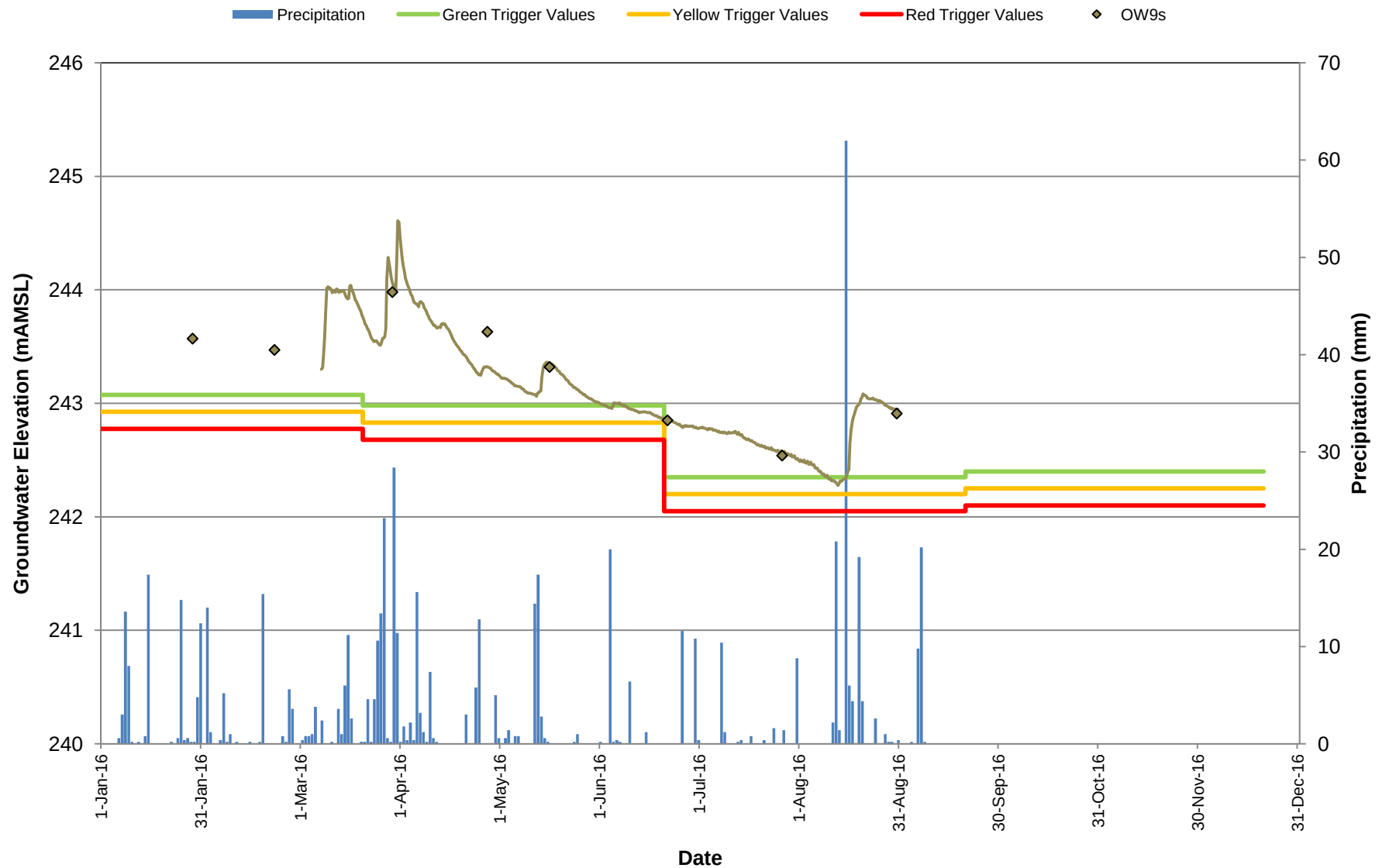
Table 1: Sentry Wells and Trigger Values Exceedances

Well ID	Green Trigger Value Exceedance		Yellow Trigger Value Exceedance		Red Trigger Value Exceedance	
	From	To	From	To	From	To
OW8d	14-Aug-16	16-Aug-16	None	None	None	None
OW9s	10-Aug-16	16-Aug-16	None	None	None	None
OW45	28-Jul-16	16-Aug-16	8-Aug-16	16-Aug-16	None	None
OW47s	30-Jul-16	16-Aug-16	10-Aug-16	16-Aug-16	None	None
OW47d	27-Jul-16	16-Aug-16	6-Aug-16	16-Aug-16	None	None
OW51	2-Aug-16	16-Aug-16	None	None	None	None
OW71k	24-Jun-16	16-Aug-16	18-Jul-16	16-Aug-16	28-Jul-16	16-Aug-16
OW71s	2-Jul-16	16-Aug-16	17-Jul-16	16-Aug-16	23-Jul-16	16-Aug-16
OW71d	25-Jun-16	16-Aug-16	16-Jul-16	16-Aug-16	24-Jul-16	16-Aug-16

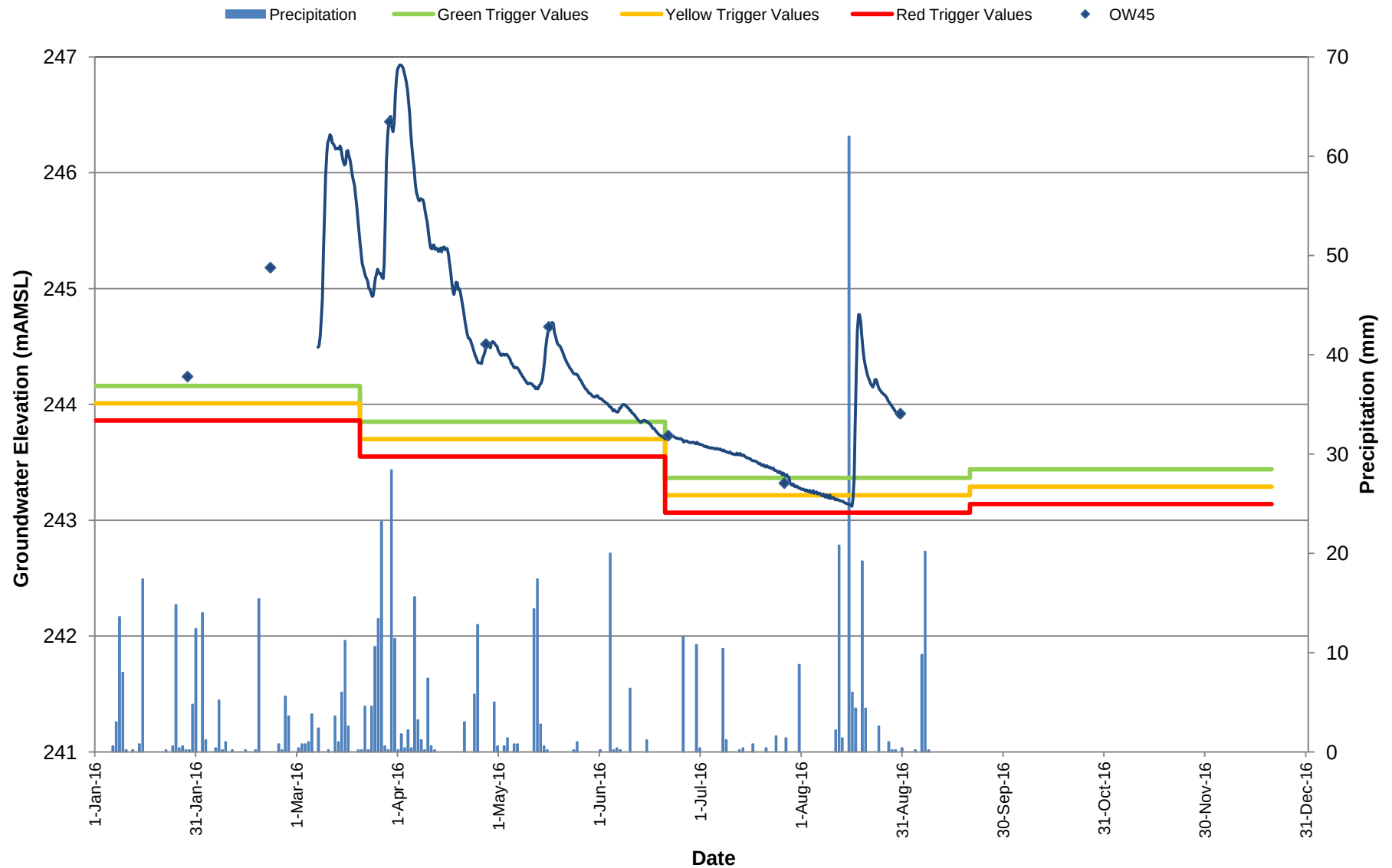
Hydrograph 1: Groundwater Elevations - OW8d



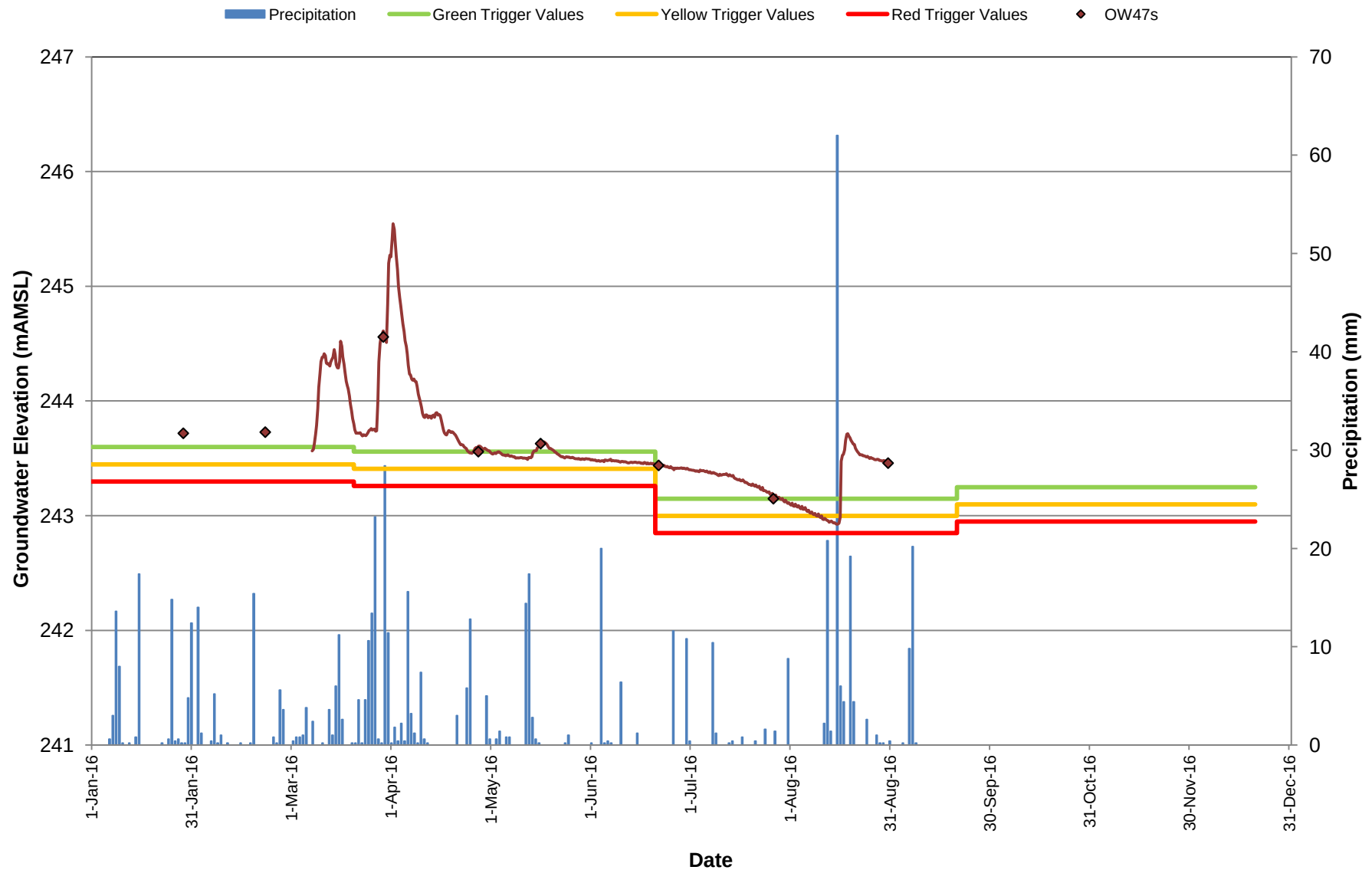
Hydrograph 2: Groundwater Elevations - OW9s



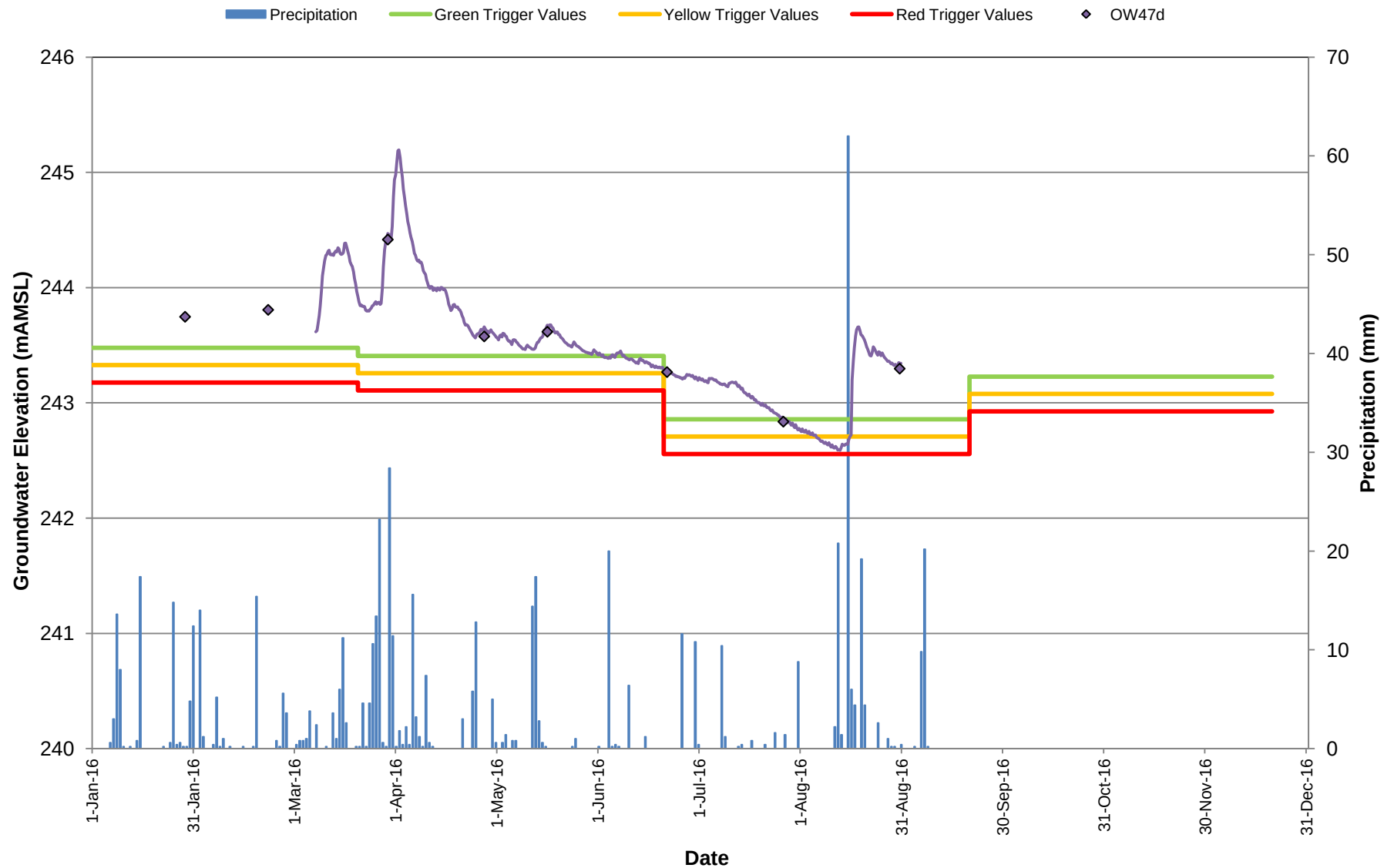
Hydrograph 3: Groundwater Elevations - OW45



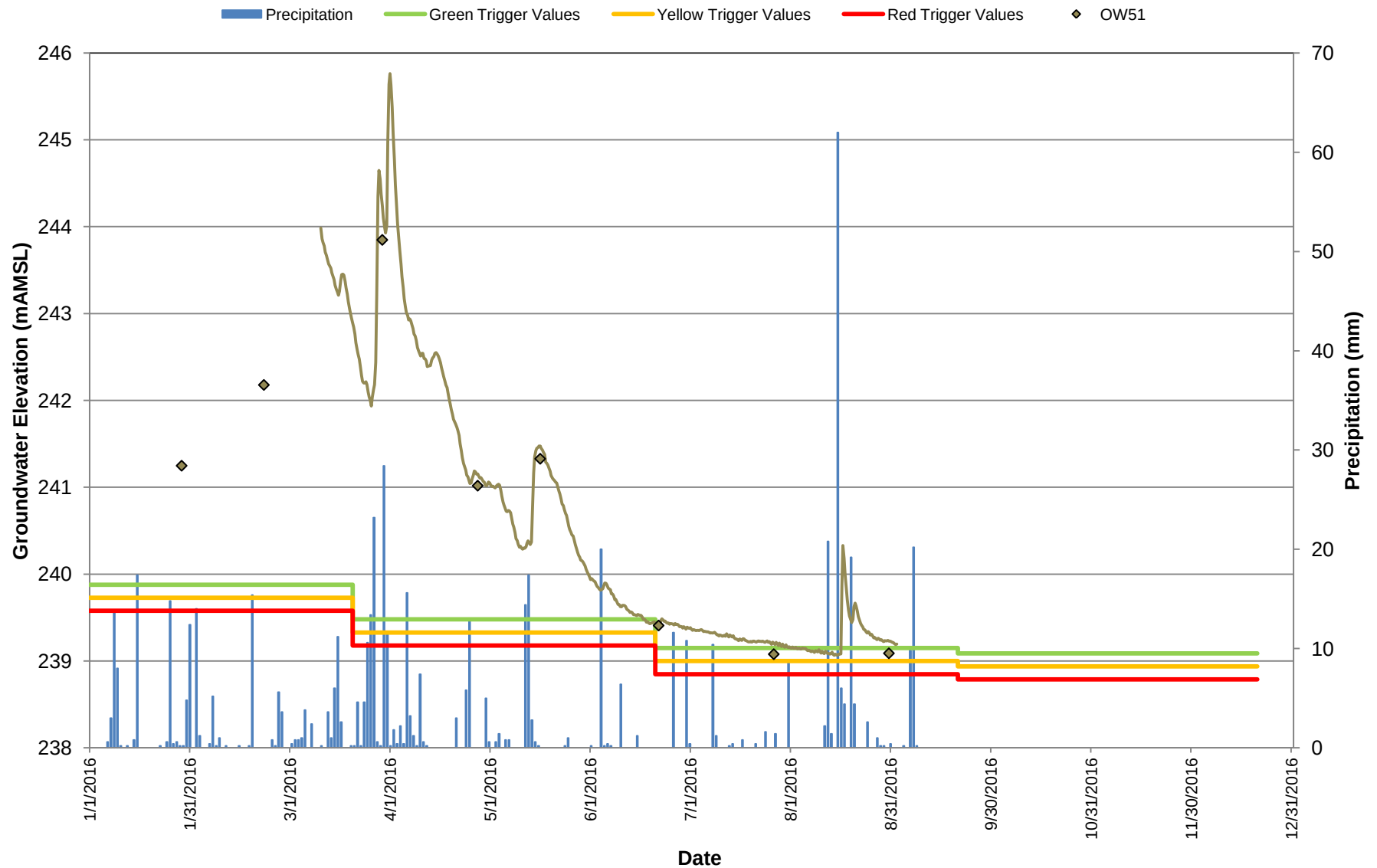
Hydrograph 4: Groundwater Elevations - OW47s



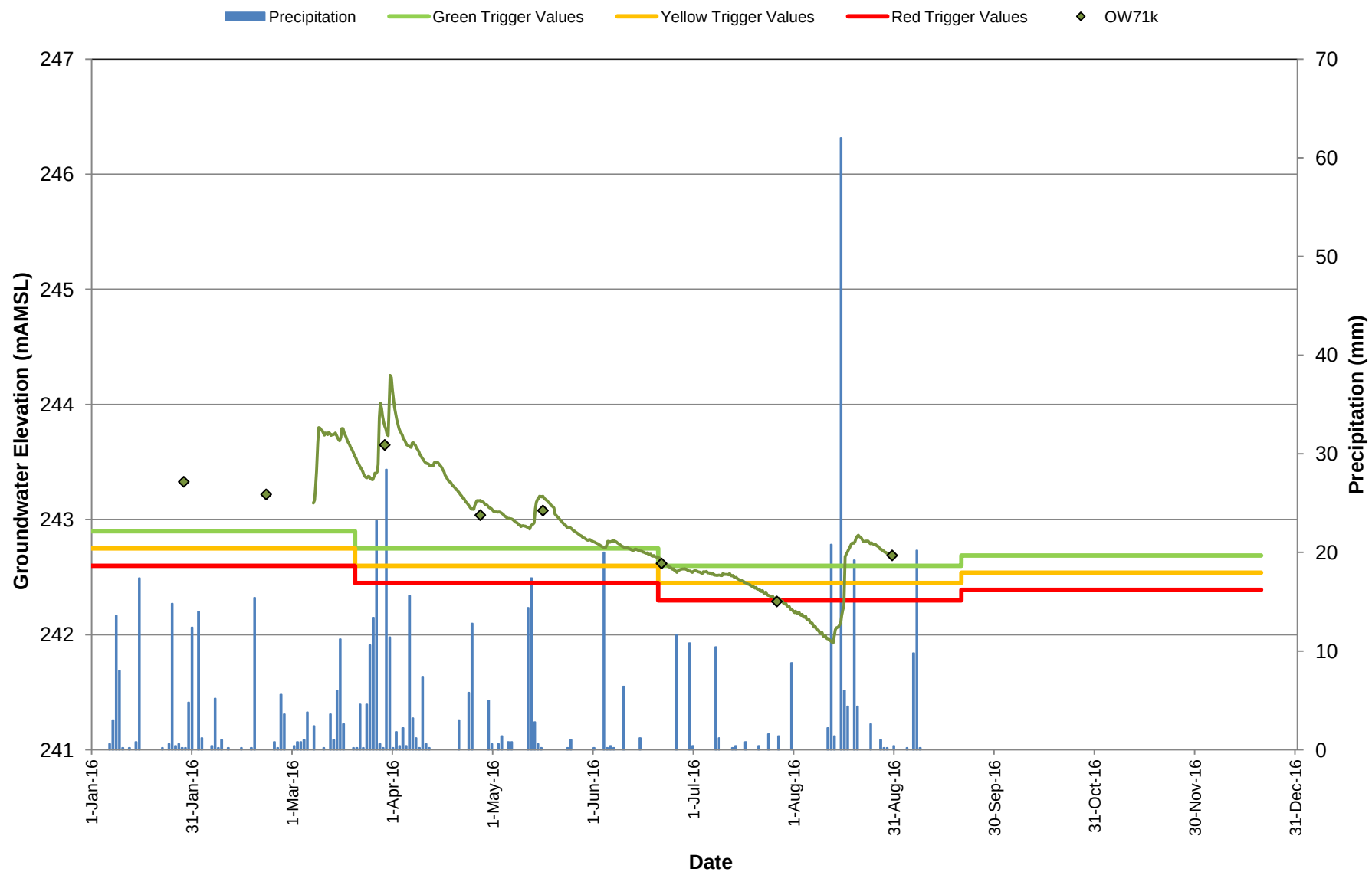
Hydrograph 5: Groundwater Elevations - OW47d



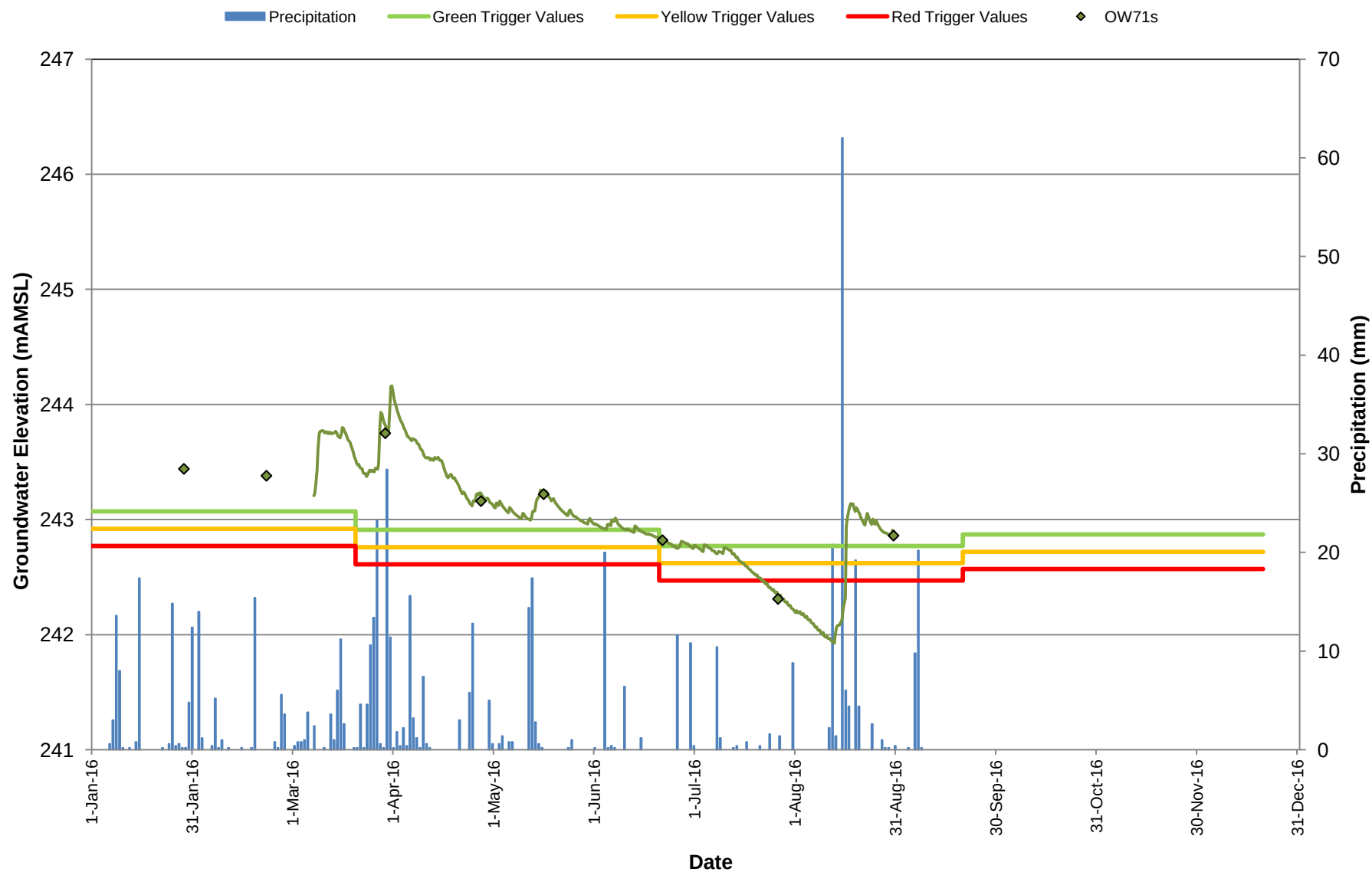
Hydrograph 6: Groundwater Elevations - OW51



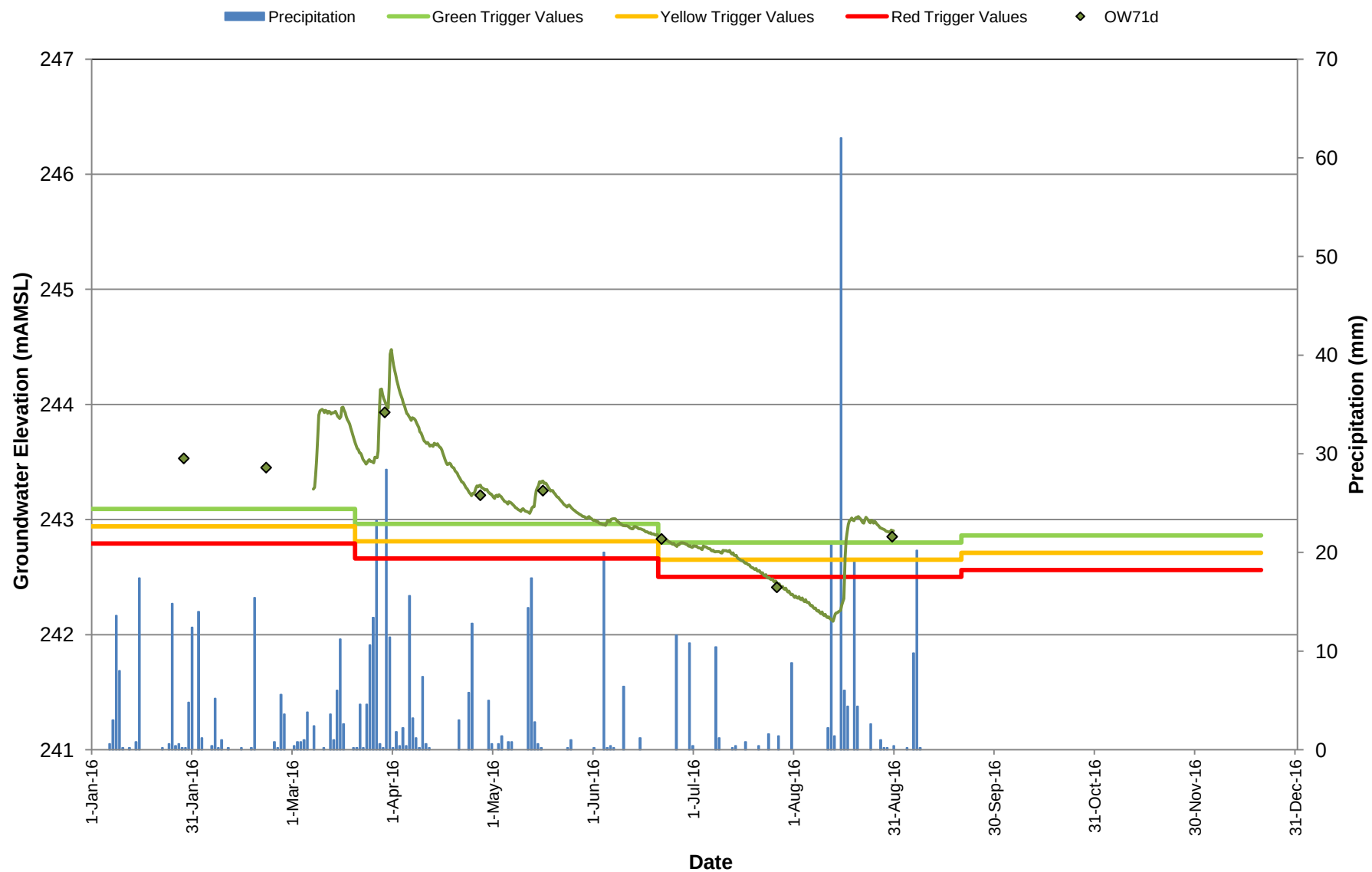
Hydrograph 7: Groundwater Elevations - OW71k



Hydrograph 8: Groundwater Elevations - OW71s



Hydrograph 9: Groundwater Elevations - OW71d



Jay B. Flanagan

From: Jay B. Flanagan
Sent: Tuesday, September 20, 2016 3:03 PM
To: 'jason.mclay2@ontario.ca'
Cc: Dave Munro; 'Jennifer Prentice'; Bruin Belisle; Peter A. Gray; Fraser Cummings
Subject: 33862-100 - Keppel Quarry - Climate Records
Attachments: Keppel Quarry 2016 vs Climate Normals.pdf; Keppel Quarry vs Climate Normals 2006-2015 Table.pdf

Hi Jason,

Further to our telephone conversation last Friday, attached is the additional climate info you requested to support the conclusion that 2016 has been a dry year. Attached is a graph showing monthly precipitation values compared to Climate Normals for 2016. This graph shows abnormally low precipitation values throughout the summer - especially in May and July where the Site received less than half the Normal amount of precipitation.

Also attached is a table showing annual precipitation values compared to Climate Normals over the last 10 years. This table shows that 2015 was also a dry year. The last time there was two dry years in a row was 2009/2010.

Jay

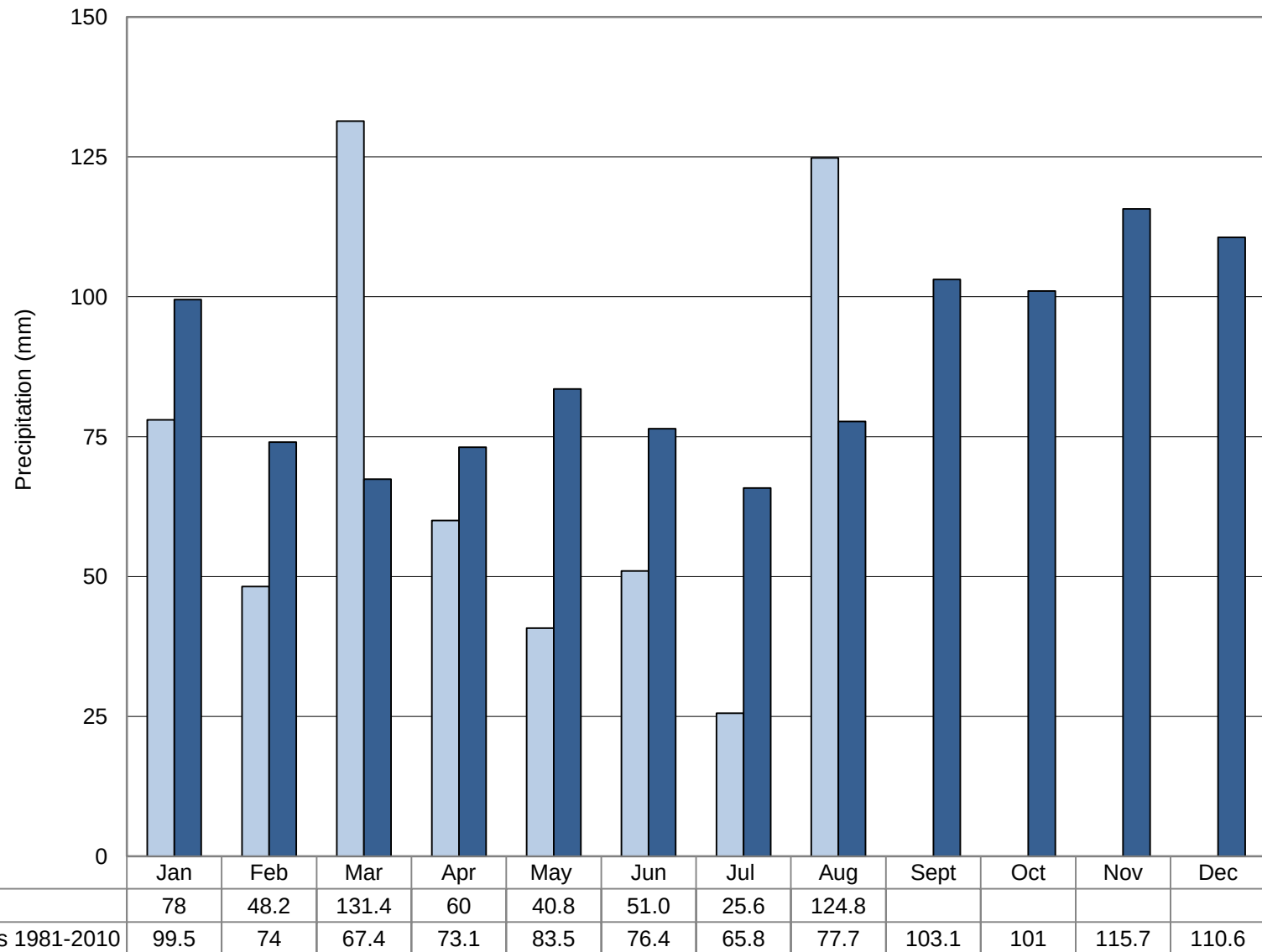
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Jay Flanagan, B.E.S., B.Ed.

Project Manager

Kitchener x1289

Precipitation (mm) - Keppel Quarry (2016) vs. Climate Normals (1981 - 2010)



Annual Precipitation vs. Climate Normals

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Precipitation (mm/year)	1088.4	979.1	1270.2	960.9	912.3	1281.9	985.8	1390.4	1126.4	831.5
Climate Normal (1981-2010)	1047.9	1047.9	1047.9	1047.9	1047.9	1047.9	1047.9	1047.9	1047.9	1047.9

Notes

Precipitation Data Prior to July 2015 was obtained from the Wiarion Airport Weather Station. From July 2015 to present precipitation data has been gathered on-Site.

Jay B. Flanagan

From: Jay B. Flanagan
Sent: Wednesday, October 19, 2016 2:38 PM
To: 'Dave Munro'; 'Bruin Belisle'
Cc: 'Jennifer Prentice'; Peter A. Gray; Fraser Cummings
Subject: 33862-100 - Keppel Quarry - AMP - Water Levels
Attachments: Figure 1 WATER RESOURCES MONITORING NETWORK.pdf

Hi Dave,

We finished our compilation and review of the water level data for the Sentry wells using the new September data. Groundwater levels have rebounded since the summer but there was an Green Trigger exceedance at OW71. No agencies need to be notified at this time since only Green Triggers have been exceeded but this Condition requires HSCL to increase the monitoring frequency to weekly at the monitoring wells listed below. Before proceeding with this extra effort, I recommend measuring water levels from only OW71 to determine if water levels have rebounded above the Green Trigger value, which may nullify the need for extra measurements.

- Line 6: OW39 OW40 OW62k OW62s OW62d OW9s OW9d OW70s OW70d OW27s OW27d
- Line 7: OW39 OW7s OW7d OW43s OW43d OW11s OW11d OW46s OW46d OW47s OW47d OW48s OW48d
- Line 8: OW30s OW30d OW39 OW10s OW10d OW44s OW44d OW45
- The Dugout Pond: SG1
- Spring S13

Give me a call if you'd like to discuss, I'm in the office today.

Jay



 Extraction Area
 Licensed Boundary
 HSCL owned lands
 Surface Water Monitoring Locations

 OW47 Sentry Well



MTE
ENVIRONMENTAL DIVISION

Project Name
Keppel Quarry

Site
Georgian Bluffs, Ontario

Client
Harold Sutherland Construction Limited

Scale.
1:10,000

MTE Project No.
33862-100

Date
December 2014

Layout No.
EV4.1

Jay B. Flanagan

From: Jay B. Flanagan
Sent: Tuesday, November 01, 2016 12:08 PM
To: 'Bruin Belisle'
Cc: Fraser Cummings; 'John Morton (aws@gbtel.ca)'; 'Dave Munro'; Peter A. Gray; 'Jennifer Prentice'
Subject: RE: OW71

Hi Bruin,

Dave and I reviewed the AMP this morning to gain clarity on the required actions due to the green exceedance at OW71. In order to be in compliance, the frequency of monitoring needs to be increased to weekly at the following stations:

- Line 6: OW39 OW40 OW62k OW62s OW62d OW9s OW9d OW70s OW70d OW27s OW27d
- Line 7: OW39 OW7s OW7d OW43s OW43d OW11s OW11d OW46s OW46d OW47s OW47d OW48s OW48d
- Line 8: OW30s OW30d OW39 OW10s OW10d OW44s OW44d OW45
- The Dugout Pond: SG1 (water levels and flow)
- Spring S13 (water levels and flow)

Can you let me know when you can measure these water levels next week? Weekly measurements will stay into effect until the water levels rebound.

Jay

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Jay Flanagan, B.E.S., B.Ed.

Project Manager

Kitchener x1289

From: Jay B. Flanagan
Sent: Tuesday, November 01, 2016 11:24 AM
To: 'Dave Munro'; Bruin Belisle
Cc: Fraser Cummings; John Morton (aws@gbtel.ca)
Subject: RE: OW71

Will do...thanks Dave.

J

From: Dave Munro [<mailto:dave@hsc-ltd.com>]
Sent: Tuesday, November 01, 2016 10:56 AM
To: Jay B. Flanagan; Bruin Belisle
Cc: Fraser Cummings; John Morton (aws@gbtel.ca)
Subject: RE: OW71

Thanks for this – the mitigation measures on page 5 of the plan indicate that for this green trigger exceedance that the Ecologist/Biologist must also be notified within 24 hrs. – so I've copied John Morton on this email so he is in the loop – please keep John informed as long as the exceedance occurs.

Dave Munro

Harold Sutherland Construction Ltd.
Aggregate Sales & Compliance Manager
Ph: 519-376-5698 Ext. 247
Cel: 519-375-2977
Fax: 519-371-6121
E-mail: dave@hsc-ltd.com



From: Jay B. Flanagan [<mailto:JFlanagan@mte85.com>]
Sent: November-01-16 10:27 AM
To: Bruin Belisle <bbelisle@hsc-ltd.com>
Cc: Dave Munro <dave@hsc-ltd.com>; Fraser Cummings <FCummings@mte85.com>
Subject: RE: OW71

Hi Bruin,
We had a look at OW71 using the new water levels you sent and it has slipped under the Green Trigger value again. Once you send us the rest of the data from the other monitoring stations, we'll let you know which wells we'll need you to measure again next week. My guess is that all other monitors will be fine and only OW71 will require extra monitoring.
Jay

Jay Flanagan, B.E.S., B.Ed. | Project Manager
MTE Consultants Inc.

T: 519-743-6500 x1289 | JFlanagan@mte85.com
520 Bingham Centre Dr., Kitchener, ON N2B 3X9
www.mte85.com | [Twitter](#) | [LinkedIn](#)

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From: Bruin Belisle [<mailto:bbelisle@hsc-ltd.com>]
Sent: Monday, October 31, 2016 4:39 PM
To: Jay B. Flanagan; Fraser Cummings
Cc: Dave Munro
Subject: OW71

OW71 levels from October sampling.

OW71s - 3.15
OW71d - 3.22
OW71k - 3.26

Thanks,

Bruin Belisle

Harold Sutherland Construction Ltd.

Environmental Technician

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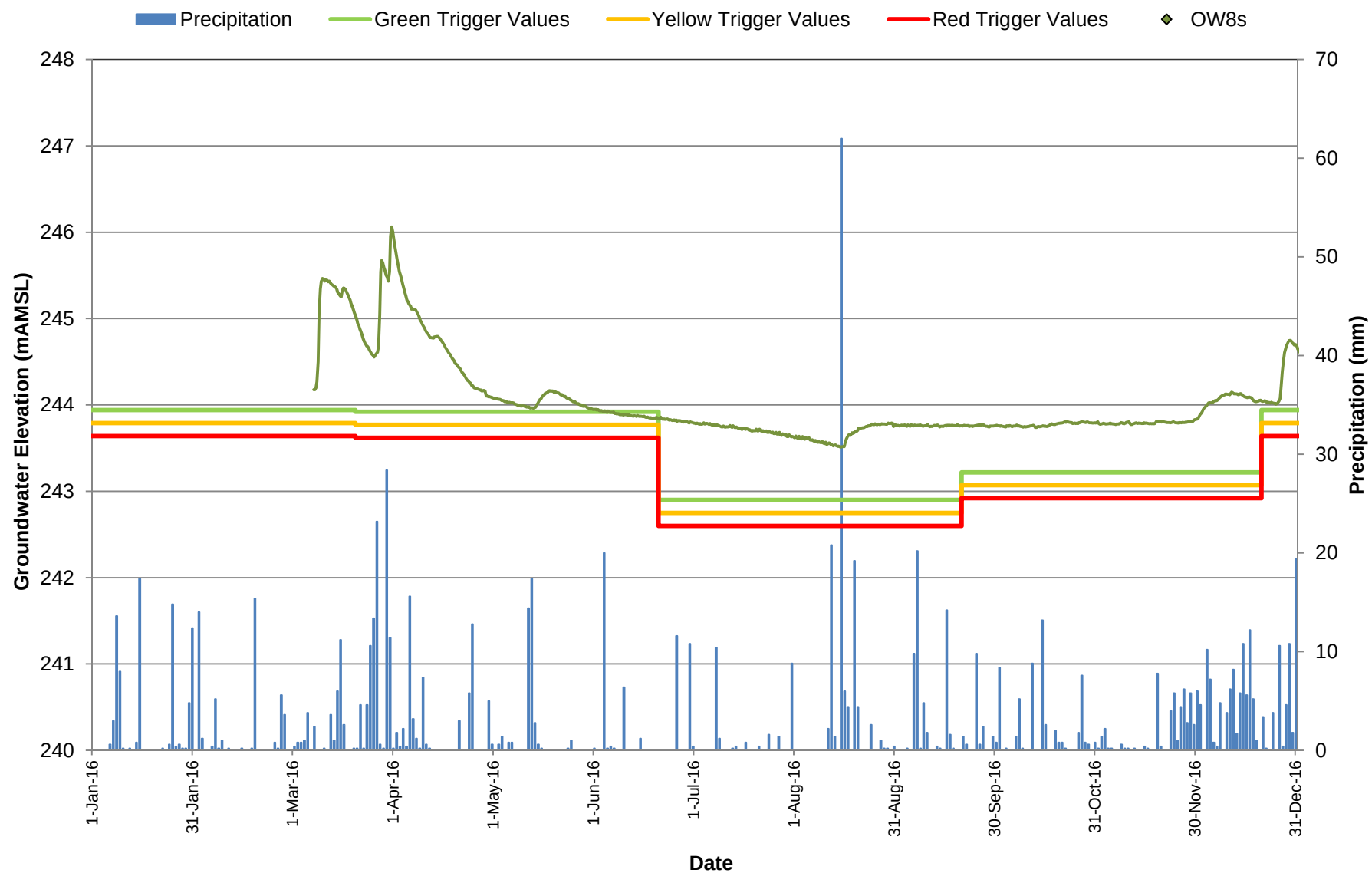
E-mail: bbelisle@hsc-ltd.com



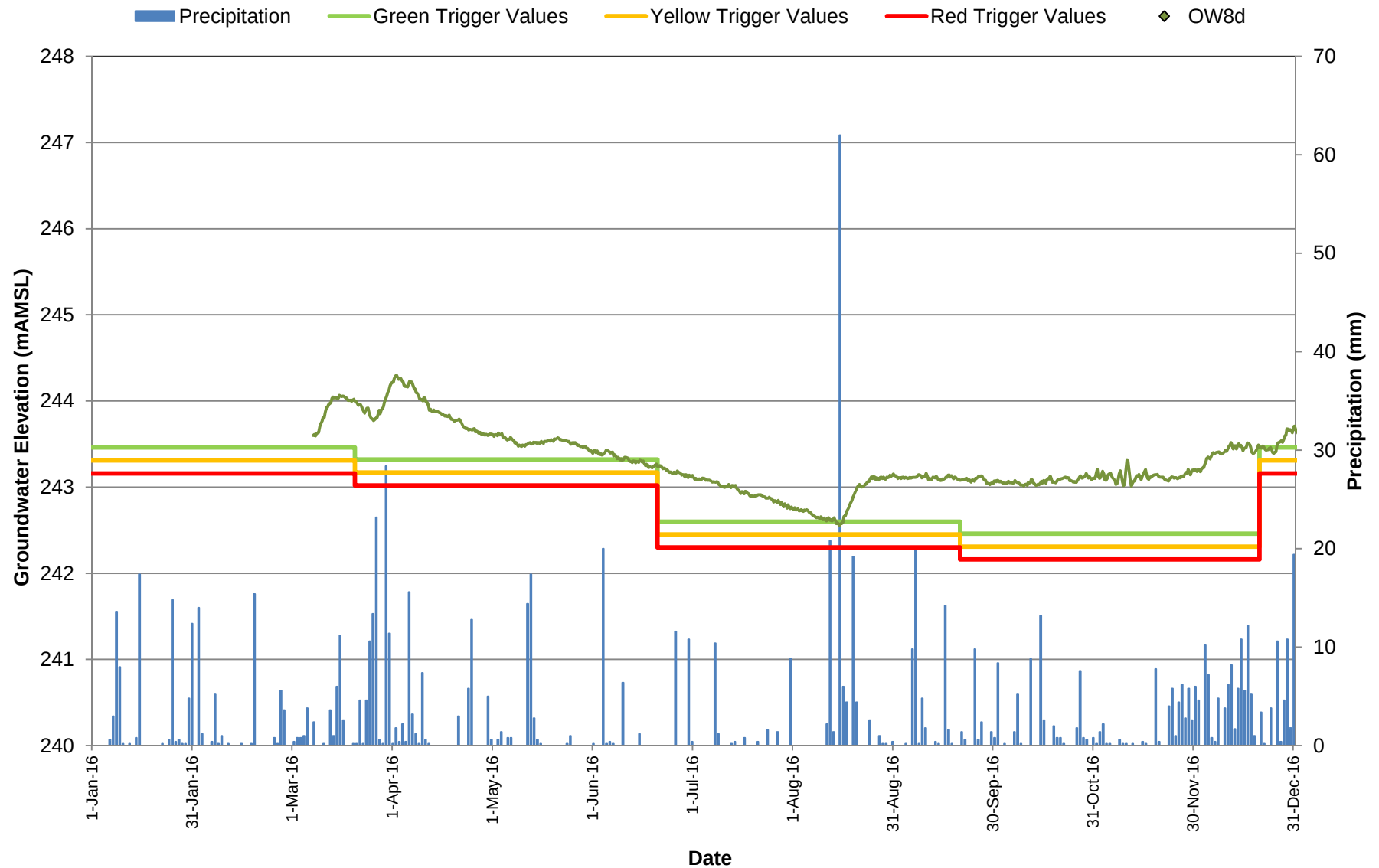
APPENDIX C10

SENTRY WELLS AND TRIGGER VALUES

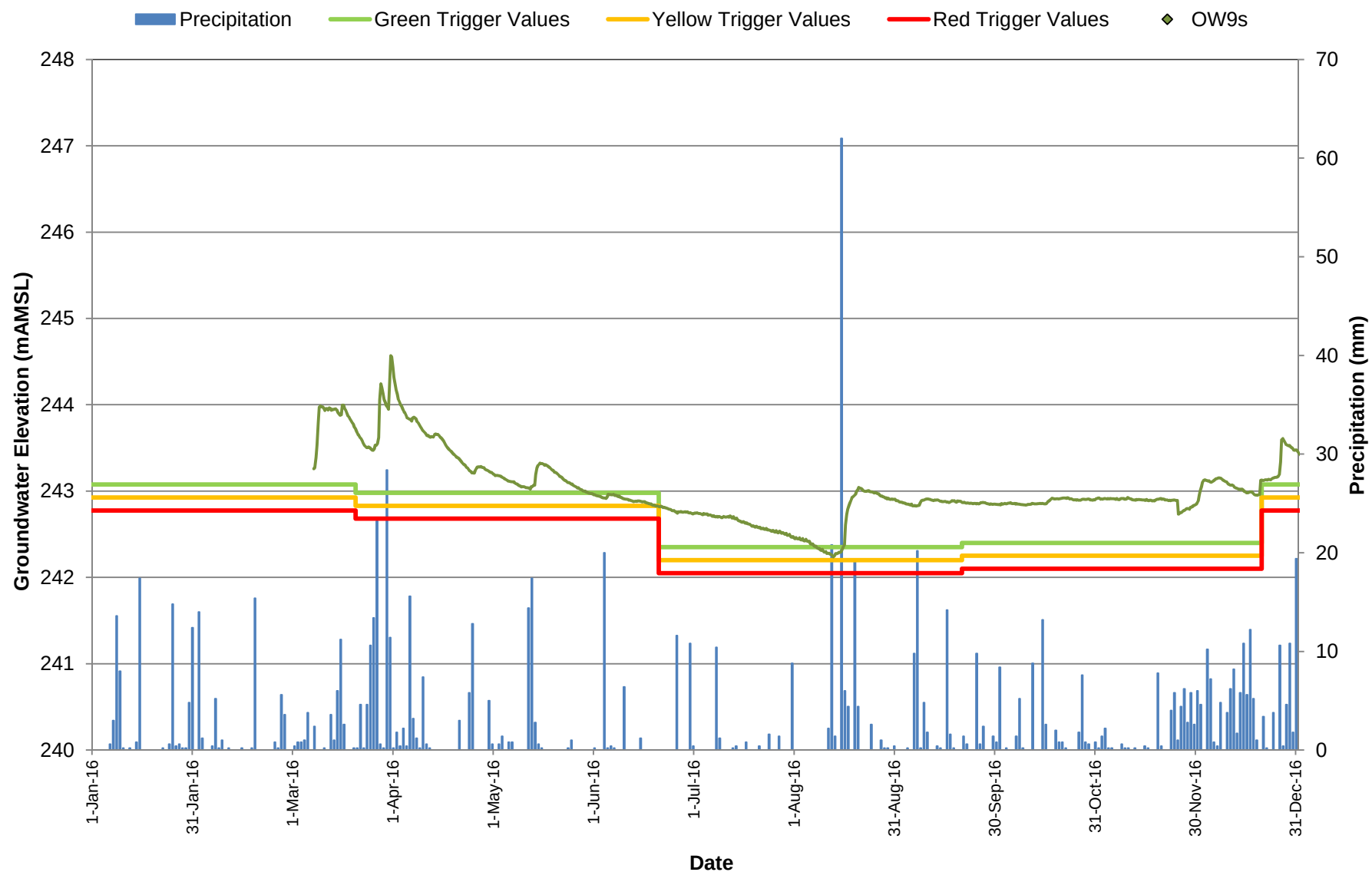
Hydrograph C-10.1: Groundwater Elevations - OW8s



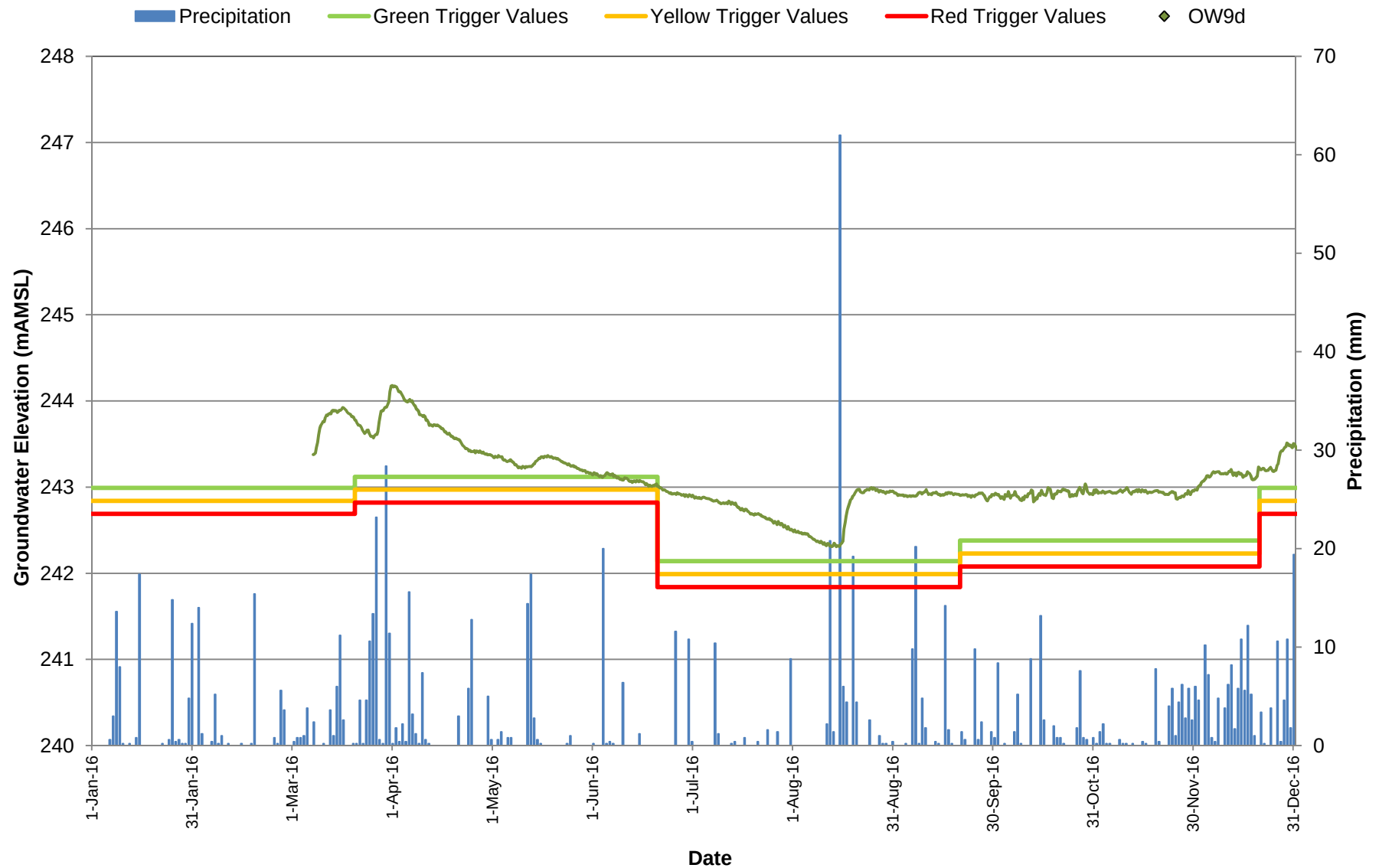
Hydrograph C-10.2: Groundwater Elevations - OW8d



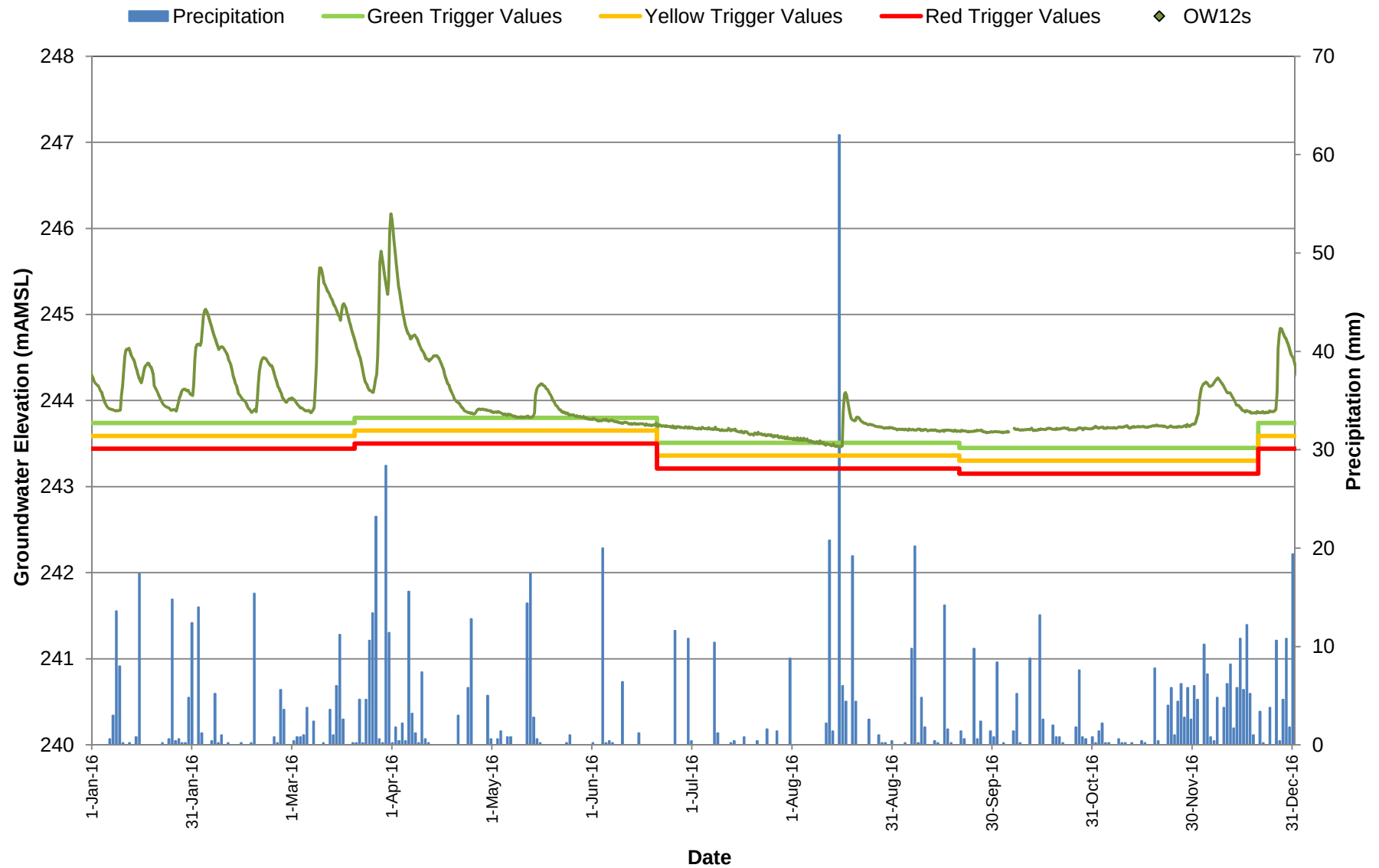
Hydrograph C-10.3: Groundwater Elevations - OW9s



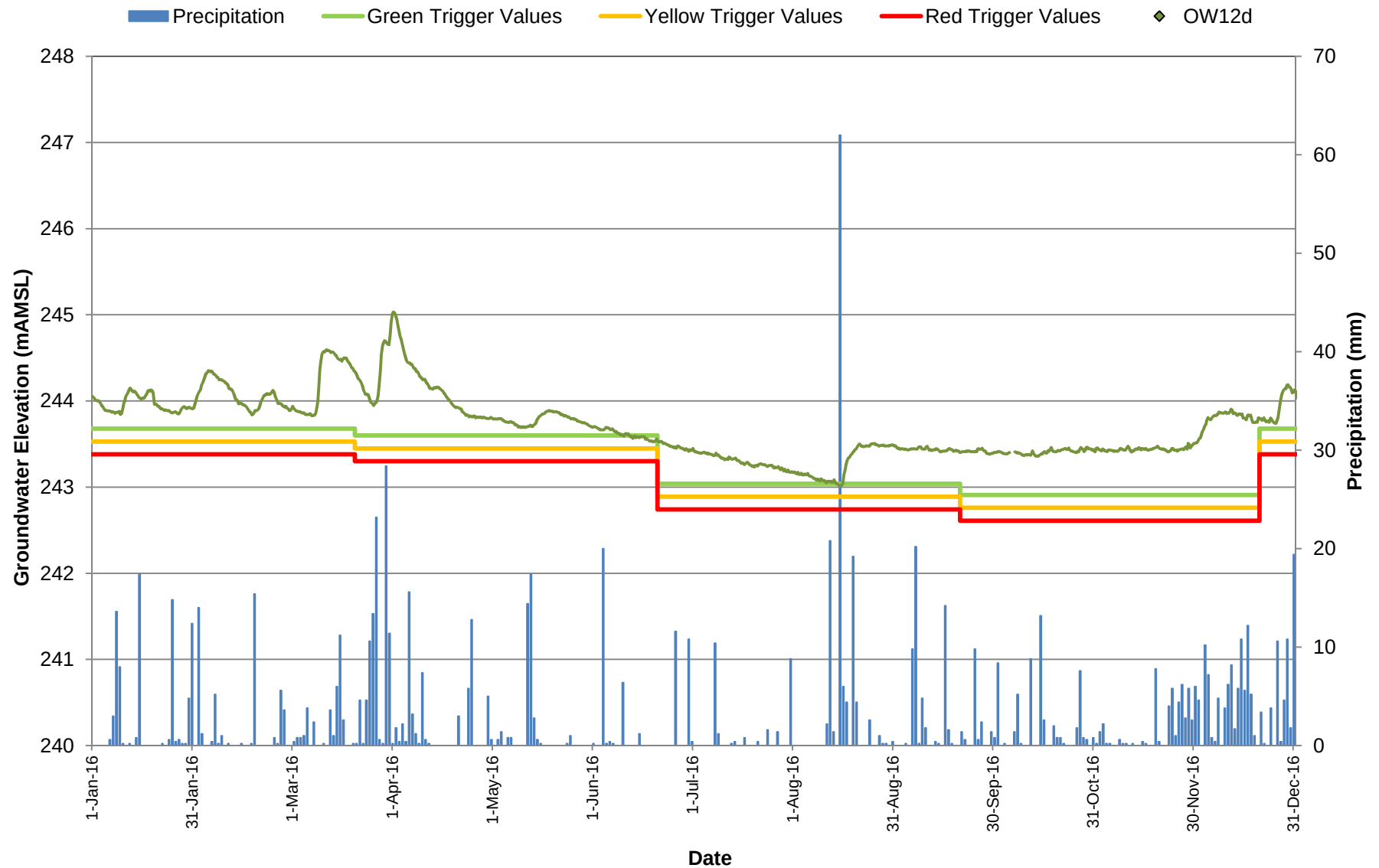
Hydrograph C-10.4: Groundwater Elevations - OW9d



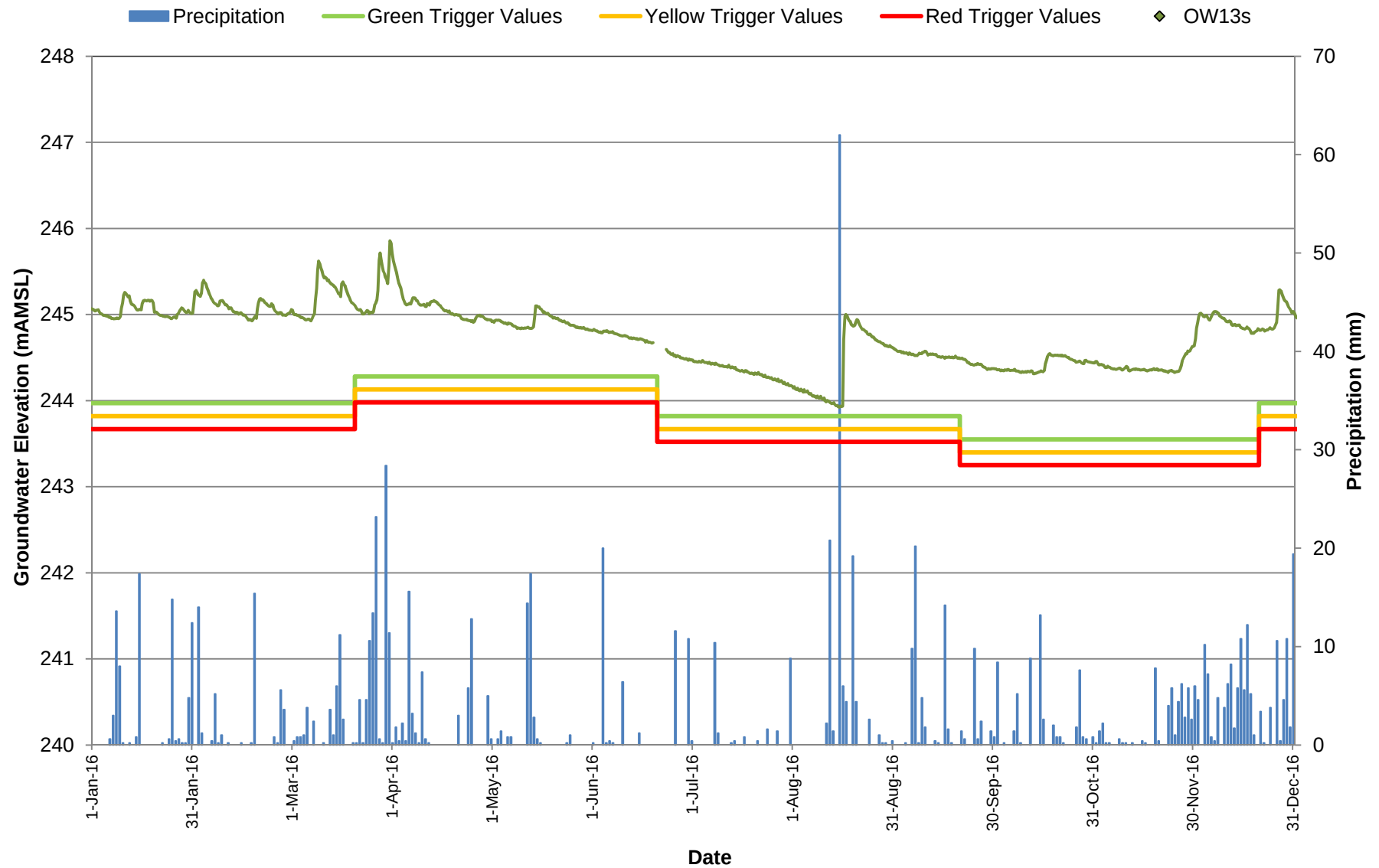
Hydrograph C-10.5: Groundwater Elevations - OW12s



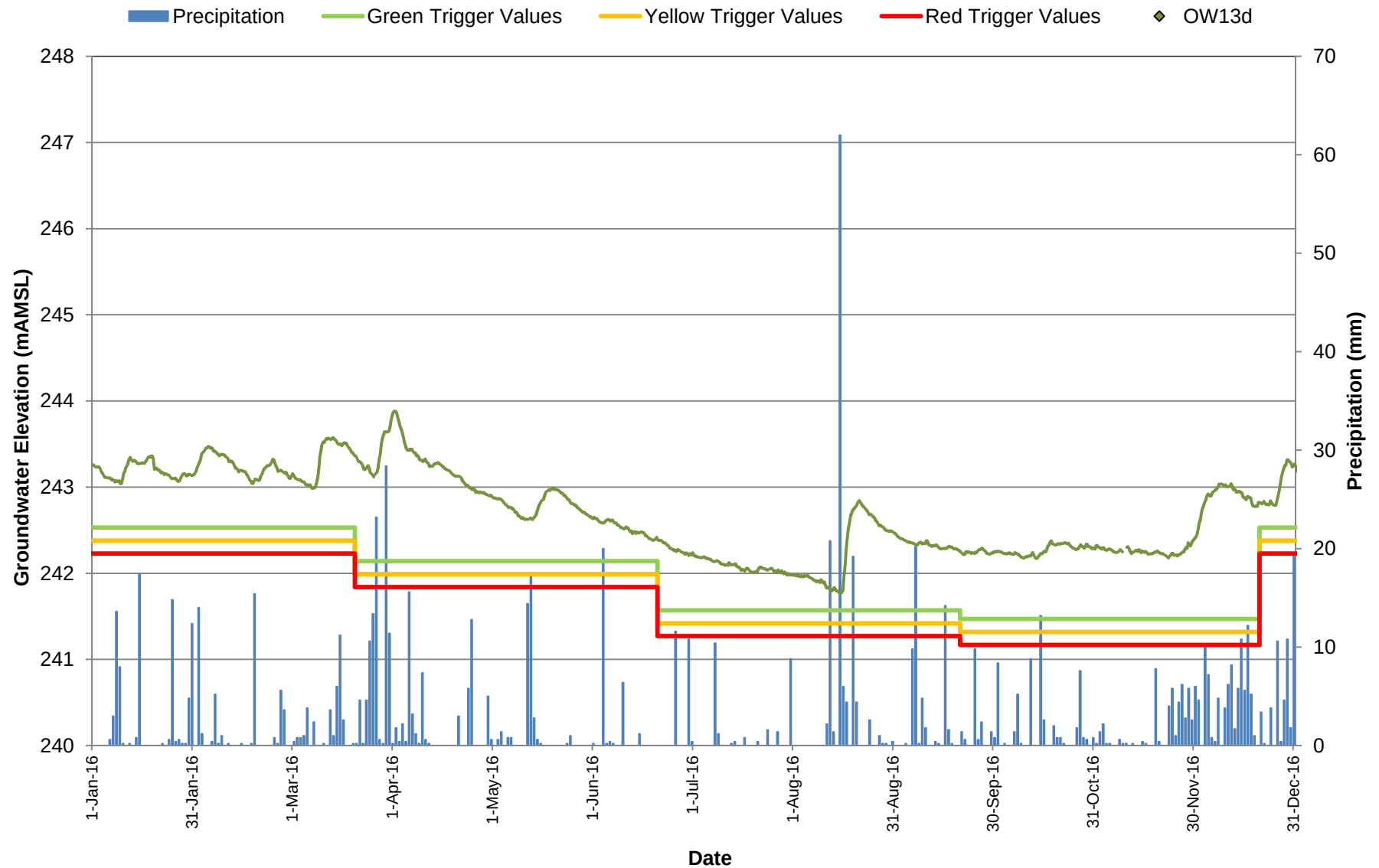
Hydrograph C-10.6: Groundwater Elevations - OW12d



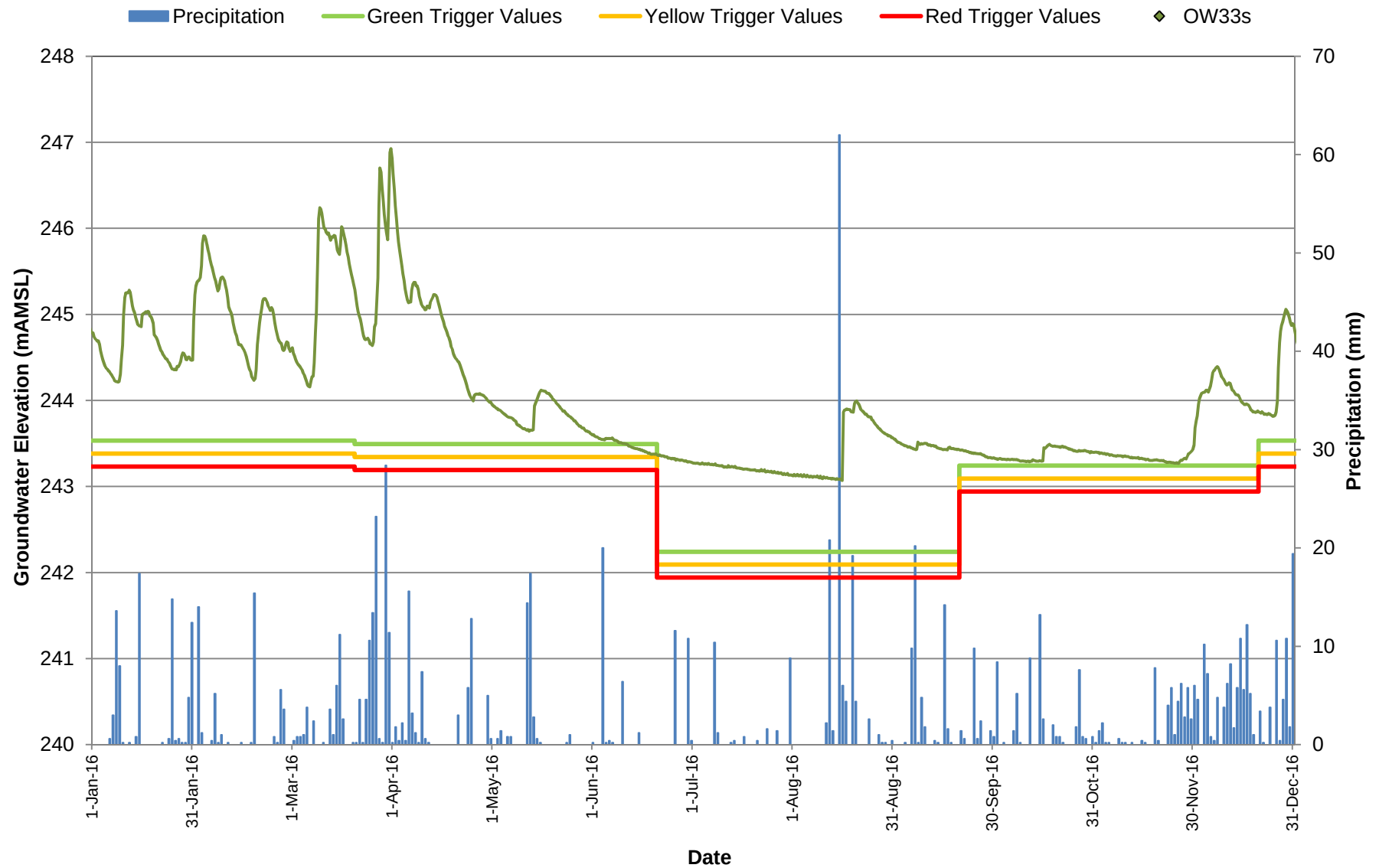
Hydrograph C-10.7: Groundwater Elevations - OW13s



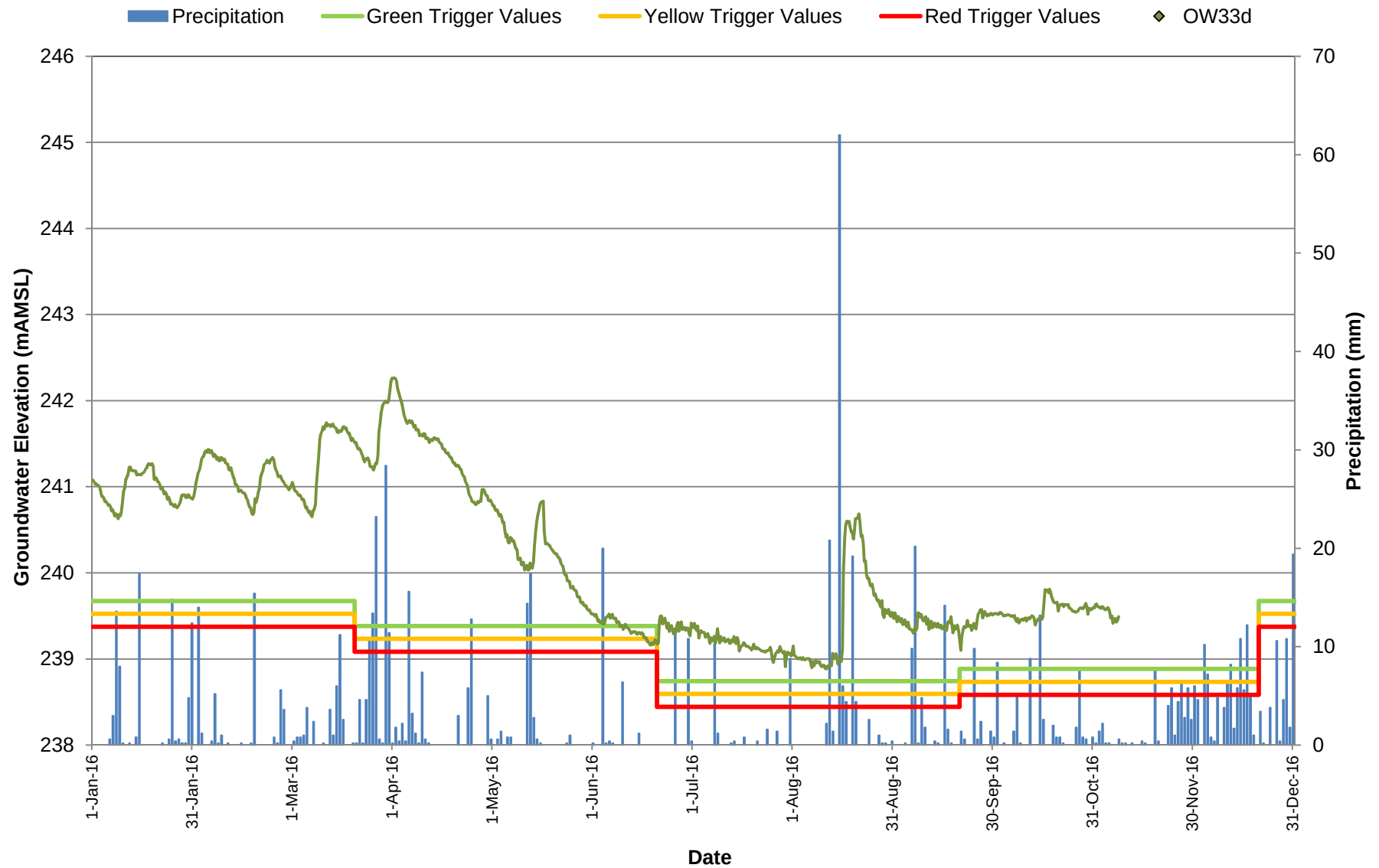
Hydrograph C-10.8: Groundwater Elevations - OW13d



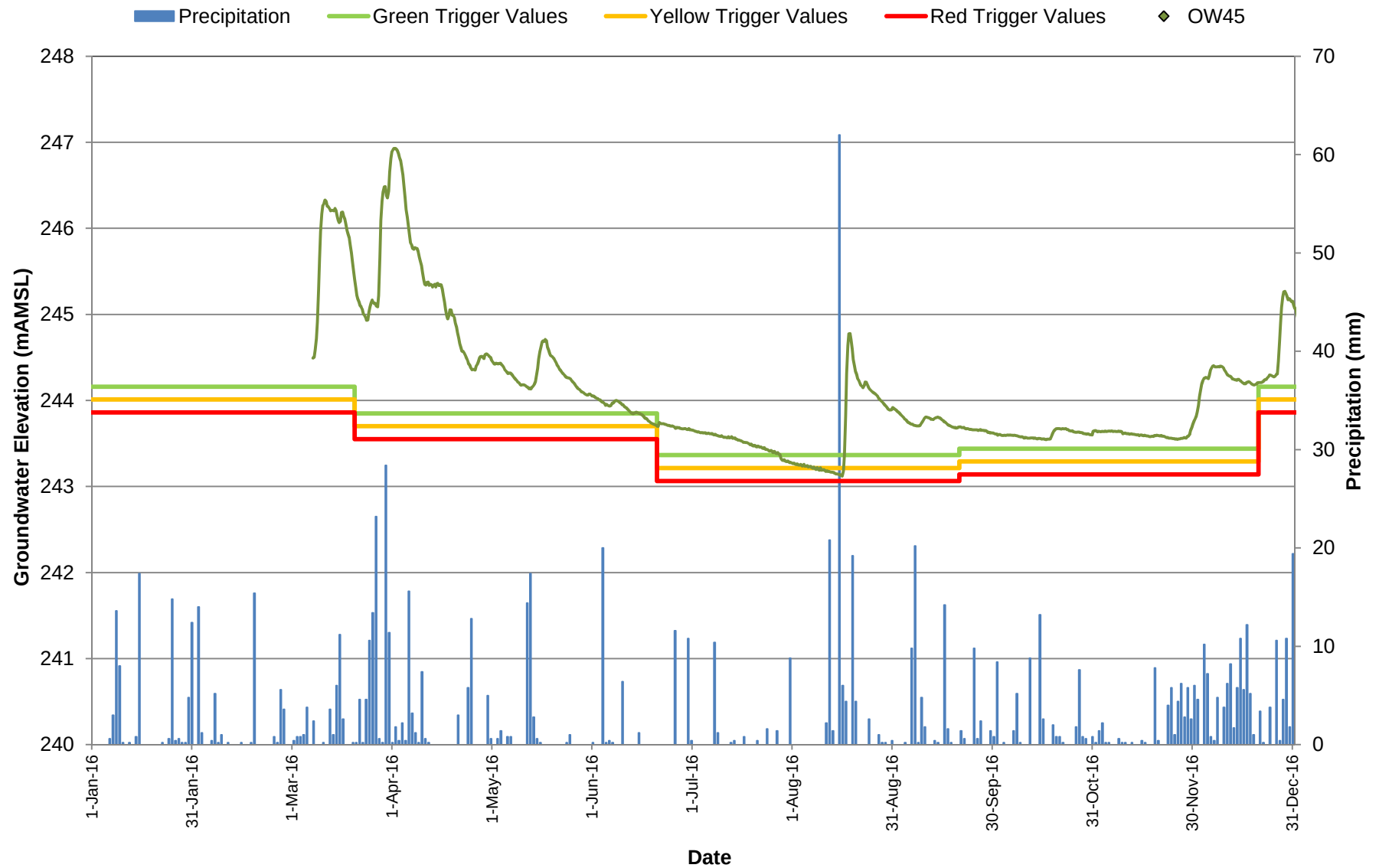
Hydrograph C-10.9: Groundwater Elevations - OW33s



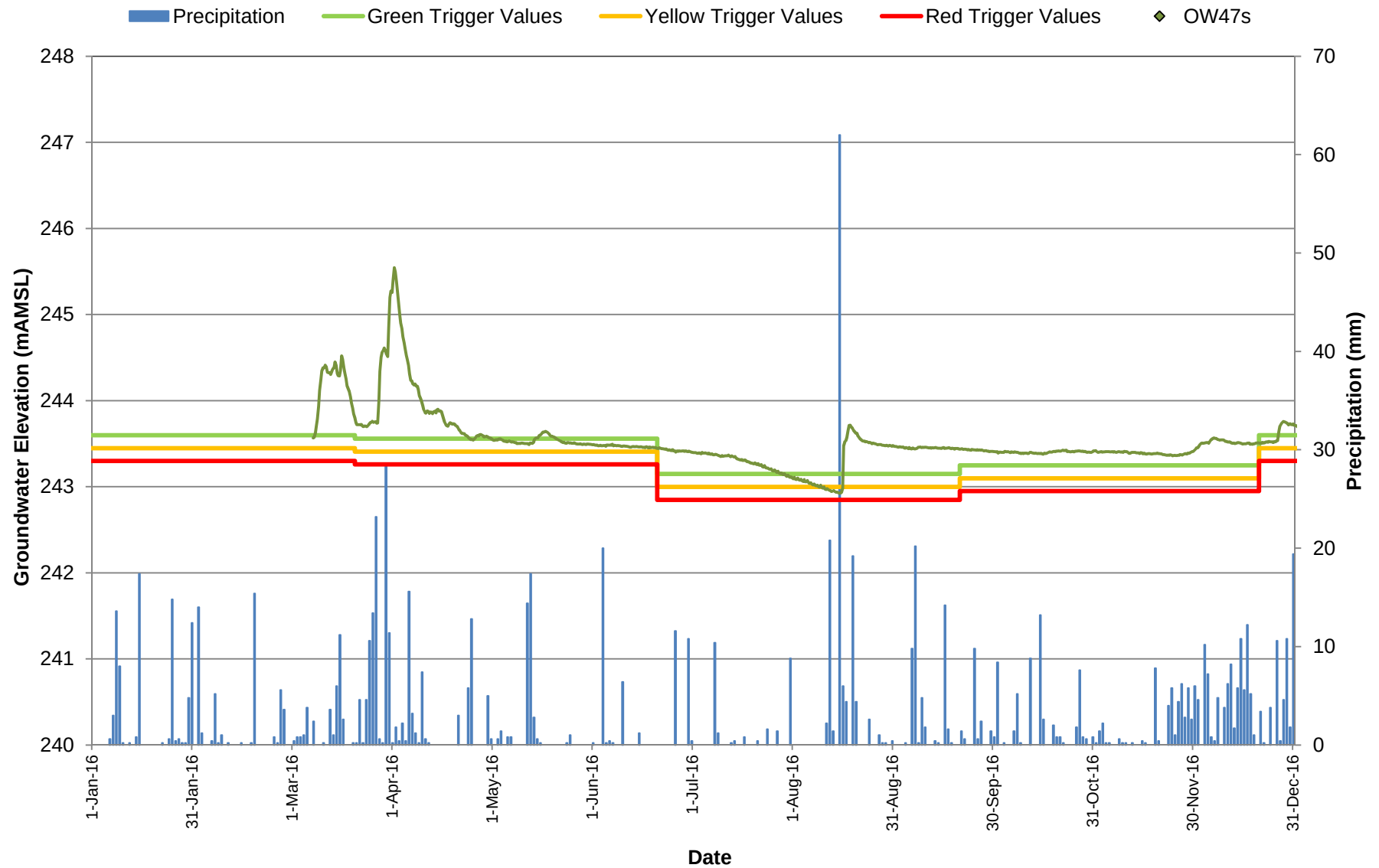
Hydrograph C-10.10: Groundwater Elevations - OW33d



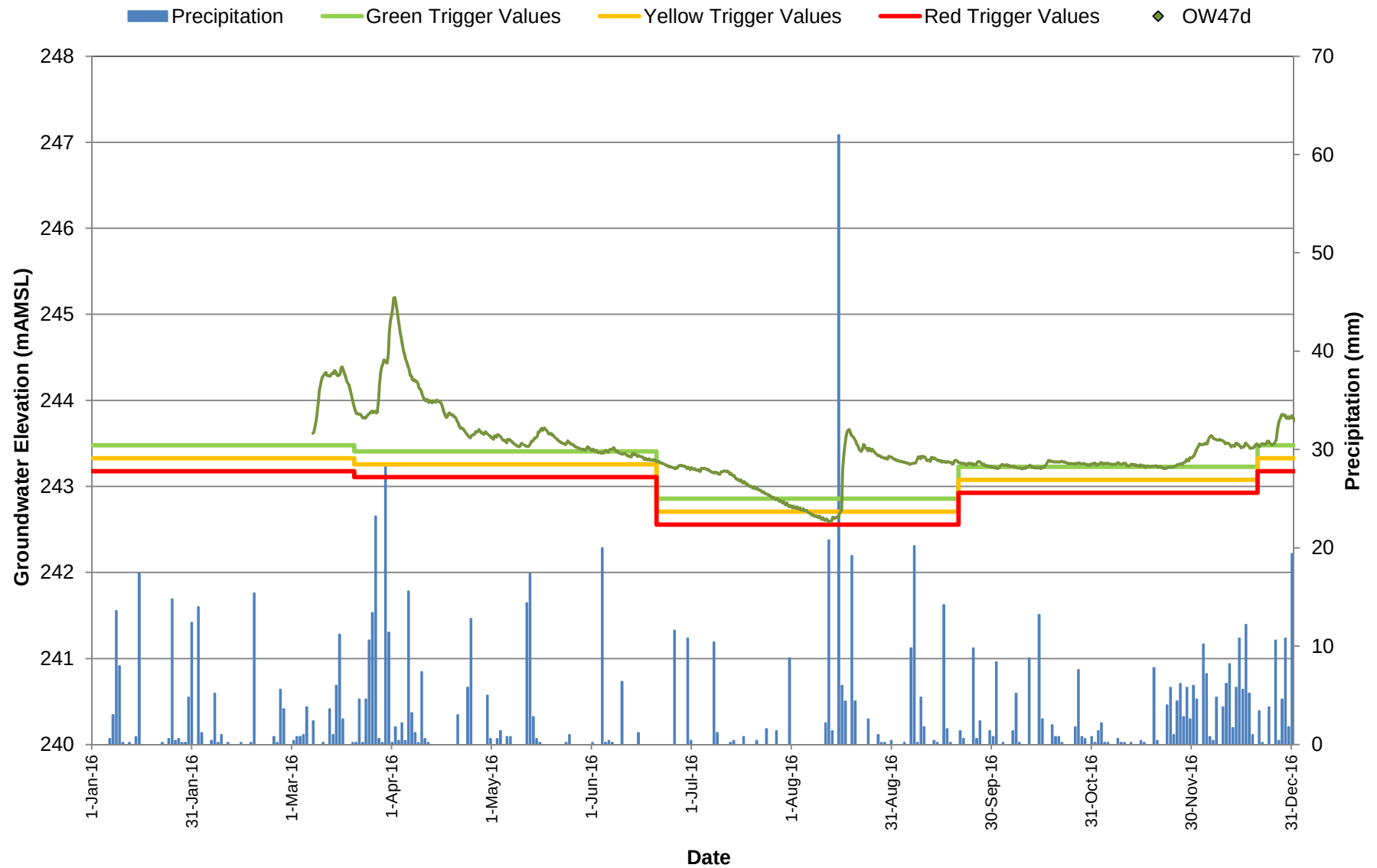
Hydrograph C-10.11: Groundwater Elevations - OW45



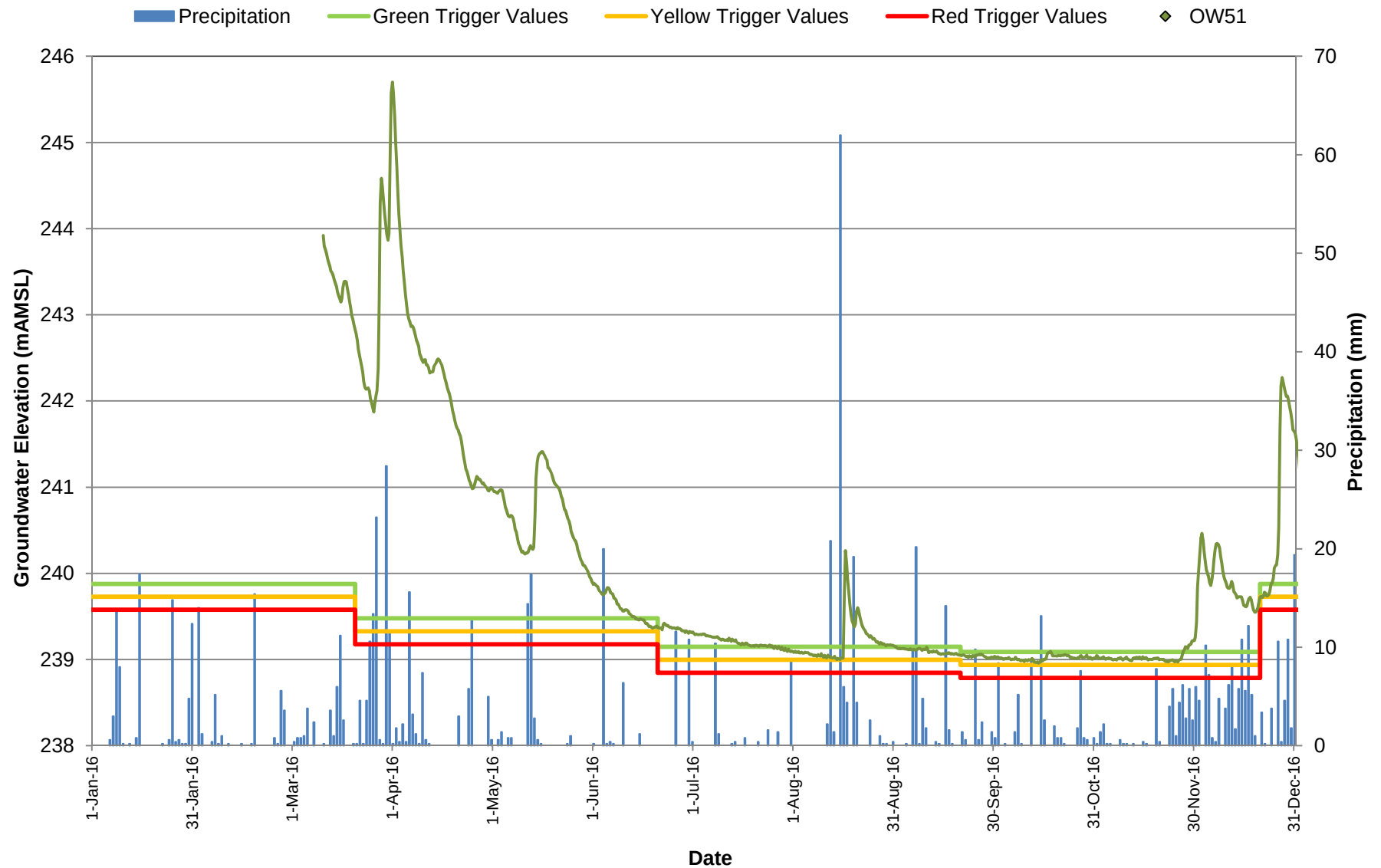
Hydrograph C-10.12: Groundwater Elevations - OW47s



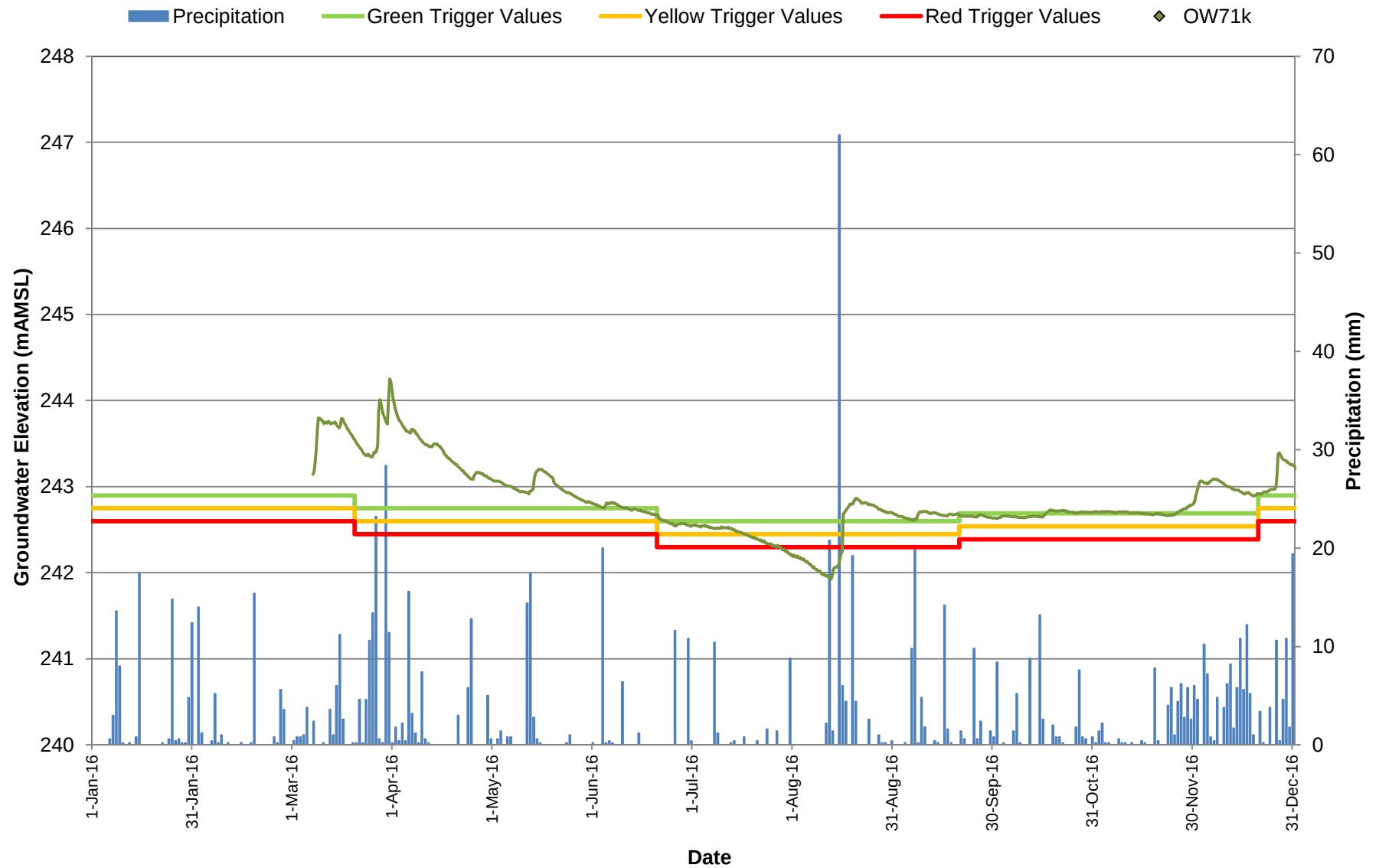
Hydrograph C-10.13: Groundwater Elevations - OW47d



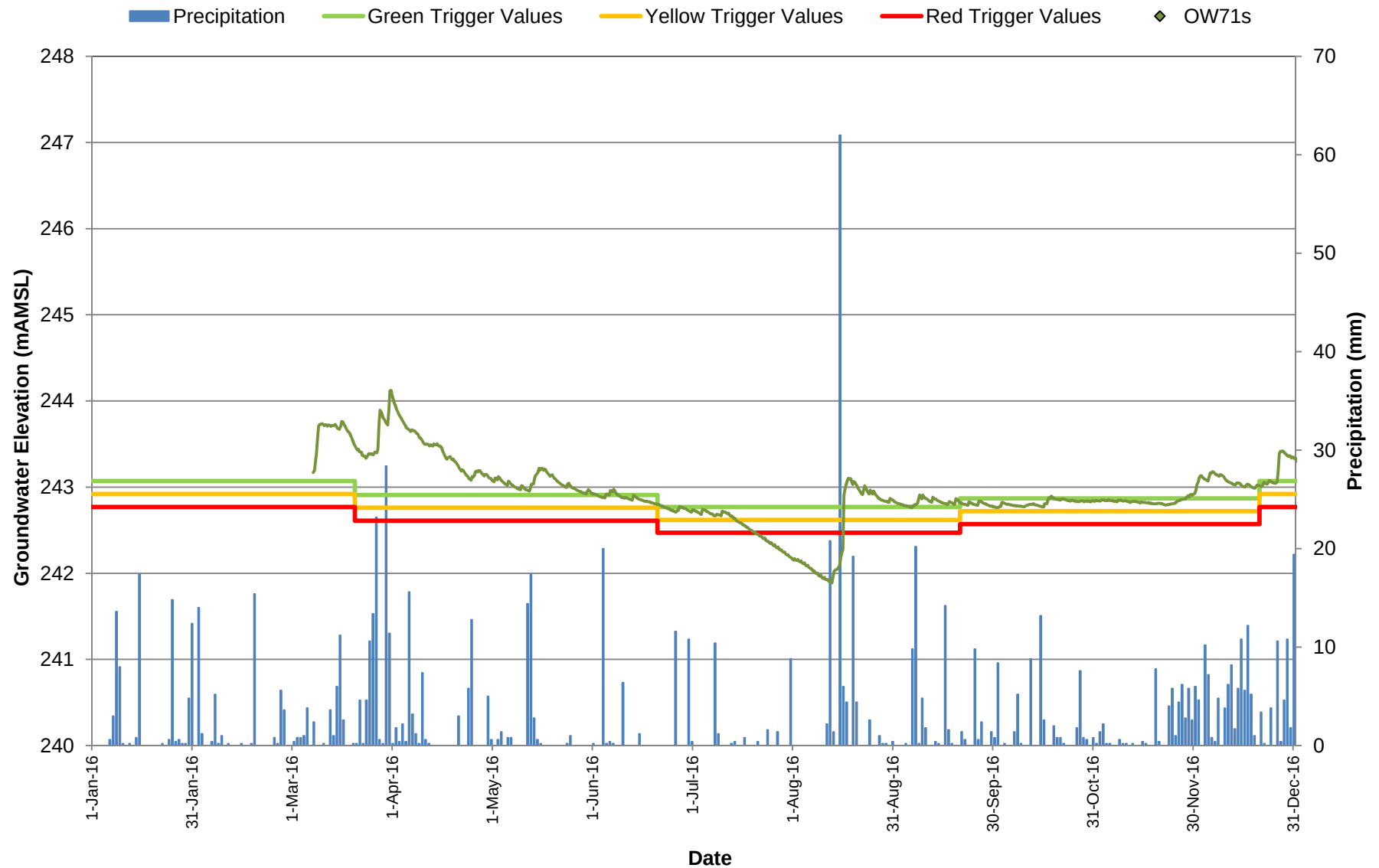
Hydrograph C-10.14: Groundwater Elevations - OW51



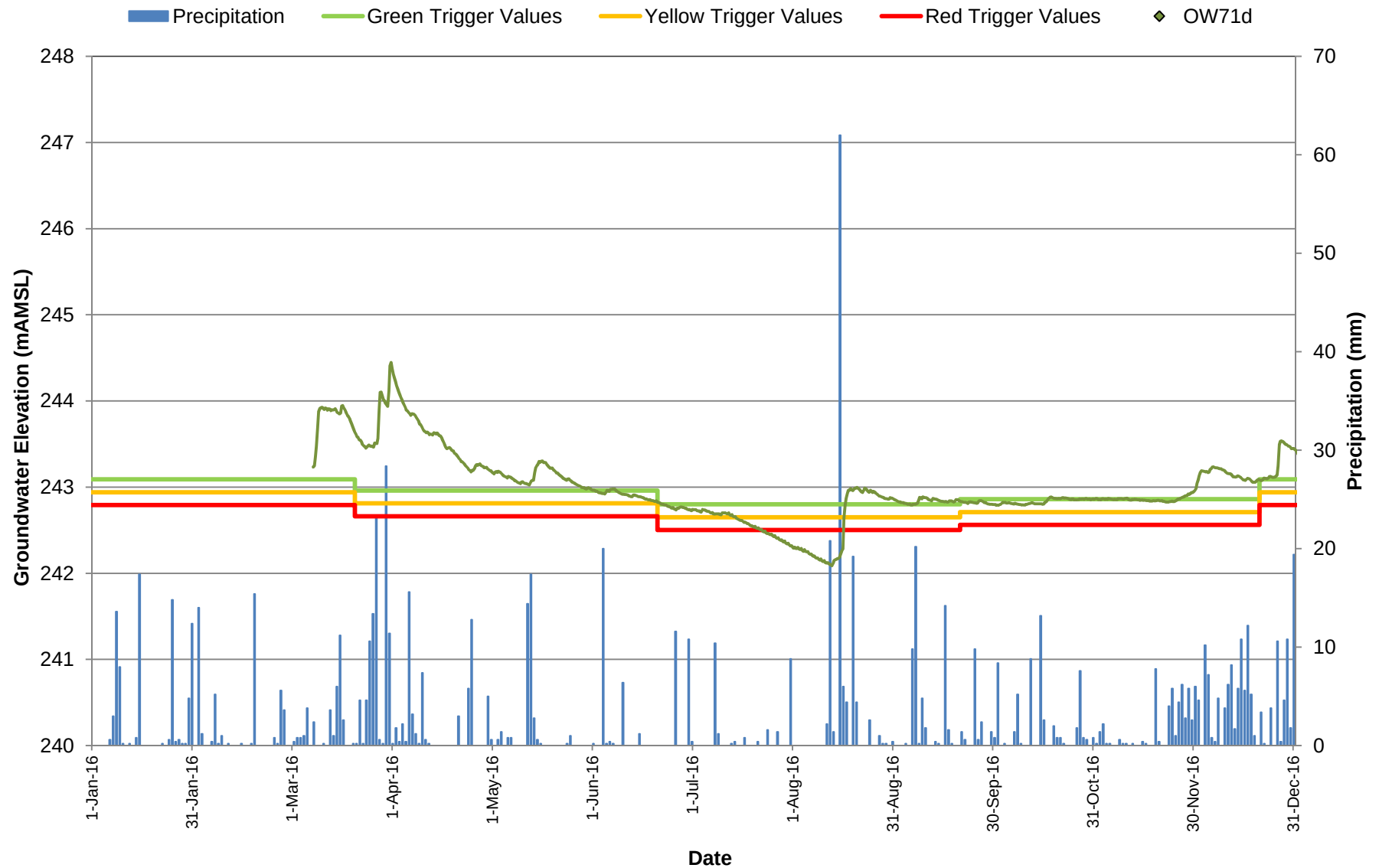
Hydrograph C-10.15: Groundwater Elevations - OW71k



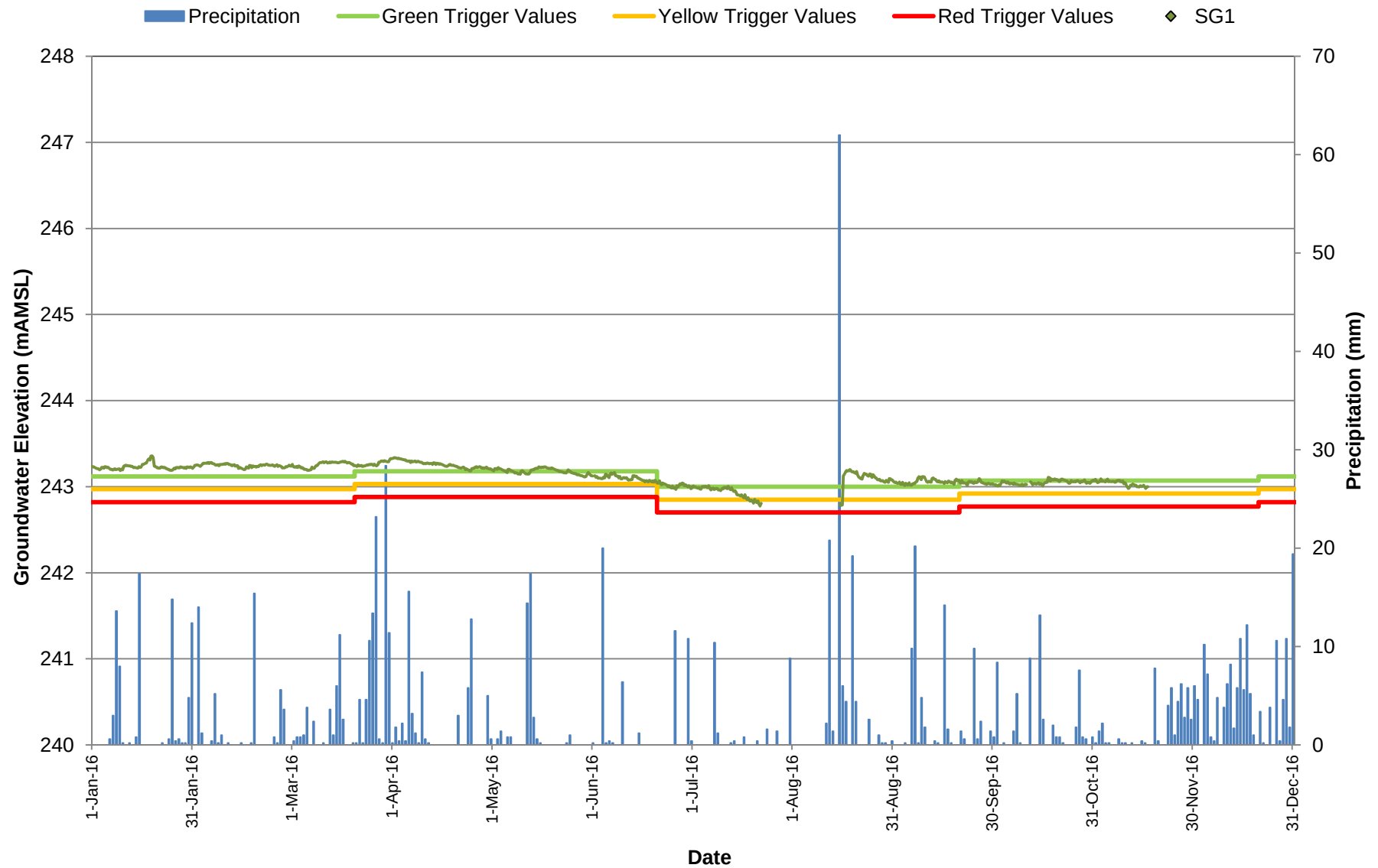
Hydrograph C-10.16: Groundwater Elevations - OW71s



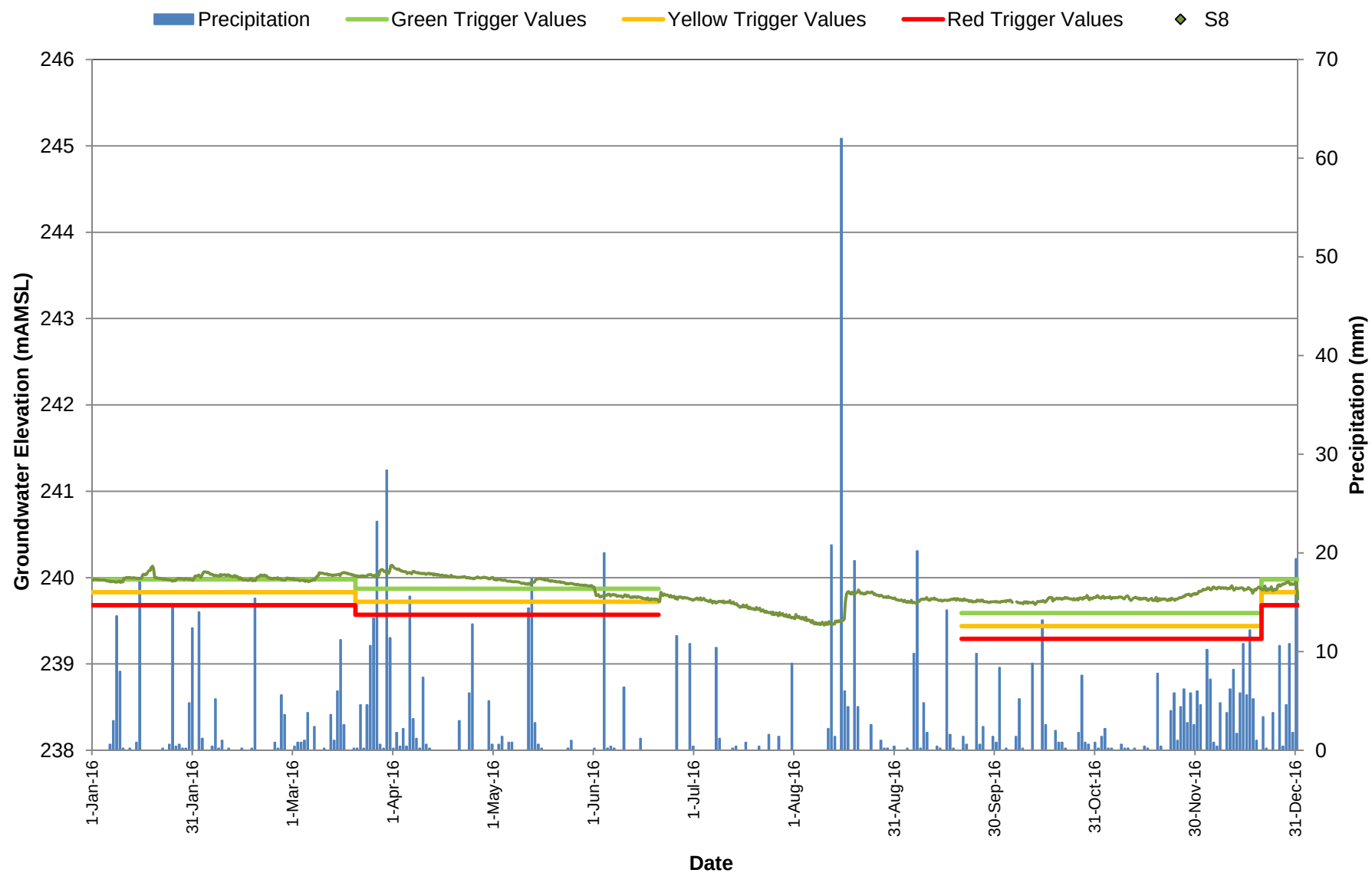
Hydrograph C-10.17: Groundwater Elevations - OW71d



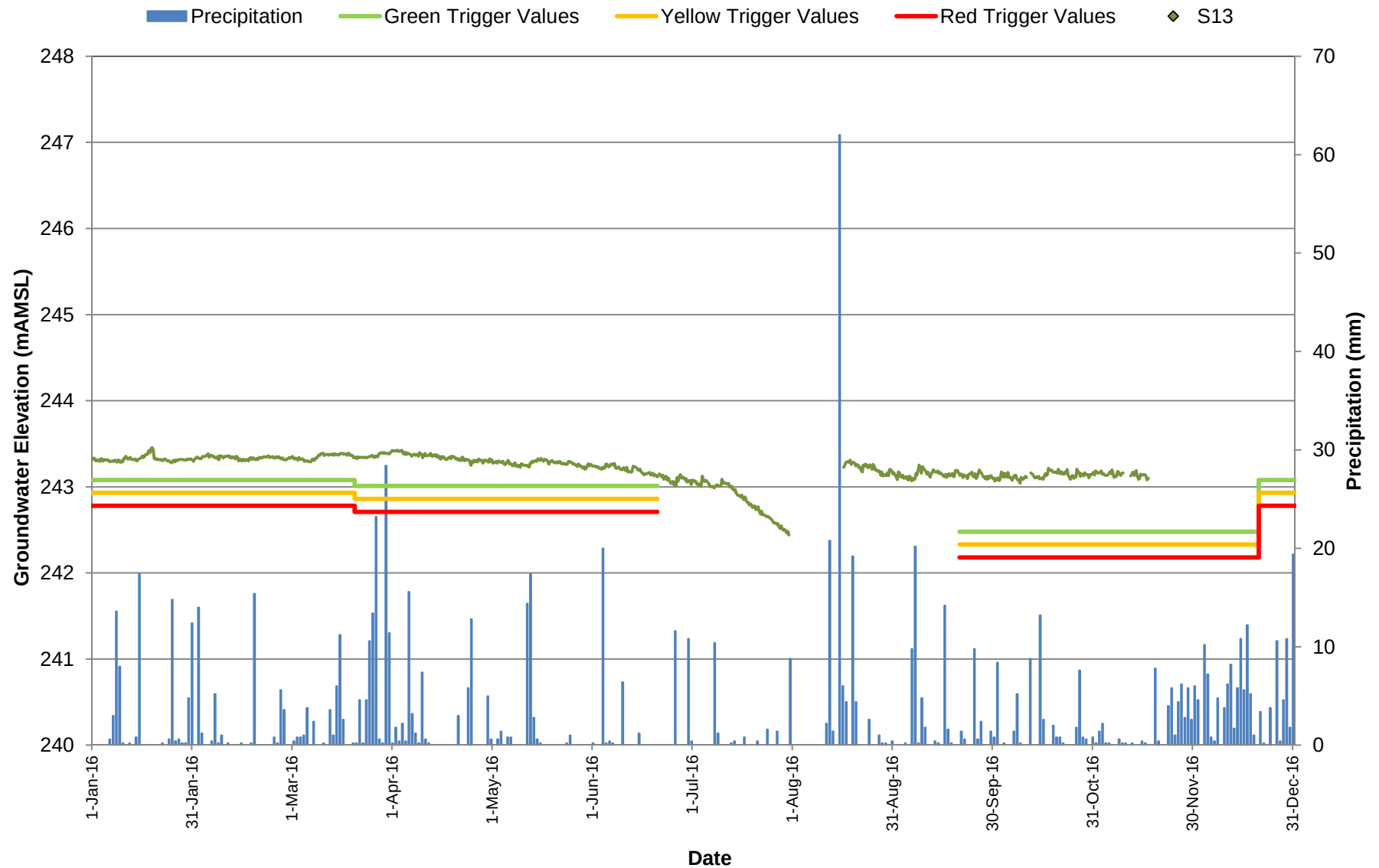
Hydrograph C-10.18: Groundwater Elevations - SG1



Hydrograph C-10.19: Groundwater Elevations - s8



Hydrograph C-10.20: Groundwater Elevations - s13





APPENDIX C11

PRIVATE WELL DATA

Table C-11.1 : Private Groundwater Levels (2003-2016)

Location	Well 3345	Well 3447	Well 5197	Well 7253	PW1	PW2	PW3
7-Mar-08	-	-	-	-	-	-	-
3-Jun-08	-	-	-	-	-	-	-
29-Jul-08	-	-	-	-	-	-	-
18-Aug-08	9.48	-	-	-	-	-	-
23-Sep-08	10.32	-	-	-	-	-	-
29-Oct-08	10.58	-	-	-	-	-	-
26-Nov-08	-	-	-	-	-	-	-
18-Dec-08	-	-	-	-	-	-	-
6-Jan-09	-	-	-	-	-	-	-
20-Jan-09	-	-	-	-	-	-	-
24-Mar-09	-	-	-	-	-	-	-
8-Apr-09	-	-	-	-	-	-	-
15-Apr-09	-	-	-	-	-	-	-
6-Jun-09	-	-	-	-	-	-	-
12-Jun-09	-	-	-	-	-	-	-
8-Jul-09	-	-	-	-	-	-	-
20-Aug-09	9.48	-	-	-	-	-	-
16-Sep-09	10.32	-	-	-	-	-	-
20-Oct-09	9.98	-	-	-	-	-	-
27-Nov-09	-	-	-	-	-	-	-
29-Mar-10	6.67	-	-	-	-	-	-
30-Apr-10	9.98	-	-	-	-	-	-
25-May-10	10.15	-	-	-	-	-	-
25-Jun-10	-	-	-	-	-	-	-
26-Jul-10	-	-	-	-	-	-	-
26-Aug-10	8.77	-	-	-	-	-	-
4-Oct-10	-	-	-	-	-	-	-
1-Nov-10	-	-	-	-	-	-	-
6-Dec-10	4.45	-	-	-	-	-	-
6-Jan-11	-	-	-	-	-	-	-
9-Feb-11	-	-	-	-	-	-	-
25-Feb-11	-	-	-	-	-	-	-
23-Mar-11	0.53	-	-	-	-	-	-
4-May-11	4.32	-	-	-	-	-	-
24-May-11	3.62	-	3.70	2.73	-	-	-
27-Jun-11	-	-	-	-	-	-	-
26-Jul-11	-	-	-	-	-	-	-
30-Aug-11	4.58	-	-	-	-	-	-
22-Sep-11	-	-	-	-	-	-	-
26-Oct-11	8.50	-	-	-	-	-	-
29-Nov-11	-	-	-	3.48	-	-	-
11-Jan-12	-	-	-	-	-	-	-
27-Feb-12	-	-	-	-	-	-	-
8-Mar-12	-	-	-	-	-	-	-
15-Mar-12	-	-	-	-	-	-	-
21-Mar-12	-	-	-	-	-	-	-
29-Mar-12	-	-	-	-	-	-	-
25-Apr-12	8.62	-	-	3.00	-	-	-
28-May-12	-	-	-	-	-	-	-
13-Jun-12	-	-	-	-	-	-	-
11-Jul-12	-	-	-	-	-	-	-
30-Aug-12	-	-	-	-	-	-	-
25-Sep-12	-	-	-	-	-	-	-

Location	Well 3345	Well 3447	Well 5197	Well 7253	PW1	PW2	PW3
24-Oct-12	-	-	-	2.95	-	-	-
27-Nov-12	-	-	-	-	-	-	-
19-Dec-12	-	-	-	-	-	-	-
28-Jan-13	-	-	-	-	-	-	-
27-Feb-13	-	-	-	-	-	-	-
26-Mar-13	-	-	-	-	-	-	-
23-Apr-13	2.80	-	-	-	-	-	-
27-May-13	-	-	-	-	-	-	-
17-Jun-13	-	-	-	-	-	-	-
29-Jul-13	-	-	-	-	-	-	-
31-Aug-13	-	-	-	-	-	-	-
19-Sep-13	-	-	-	-	-	-	-
25-Oct-13	-	-	-	-	-	-	-
30-Nov-13	-	-	-	-	-	-	-
18-Dec-13	-	-	-	-	-	-	-
15-Mar-14	-	-	-	-	-	-	-
28-Apr-14	-	-	-	-	-	-	-
24-May-14	-	-	-	-	-	-	-
27-Jun-14	8.71	-	-	-	-	-	-
15-Jul-14	-	-	-	-	-	-	-
12-Sep-14	-	-	-	-	-	-	-
23-Oct-14	5.98	-	-	-	-	-	-
29-Jan-15	-	-	-	-	-	-	-
13-Mar-15	-	-	-	-	-	-	-
27-Apr-15	7.86	3.03	-	3.02	-	-	-
29-May-15	-	-	-	-	-	-	-
30-Jun-15	6.79	3.02	-	3.06	9.95	9.90	9.66
28-Jul-15	-	-	-	-	-	-	-
27-Aug-15	-	-	-	-	-	-	-
29-Sep-15	9.84	3.92	-	3.95	12.28	11.83	11.47
22-Oct-15	-	3.93	-	4.07	12.58	12.13	11.78
17-Nov-15	-	3.14	-	3.21	-	-	-
23-Dec-15	-	3.15	-	3.17	8.12	7.51	7.74
29-Jan-16	-	-	-	-	-	-	-
23-Feb-16	-	-	-	-	-	-	-
30-Mar-16	-	-	-	-	4.44	2.88	3.46
28-Apr-16	-	-	-	-	-	-	-
17-May-16	-	4.04	-	-	-	-	-
21-Jun-16	-	4.62	-	-	10.85	10.55	10.24
21-Jul-16	-	4.24	-	-	-	-	-
31-Aug-16	-	4.12	-	-	-	-	-
29-Sep-16	-	4.22	-	-	-	-	-
31-Oct-16	-	4.17	-	-	10.59	10.34	10.08
17-Nov-16	-	4.22	-	-	-	-	-
23-Dec-16	-	3.95	-	-	-	-	-

Notes:

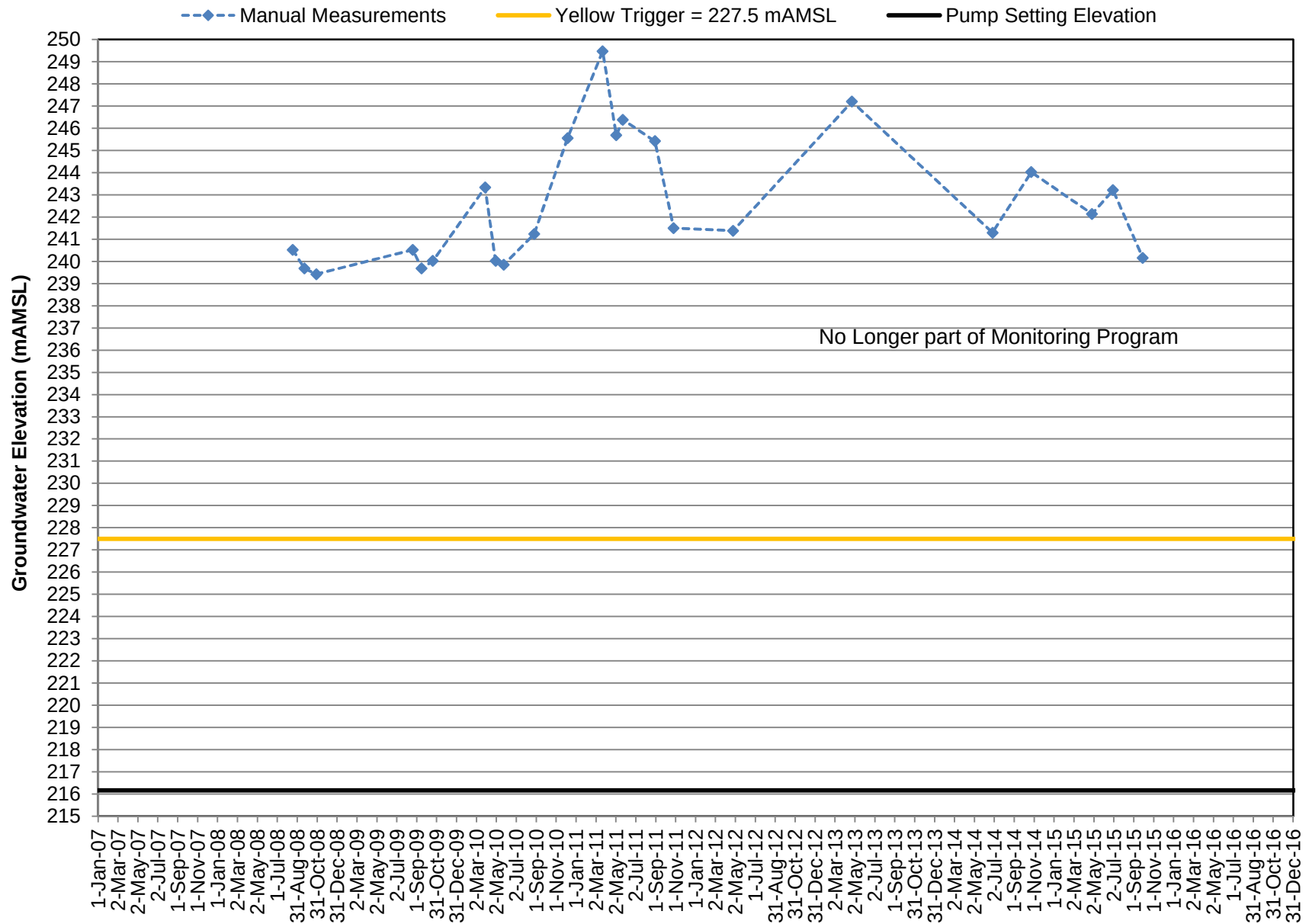
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Table C-11.2 : Private Groundwater Elevations (2003-2016)

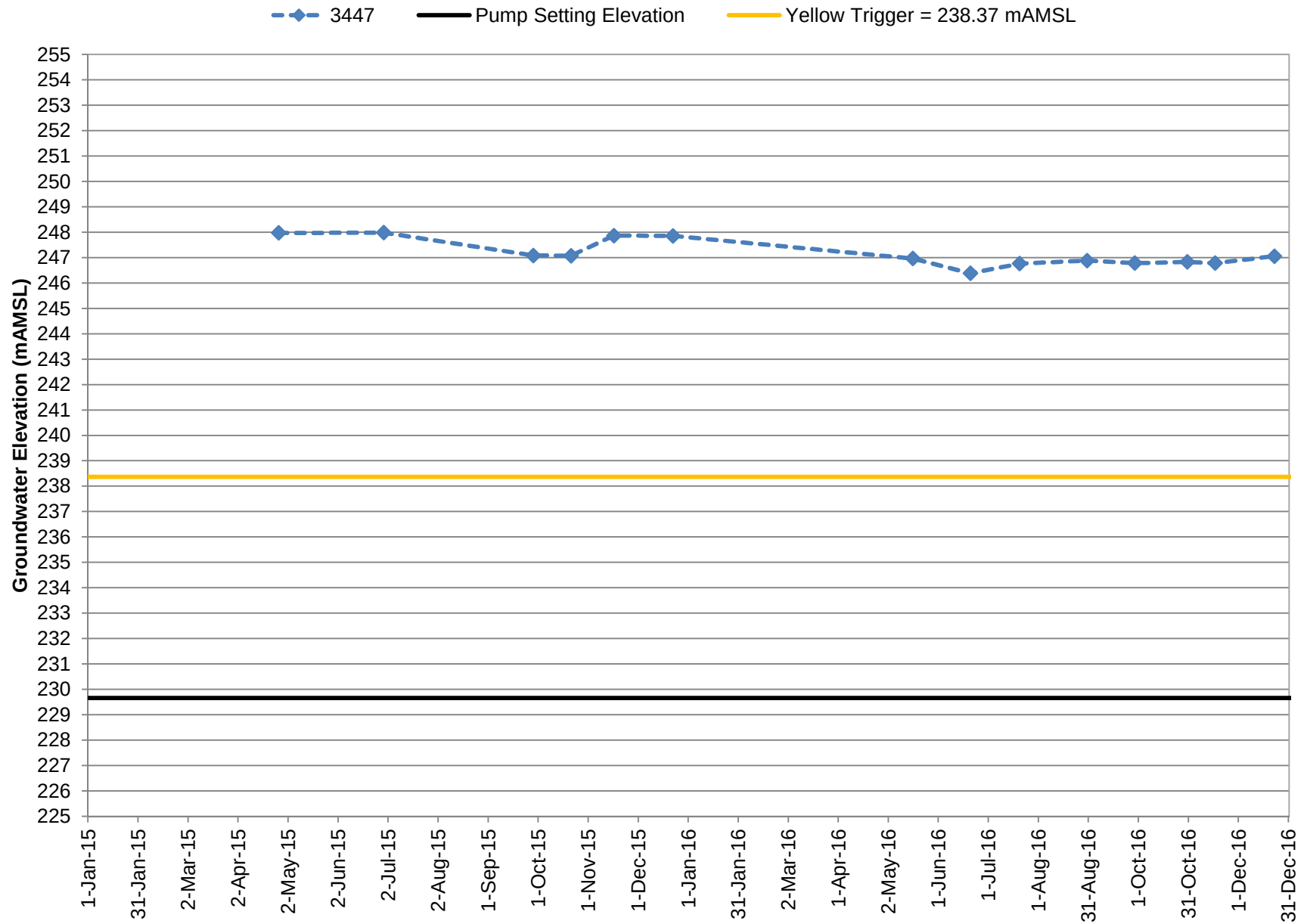
Location	Well 3345	Well 3447	Well 5197	Well 7253	PW1	PW2	PW3
Ref Elevation	250	251.00	255	251.46	255	255	253
7-Mar-08	-	-	-	-	-	-	-
3-Jun-08	-	-	-	-	-	-	-
29-Jul-08	-	-	-	-	-	-	-
18-Aug-08	240.52	-	-	-	-	-	-
23-Sep-08	239.68	-	-	-	-	-	-
29-Oct-08	239.42	-	-	-	-	-	-
26-Nov-08	-	-	-	-	-	-	-
18-Dec-08	-	-	-	-	-	-	-
6-Jan-09	-	-	-	-	-	-	-
20-Jan-09	-	-	-	-	-	-	-
24-Mar-09	-	-	-	-	-	-	-
8-Apr-09	-	-	-	-	-	-	-
15-Apr-09	-	-	-	-	-	-	-
6-Jun-09	-	-	-	-	-	-	-
12-Jun-09	-	-	-	-	-	-	-
8-Jul-09	-	-	-	-	-	-	-
20-Aug-09	240.52	-	-	-	-	-	-
16-Sep-09	239.68	-	-	-	-	-	-
20-Oct-09	240.02	-	-	-	-	-	-
27-Nov-09	-	-	-	-	-	-	-
29-Mar-10	243.33	-	-	-	-	-	-
30-Apr-10	240.02	-	-	-	-	-	-
25-May-10	239.85	-	-	-	-	-	-
25-Jun-10	-	-	-	-	-	-	-
26-Jul-10	-	-	-	-	-	-	-
26-Aug-10	241.23	-	-	-	-	-	-
4-Oct-10	-	-	-	-	-	-	-
1-Nov-10	-	-	-	-	-	-	-
6-Dec-10	245.55	-	-	-	-	-	-
6-Jan-11	-	-	-	-	-	-	-
9-Feb-11	-	-	-	-	-	-	-
25-Feb-11	-	-	-	-	-	-	-
23-Mar-11	249.47	-	-	-	-	-	-
4-May-11	245.68	-	-	-	-	-	-
24-May-11	246.38	-	251.30	248.73	-	-	-
27-Jun-11	-	-	-	-	-	-	-
26-Jul-11	-	-	-	-	-	-	-
30-Aug-11	245.42	-	-	-	-	-	-
22-Sep-11	-	-	-	-	-	-	-
26-Oct-11	241.50	-	-	-	-	-	-
29-Nov-11	-	-	-	247.98	-	-	-
11-Jan-12	-	-	-	-	-	-	-
27-Feb-12	-	-	-	-	-	-	-
8-Mar-12	-	-	-	-	-	-	-
15-Mar-12	-	-	-	-	-	-	-
21-Mar-12	-	-	-	-	-	-	-
29-Mar-12	-	-	-	-	-	-	-
25-Apr-12	241.38	-	-	248.46	-	-	-
28-May-12	-	-	-	-	-	-	-
13-Jun-12	-	-	-	-	-	-	-
11-Jul-12	-	-	-	-	-	-	-
30-Aug-12	-	-	-	-	-	-	-

Location	Well 3345	Well 3447	Well 5197	Well 7253	PW1	PW2	PW3
Ref Elevation	250	251.00	255	251.46	255	255	253
25-Sep-12	-	-	-	-	-	-	-
24-Oct-12	-	-	-	248.51	-	-	-
27-Nov-12	-	-	-	-	-	-	-
19-Dec-12	-	-	-	-	-	-	-
28-Jan-13	-	-	-	-	-	-	-
27-Feb-13	-	-	-	-	-	-	-
26-Mar-13	-	-	-	-	-	-	-
23-Apr-13	247.20	-	-	-	-	-	-
27-May-13	-	-	-	-	-	-	-
17-Jun-13	-	-	-	-	-	-	-
29-Jul-13	-	-	-	-	-	-	-
31-Aug-13	-	-	-	-	-	-	-
19-Sep-13	-	-	-	-	-	-	-
25-Oct-13	-	-	-	-	-	-	-
30-Nov-13	-	-	-	-	-	-	-
18-Dec-13	-	-	-	-	-	-	-
15-Mar-14	-	-	-	-	-	-	-
28-Apr-14	-	-	-	-	-	-	-
24-May-14	-	-	-	-	-	-	-
27-Jun-14	241.29	-	-	-	-	-	-
15-Jul-14	-	-	-	-	-	-	-
12-Sep-14	-	-	-	-	-	-	-
23-Oct-14	244.02	-	-	-	-	-	-
29-Jan-15	-	-	-	-	-	-	-
13-Mar-15	-	-	-	-	-	-	-
27-Apr-15	242.14	247.97	-	248.44	-	-	-
29-May-15	-	-	-	-	-	-	-
30-Jun-15	243.21	247.98	-	248.40	245.05	245.10	243.34
28-Jul-15	-	-	-	-	-	-	-
27-Aug-15	-	-	-	-	-	-	-
29-Sep-15	240.16	247.08	-	247.51	242.72	243.17	241.53
22-Oct-15	-	247.07	-	247.39	242.42	242.87	241.22
17-Nov-15	-	247.86	-	248.25	-	-	-
23-Dec-15	-	247.85	-	248.29	246.88	247.49	245.26
29-Jan-16	-	-	-	-	-	-	-
23-Feb-16	-	-	-	-	-	-	-
30-Mar-16	-	-	-	-	250.56	252.12	249.54
28-Apr-16	-	-	-	-	-	-	-
17-May-16	-	246.96	-	-	-	-	-
21-Jun-16	-	246.38	-	-	244.15	244.45	242.76
21-Jul-16	-	246.76	-	-	-	-	-
31-Aug-16	-	246.88	-	-	-	-	-
29-Sep-16	-	246.78	-	-	-	-	-
31-Oct-16	-	246.83	-	-	244.41	244.66	242.92
17-Nov-16	-	246.78	-	-	-	-	-
23-Dec-16	-	247.05	-	-	-	-	-

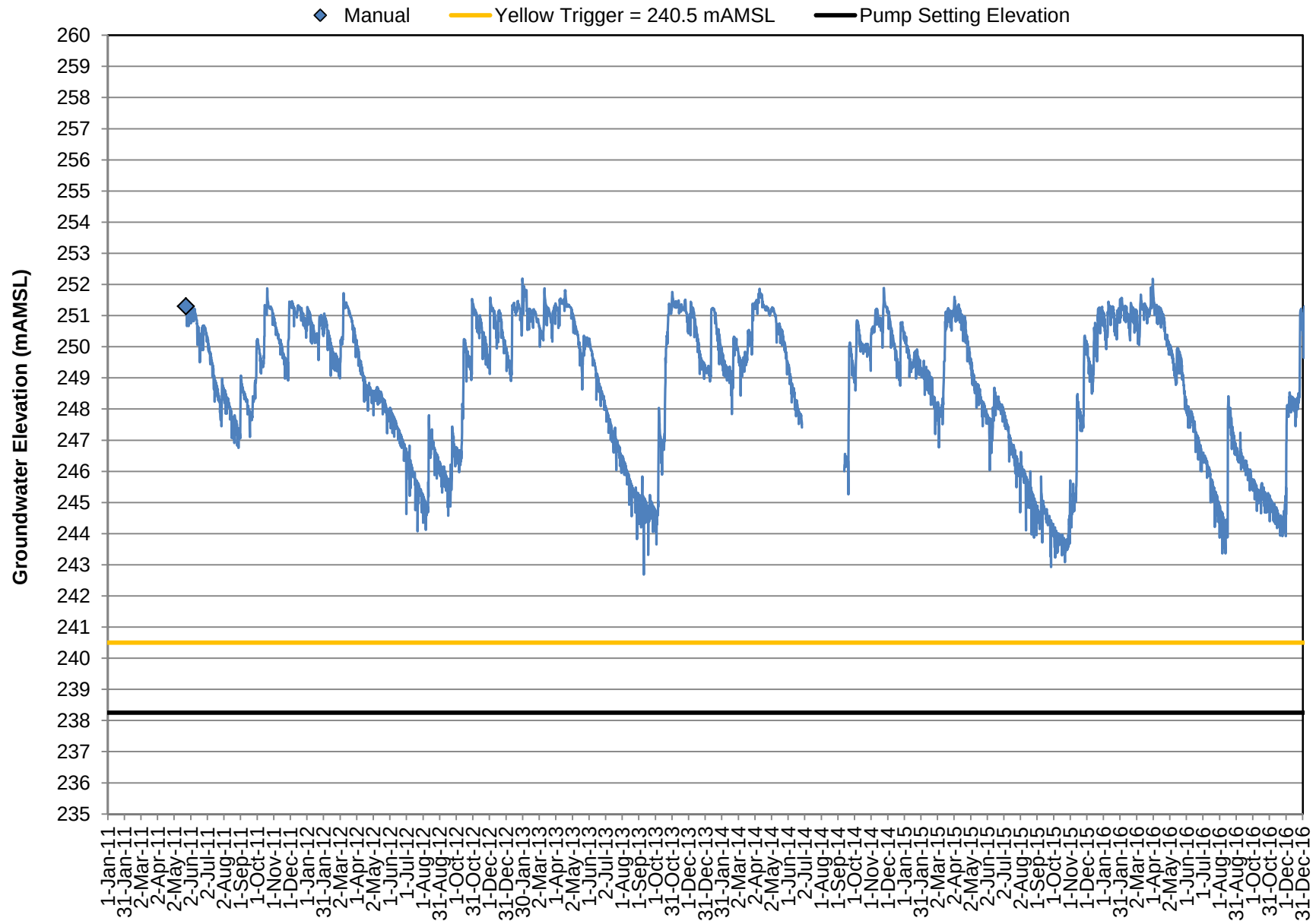
Hydrograph C-11.1 - Catagory A Private Wells - Well 3345



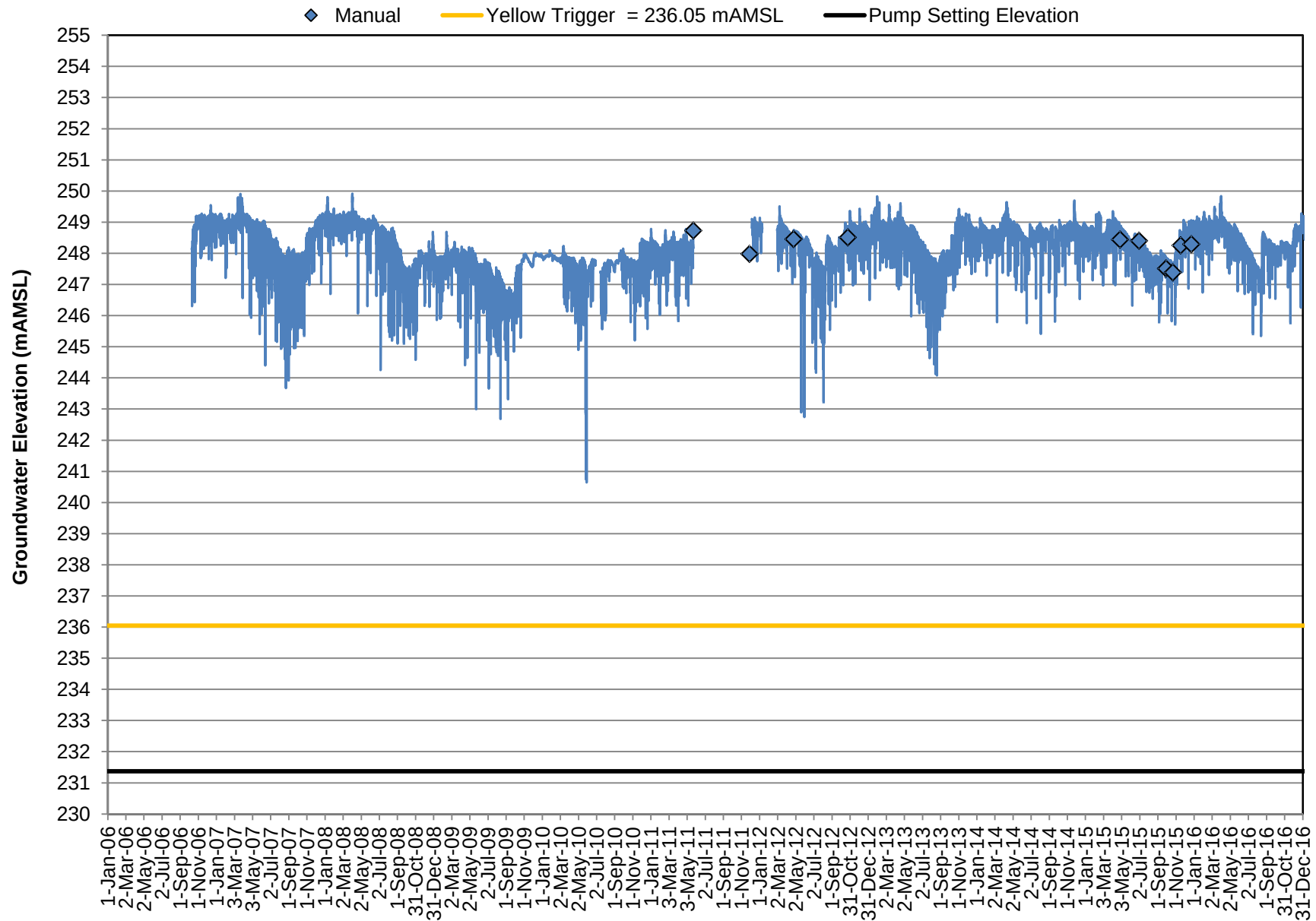
Hydrograph C-11.2 - Catagory A Private Wells - Well 3447



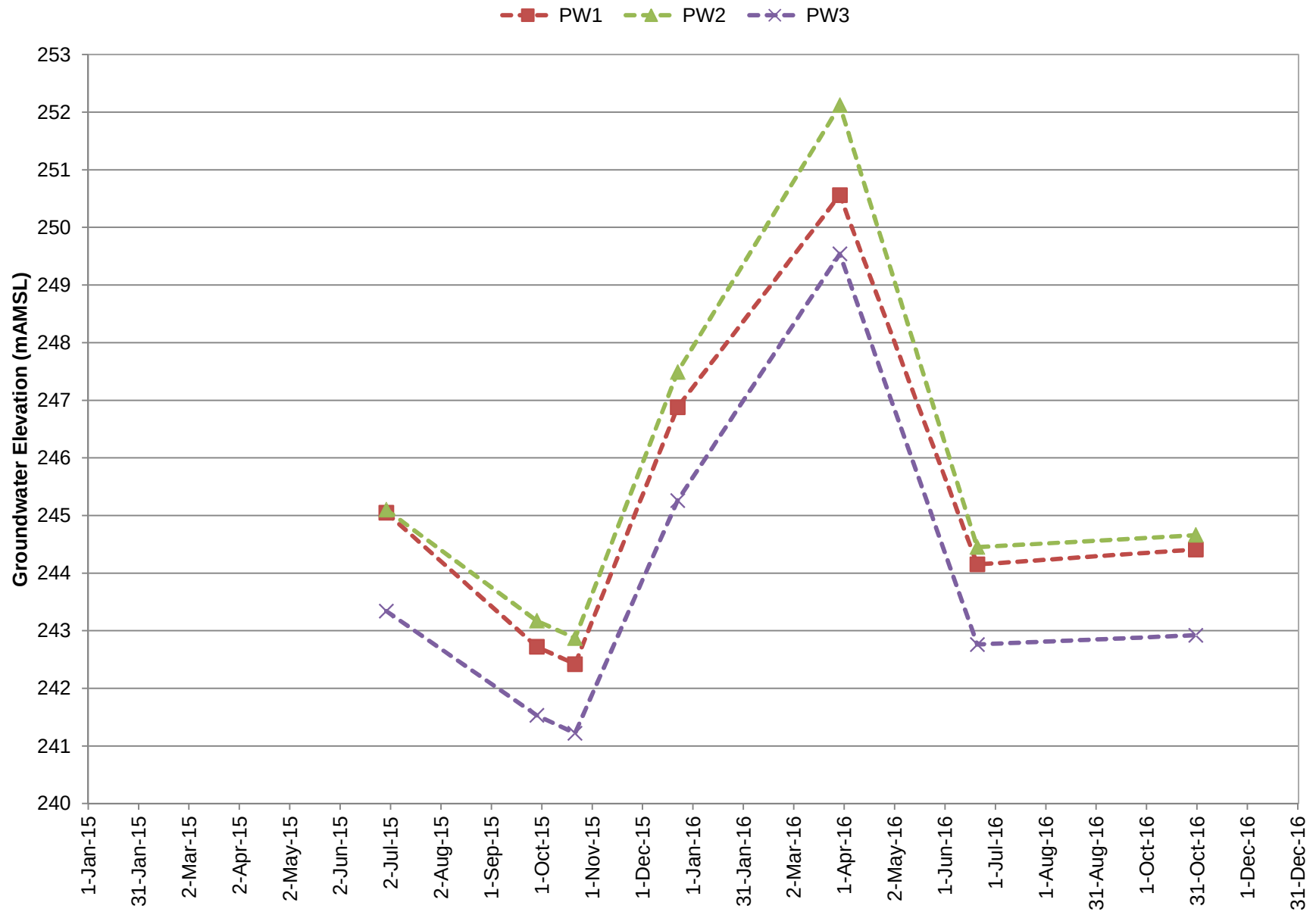
Hydrograph C-11.3 - Catagory A Private Wells - Well 5197



Hydrograph C-11.4 - Catagory A Private Wells - Well 7253



Hydrograph C-11.5 - Catagory B Private Wells



WATER WELL INVENTORY

Resident Name:

911 Number: 283197 Road: Concession 10

Address: _____

Phone Number: Email: _____

Property Owner: ☒ Yes ☐ No If No, Property Owner's Name: _____

Previous Property Owners: none

Number of Wells on Property: 1

Type of Well: ☒ Drilled ☐ Dug ☐ Sand Point ☐ Other jet pump

Diameter of Well: ☐ 2 in. ☐ 4 in. ☒ 6 in. ☐ 8 in. ☐ 3 ft.

Depth of Well: 62'

Depth of Water: 3.93m from floor surface

Pump Depth: n

Pump Type: jet pump

Water Source: ☒ Bedrock ☐ Sand/Gravel/Overburden

Name of Well Driller: Wights Drilling 3/1975

Date Installed: upgraded tank 2004

I have the MOE Water Well Record: ☐ Yes ☒ No

MOE Water Well Record Number: _____

Type of Water Use: ☒ Domestic ☒ Farm ☐ Irrigation ☐ Industrial ☐ Other 80 head of cattle

Water Treatment: ☐ Softener ☒ Sand Filter ☐ Carbon Filter ☐ Fiber Filter ☐ Aluminum Oxide
☐ UV ☐ Reverse Osmosis ☐ distillation ☐ Ion Exchange ☐ Ozonation

Other Water Treatment: _____

WATER WELL INVENTORY

Condition of Well Casing: ☒ Good ☐ Buried ☐ Corroded ☐ Seized ☐ Broken ☐ Don't Know
Other: 2000-2001 bleaching

Any problems with water quantity in the past? ☐ Yes ☒ No

Any problem with water quality in the past? ☐ Yes ☒ No

If yes, what type? ☐ Sulphur smell ☐ Iron Taste ☐ Brown Water ☐ Bacteria

Other: little lime on kettle.

Location of Septic Bed: back of house 150 ft.

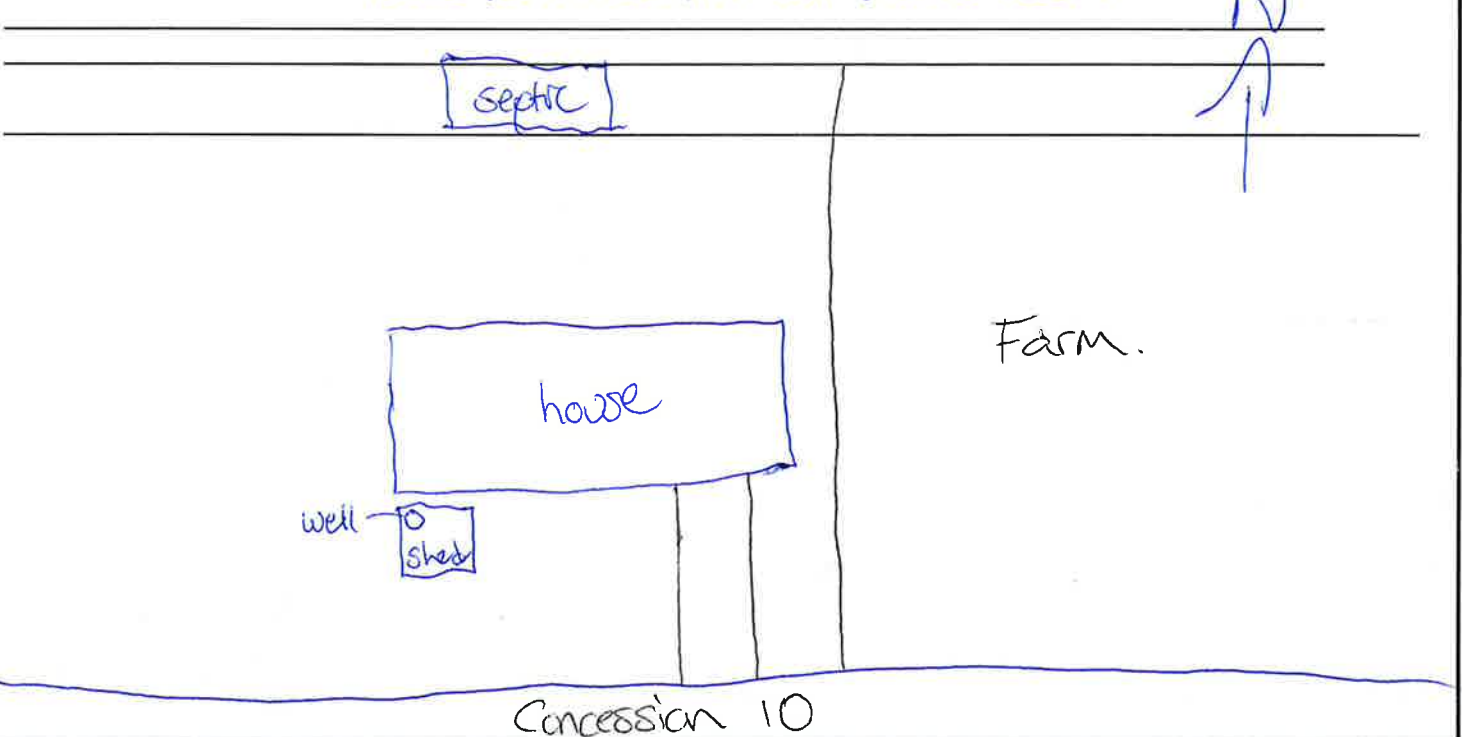
Potential Sources of Contamination: ☐ Barn ☒ Manure Pile ☐ Gas Tanks ☐ Heating Oil Tank

Other: far side of barn.

Is the well easily accessible? ☐ Yes ☒ No Sam can move lid with hook.

If Yes, may we measure water levels in this well? ☒ Yes ☐ No

Describe Well Location back left side in floor inside shed.



Water Well Inventory – Page 1

Resident Name_____

911 Number _____ Road _____

Address_____

Phone Number_____ email_____

Property Owner: Yes No If No, Property Owner's Name_____

Previous Property Owners_____

Number of Wells on property _____ Don't Know

Type of Well: Drilled Dug Sand Point Other_____ Don't Know

Diameter of Well: 2 inches 4 inches 5 inches 8 inches 3 feet Don't Know

Depth of Well _____ Don't Know

Depth to Water _____ Don't Know

Pump Depth _____ Don't Know

Pump Type _____ Don't Know

Water Source: Bedrock Sand/Gravel/Overburden Don't Know

Name of Well Driller_____ Don't Know

Date Installed _____ Don't Know

I have the MOE Water Well Record Yes No Don't Know

MOE Water Well Record Number_____ Don't Know

Type of Water Use: Domestic Farm Irrigation Industrial Other_____

Water Treatment: Softener Sand Filter Carbon Filter Fiber Filter Aluminum Oxide

UV Reverse Osmosis Distillation Ion Exchange Ozonation

Other Water Treatment_____ Don't Know

Water Well Inventory – Page 2

Condition of Well Casing Good Buried Corroded Seized Broken Don't Know

Other _____

Any problems with water quantity in the past? Yes No

Any problems with water quality in the past? Yes No

If yes, what type ? Sulphur smell Iron taste Brown water Bacteria

Other _____

Location of Septic Bed _____

Potential Sources of Contamination: barn manure pile gas tanks heating oil tank

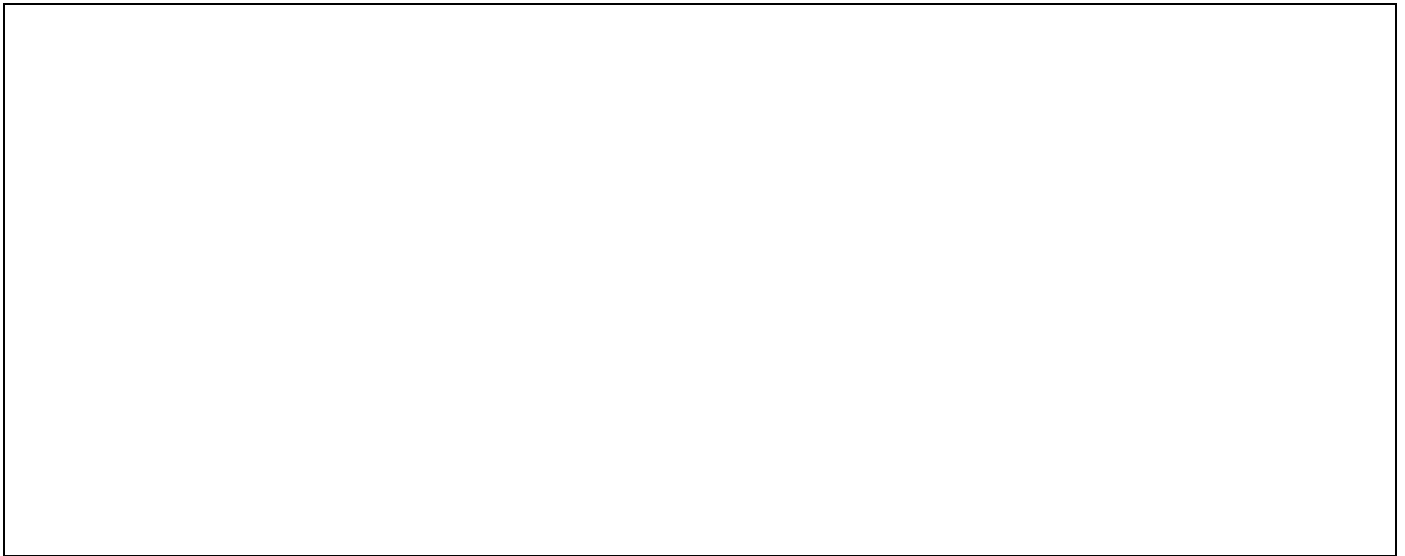
Other _____

Is the well easily accessible? Yes No

If Yes, may we measure the water level in this well? Yes No

Describe Well Location _____

Sketch a diagram to show the location of well(s), house, buildings, road(s), and septic bed:



Important!! Learn to protect your water supply. Ask us for an information package or visit:

www.gca.ca
www.wellaware.ca

WATER WELL INSPECTION FORM

Resident Name:

911 Number: _____ Road: _____

Address: 283242 CONC 10 INDIAN ACRES ROAD
TWP OF GEORGIAN BLUFFS

Phone Number: Email: _____

Property Owner: ☒ Yes ☐ No If No, Property Owner's Name: _____

Previous Property Owners: _____

Number of Wells on Property: 1

Type of Well: ☒ Drilled ☐ Dug ☐ Sand Point ☐ Other _____

Diameter of Well: ☐ 2 in. ☐ 4 in. ☒ 6 in. ☐ 8 in. ☐ 3 ft.

Depth of Well: 110 ft

Depth of Water: 7.80

Pump Depth: _____

Pump Type: SUBMER SIBLE

Water Source: ☒ Bedrock ☐ Sand/Gravel/Overburden

Name of Well Driller: WRIGHT WELL DRILLING

Date Installed: 1988

I have the MOE Water Well Record: ☐ Yes ☒ No

MOE Water Well Record Number: _____

Type of Water Use: ☒ Domestic ☐ Farm ☐ Irrigation ☐ Industrial ☐ Other _____

Water Treatment: ☒ Softener ☐ Sand Filter ☐ Carbon Filter ☐ Fiber Filter. ☐ Aluminum Oxide
☒ UV ☐ Reverse Osmosis ☐ distillation ☐ Ion Exchange. ☐ Ozonation

Other Water Treatment: _____

WATER WELL INSPECTION FORM

PAGE 2

Condition of Well Casing: ☒ Good ☐ Buried ☐ Corroded ☐ Seized ☐ Broken ☐ Don't Know
Other: _____

Any problems with water quantity in the past? ☐ Yes ☒ No

Any problem with water quality in the past? ☐ Yes ☒ No

If yes, what type? ☐ Sulphur smell ☐ Iron Taste ☐ Brown Water ☐ Bacteria
Other: _____

Location of Septic Bed: 80 ft SOUTH OF HOUSE

Potential Sources of Contamination: ☐ Barn ☐ Manure Pile ☐ Gas Tanks ☐ Heating Oil Tank
Other: _____

Is the well easily accessible? ☒ Yes ☐ No

If Yes, may we measure water levels in this well? ☒ Yes ☐ No

Describe Well Location NE CORNER OF HOUSE (12 FT FROM HOUSE)

WATER WELL INSPECTION FORM

Resident Name: _____

911 Number: _____ Road: _____

Address: 283249 Cone 10 INDIAN ACRES ROAD
TWP OF GEORGIAN BLUFFS

Phone Number: _____ Email: _____

Property Owner: ☒ Yes ☐ No If No, Property Owner's Name: _____

Previous Property Owners: _____

Number of Wells on Property: 1 ☐ Don't Know

Type of Well: ☒ Drilled ☐ Dug ☐ Sand Point ☐ Other _____ ☐ Don't Know

Diameter of Well: ☐ 2 in. ☐ 4 in. ☒ 6 in. ☐ 8 in. ☐ 3 ft. ☐ Don't Know

Depth of Well: 120 FT ☐ Don't Know

Depth of Water: 7.53m ☐ Don't Know

Pump Depth: _____ ☒ Don't Know

Pump Type: SUBMERSIBLE ☐ Don't Know

Water Source: ☒ Bedrock ☐ Sand/Gravel/Overburden ☐ Don't Know

Name of Well Driller: WRIGHT WELL DRILLERS ☐ Don't Know

Date Installed: PRE 1990 ☐ Don't Know

I have the MOE Water Well Record: ☐ Yes ☒ No ☐ Don't Know

MOE Water Well Record Number: _____ ☒ Don't Know

Type of Water Use: ☒ Domestic ☐ Farm ☐ Irrigation ☐ Industrial ☐ Other _____

Water Treatment: ☒ Softener ☐ Sand Filter ☐ Carbon Filter ☐ Fiber Filter. ☐ Aluminum Oxide
☒ UV ☐ Reverse Osmosis ☐ distillation ☐ Ion Exchange. ☐ Ozonation

Other Water Treatment: _____ ☐ Don't Know

WATER WELL INSPECTION FORM

PAGE 2

Condition of Well Casing: ☒ Good ☐ Buried ☐ Corroded ☐ Seized ☐ Broken ☐ Don't Know
Other: _____

Any problems with water quantity in the past? ☐ Yes ☒ No

Any problem with water quality in the past? ☐ Yes ☒ No

If yes, what type? ☐ Sulphur smell ☐ Iron Taste ☐ Brown Water ☐ Bacteria

Other: _____

Location of Septic Bed: BEHIND HOUSE

Potential Sources of Contamination: ☐ Barn ☐ Manure Pile ☐ Gas Tanks ☐ Heating Oil Tank
Other: _____

Is the well easily accessible? ☒ Yes ☐ No

If Yes, may we measure water levels in this well? ☒ Yes ☐ No

Describe Well Location SOUTH SIDE AT FRONT OF HOUSE
100 FT FROM ROAD

WATER WELL INSPECTION FORMResident Name:

911 Number: _____

Road: _____

Address: 283253 Conc 10 INDIAN ACRES ROAD
TWP OF GEORGIAN BLUFFSPhone Number:

Email: _____

Property Owner: ☒ Yes☐ No

If No, Property Owner's Name: _____

Previous Property Owners: _____

Number of Wells on Property: 1Type of Well: ☒ Drilled ☐ Dug ☐ Sand Point ☐ Other _____Diameter of Well: ☐ 2 in. ☐ 4 in. ☒ 6 in. ☐ 8 in. ☐ 3 ft.Depth of Well: 110 ftDepth of Water: 7.84 m

Pump Depth: _____

Pump Type: SUBMERSIBLEWater Source: ☒ Bedrock ☐ Sand/Gravel/OverburdenName of Well Driller: WRIGHT WELL DRILLINGDate Installed: 1988I have the MOE Water Well Record: ☐ Yes ☒ No

MOE Water Well Record Number: _____

Type of Water Use: ☒ Domestic ☐ Farm ☐ Irrigation ☐ Industrial ☐ Other _____Water Treatment: ☒ Softener ☐ Sand Filter ☐ Carbon Filter ☐ Fiber Filter. ☐ Aluminum Oxide☒ UV ☐ Reverse Osmosis ☐ distillation ☐ Ion Exchange. ☐ Ozonation

Other Water Treatment: _____

☐ Don't Know☐ Don't Know☐ Don't Know☐ Don't Know☐ Don't Know☒ Don't Know☐ Don't Know☐ Don't Know☐ Don't Know☐ Don't Know☐ Don't Know☒ Don't Know☐ Don't Know

WATER WELL INSPECTION FORM

PAGE 2

Condition of Well Casing: ☒ Good ☐ Buried ☐ Corroded ☐ Seized ☐ Broken ☐ Don't Know
Other: _____

Any problems with water quantity in the past? ☐ Yes ☒ No

Any problem with water quality in the past? ☐ Yes ☒ No

If yes, what type? ☐ Sulphur smell ☐ Iron Taste ☐ Brown Water ☐ Bacteria
Other: _____

Location of Septic Bed: NE OF HOUSE

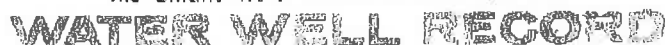
Potential Sources of Contamination: ☐ Barn ☐ Manure Pile ☐ Gas Tanks ☐ Heating Oil Tank
Other: _____

Is the well easily accessible? ☒ Yes ☐ No

If Yes, may we measure water levels in this well? ☐ Yes ☐ No

Describe Well Location SOUTH SIDE OF PROPERTY 150A
FROM ROAD

The Ontario Water Resources Commission Act



2. ENSURE ☒ CONNECT BOX WHERE APPLICABLE

12503345

1745151

559

1

SCANDY CO. DISTRICT

TO: BUREAU, BOSTON, CINCINNATI, CLEVELAND, DETROIT, KANSAS CITY, LOUISVILLE, MEMPHIS, MILWAUKEE, MINNEAPOLIS, NEW YORK, PHILADELPHIA, PITTSBURGH, RICHMOND, ST. LOUIS, ST. PAUL, TAMPA, WASHINGTON, WICHITA.

CONFIDENTIAL, TRACY, GUYVER, ETC

60

CHAS. H. BRIDGEMAN, PRES.

12-52

STATE OF TEXAS, COUNTY OF DALLAS.

11

23

175. 1924/5.

10/2/2014

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لَمَّا رَأَى الْوَلَدُ

100 OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

1
 5507
 201170
 P/E

2. CHECK ☒ CORRECT BOX WHERE APPLICABLELOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

OFFICE USE ONLY	DRILLERS' REMARKS:		
	DATA SOURCE /	58 CONTRACTOR 5507	59-63 DATE RECEIVED 230671
	DATE OF INSPECTION		63-68 /
	REMARKS:		P WI

OWRC COPY



Ontario

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

COUNTY OR DISTRICT: **GREY** TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: **HEPPEL** CON., BLOCK, TRACT, SURVEY, ETC.: **CON 10**

OWNER (SURNAME FIRST): **[REDACTED]** ADDRESS: **[REDACTED]** DATE COMPLETED: **04 06 75**

LOT: **029**

GENERAL COLOUR	MOISTURE	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET
				FROM TO
Brown	58.15			0 1
Brown	lime-stone			1 60

31 0001602 00606/15

32

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
10-15	1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL
15-20	1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL
20-25	1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL
25-30	1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL
30-35	1 FRESH 3 SULPHUR 2 SALTY 4 MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET
			FROM TO
10-15	1 STEEL 2 GALVANIZED 3 CONCRETE 4 OPEN HOLE	188	0 202.3
15-20	1 STEEL 2 GALVANIZED 3 CONCRETE 4 OPEN HOLE		202.3 221.5
20-25	1 STEEL 2 GALVANIZED 3 CONCRETE 4 OPEN HOLE		221.5 246.0
25-30	1 STEEL 2 GALVANIZED 3 CONCRETE 4 OPEN HOLE		246.0 27.30

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET	MATERIAL AND TYPE	ICEMENT GROUT, LEAD PACKER, ETC.
FROM TO		
10-15	16-17	
18-21	18-20	
20-25	20-23	

71 PUMPING TEST METHOD

1 PUMP 2 ☒ WELER

PUMPING RATE: **0007** GPM

11-14 DURATION OF PUMPING: **01 16-18 HOURS 00** MINS

17-18

STATIC LEVEL: **026** FEET

WATER LEVEL END OF PUMPING: **025** FEET

WATER LEVELS DURING PUMPING

15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
026 FEET	025 FEET	025 FEET	025 FEET

17 FLOWING GIVE RATE: **000.4** GPM

RECOMMENDED PUMP TYPE: **SHALLOW**

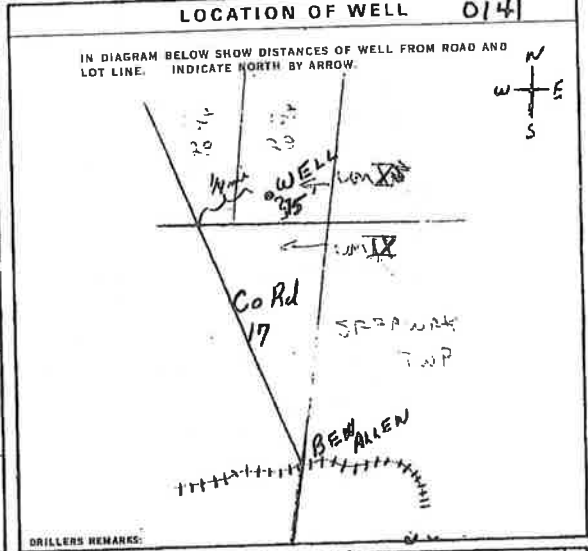
RECOMMENDED PUMP SETTING: **055** FEET

RECOMMENDED PUMPING RATE: **0005** GPM

FINAL STATUS OF WELL: **1**

WATER USE: **01**

METHOD OF DRILLING: **1**



CONTRACTOR: **Star & Roy Wright** LICENCE NUMBER: **5605**

ADDRESS: **298 Frank St. Waverton Ont.**

NAME OF DRILLER OR OWNER: **Mike Wright** LICENCE NUMBER: **5519**

SIGNATURE OF CONTRACTOR: **Star Wright** SUBMISSION DATE: **DAY 10 MO 06 YR 75**

OFFICE USE ONLY

DATA SOURCE: **1** CONTRACTOR: **5305** DATE RECEIVED: **110975**

DATE OF INSPECTION: **011075** INSPECTOR: **71**

REMARKS: **N.P.**

P.T.D. **WIT**



Ministry
of the
Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

1. PRINT ONLY IN SPACES PROVIDED

2. CHECK () CORRECTLY BUT WHERE APPLICABLE

(11)

2507253

25009

CON

027

COUNTY OR DISTRICT GREY	TOWNSHIP KEPPEL	CON. BLOCK CON X	LOT 027
OWNER (SURNAME FIRST) CRAMP	SECOND GARNET	ADDRESS R. R. # 2, OWEN SOUND, ON 1909-4 Ave N	DATE COMPLETED 15 May 80
TO 17	FROM 500.700	TO 4941.800	FROM 5
TO 17	FROM 500.700	TO 4941.800	FROM 5

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MUST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET
Black	Top Soil			0 1
Grey	Limestone			1 46
Brown	Limestone			46 68
Blue	Limestone			68 72
Blue	Shale			72 75'

31	0001802	0046215	0068415	0072315	0075317
32					

41 WATER RECORD	
WATER FOUND AT - FEET	KIND OF WATER
50-55	FRESH ☐ SULPHUR ☐ SALT ☐ MINERAL
55-60	FRESH ☐ SULPHUR ☐ SALT ☐ MINERAL
60-65	FRESH ☐ SULPHUR ☐ SALT ☐ MINERAL
65-70	FRESH ☐ SULPHUR ☐ SALT ☐ MINERAL
70-75	FRESH ☐ SULPHUR ☐ SALT ☐ MINERAL

51 CASING & OPEN HOLE RECORD	
INCHES	FEET
1/8	188
20	0020
20	0075

SCREEN	SIZE OF OPENING	FEET
	1/2	1/2

61 PLUGGING & SEALING RECORD	
DEPTH SET AT - FEET	MATERIAL AND TYPE
10-12	1/2
12-15	1/2
15-18	1/2
18-21	1/2
21-24	1/2

71 PUMPING TEST METHOD	
1 PUMP	30 BAILER
STATIC LEVEL	WATER LEVEL END OF PUMPING
014	063
IF FLOODING	DATE
RECOMMENDED PUMP TYPE	RECOMMENDED PUMP SETTING
SHALLOW	DEEP
060	0004

LOCATION OF WELL	
IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.	
DRILLER'S REMARKS	

FINAL STATUS OF WELL	
1	2
WATER USE	
01	01
METHOD OF DRILLING	
2	2

CONTRACTOR	
NAME OF WELL CONTRACTOR	ADDRESS
STAN WRIGHT & CO WELL DRILLERS 5505	298 FRANK ST., WILTON, ONT.
NAME OF DRILLER OR BORE	ADDRESS
DAVE & BOY WRIGHT	5505
SIGNATURE OF CONTRACTOR	DATE
	30 May 80

OFFICE USE ONLY	
DATE OF INSPECTION	INSPECTION
10/8/81	



APPENDIX D

ECOLOGICAL MONITORING PROGRAM

Year 2 (2016) Ecological Monitoring Report

H.S.C. Ltd New Keppel Quarry

1. Introduction

This Year 2 (2016) Ecological Monitoring Report provides on-going baseline data for future comparative analysis of the natural environment surrounding the New Keppel Quarry. The monitoring network shall be able to provide any 'trends through time' which could show unanticipated impacts to the surrounding woodlands and wetlands related to the extraction operations through the full AMP triggering review process.

With the ARA licence issued in the early spring of 2015, site clearing and extraction operations commenced that year within Phase 1A area (east of Grey Rd # 17). Site clearing within the Phase 1B area concluded in the early spring of 2015 with construction of the mitigation berm along the west side of Grey Rd 17 concluded in the spring of 2016. As discussed in the Year 1 monitoring report, not all baseline ecological monitoring components could be collected in 2015 due to safety concerns, however delayed data collection was completed in 2016 and incorporated into this Year 2 monitoring report for future baseline data comparisons.

2. Terrestrial Monitoring

i. EMA-1; Woodland Tree Health, Regeneration, Diversity Comparative Analysis

Three fixed forest plots were established in Lot 26 and Lot 27 in 2015, north of the New Keppel Quarry licence lands with base line data collected in 2015 and provided within the Year 1 monitoring report. Year 2 data has been provided under Appendix 1 with comparative discussions for each of the three monitoring sites provided below.

a) Plot F-1

- Main Plot (20m x 20m)
 - o No changes in 'Upper Canopy Live Tree' data
 - o No changes in 'Canopy Layer Composition' data
 - o No changes in 'Standing dead Tree' data
 - o No changes in 'Downed trees & woody Debris' data
- Regeneration Plots (2m x 2m)
 - o Some minor growth advancement in seedlings
- Ground Vegetation Composition Plots (1mx1m)
 - o Some minor composition changes from growth advancement of seedlings

b) Plot F-2

- Main Plot (20m x 20m)
 - No changes in 'Upper Canopy Live Tree' data
 - No changes in 'Canopy Layer Composition' data
 - No changes in 'Standing dead Tree' data
 - Minor change in 'Downed Trees & Woody Debris', from fallen branch and woody debris data
- Regeneration Plots (2m x 2m)
 - Some minor growth advancement in seedlings
- Ground Vegetation Composition Plots (1mx1m)
Some minor composition changes from growth advancement of seedlings

c) Plot F- 3

- Main Plot (20m x 20m)
 - No changes in 'Upper Canopy Live Tree' data
 - No changes in 'Canopy Layer Composition' data
 - No changes in 'Standing dead Tree' data
 - No changes in 'Downed Trees & Woody Debris' data
- Regeneration Plots (2m x 2m)
 - Some minor growth advancement in seedlings
- Ground Vegetation Composition Plots (1mx1m)
Some minor composition changes from growth advancement of seedlings

3. Wetland Monitoring

i. EMA- 4; Shouldice Wetland-Main Complex / S8 & S9 locations

Anuran night time calling surveys were completed in the spring season of 2016 for early, mid and late season breeding activity with data collected provided in Table No. 1 below.

Table No. 1: Anuran Monitoring Survey at EMA-4 location

Date	Time	Weather	Species	Calling Code/ Numbers
April 22, 2016	2210	10.0C, Wind speed 0-3 km/hr	Spring Peeper	Code 3/ >20
			Wood Frog	Code 1 / 7-8
May 30, 2016	2230	14.0C, Wind speed 3-11 km/hr	Northern Leopard Frog	Code 3 / >20
			Gray Treefrog	Code 1/ 5
June 29, 2016	2245	16.0C, Wind speed 3-11km/hr	Green Frog	Code 2/ 14-16

ii. **EMA- 5; Ephemeral Pond**

- a) Anuran night time calling surveys were completed in the spring season of 2016 for early, mid and late season breeding activity periods, with data collected provided in Table No. 2 below.

Table No. 2: Anuran Calling Survey at EMA-5 location

Date	Time	Weather	Species	Calling Code
April 22, 2016	2230	10.0C, Wind speed 0-3 km/hr	Spring Peeper	Code 3/ >20
May 30, 2016	2245	14.0C, Wind speed 3-11 km/hr	Northern Leopard Frog	Code 2 / 12-14
June 29, 2016	2300	16.0C, Wind 10km/hr	None	Code 0

Water depth data was collected by H.S.C. Ltd staff through monthly spring season monitoring of a permanent depth gauge placed within the ephemeral pond feature, with data collected summarized in Table No. 2B below.

Table No. 2B: Water Depths at EMA-5

Date	Water Depth (cm)
April 27, 2016	50.0
May 16, 2016	49.0
June 21, 2016	20.0
July 28, 2016	0.0

- b) Egg mass searches were undertaken in the spring season of 2016 for early, mid and late season breeding activity periods, with observations provided in Table No. 3 below.

Table No. 3: Anuran Egg Mass Survey at EMA-5 location

Date	Time	Observations
April 22, 2016	1600	Numerous frog egg masses, no salamander egg masses or salamander adults observed
May 30, 2016	1700	No egg masses, numerous tadpoles
June 27, 2016	1200	No egg masses, few tadpoles, pond area at 10% coverage from maximum surface area (almost dry)

iii. EMA- 6; Shouldice Wetland-Pond / S13 & East Park Head Creek Branch

- a) Anuran night time calling surveys were completed in the spring season of 2016 for early, mid and late season breeding activity with data collected provided in Table No. 4 below.

Table No. 4: Anuran Monitoring Survey at EMA-6 location

Date	Time	Weather	Species	Calling Code
April 22, 2016	2245	10.0C, Wind speed 0-3 km/hr	Spring Peeper	Code 1 / 6-7
			Wood Frog	Code 1/ 2
May 30, 2016	2300	14.0C, Wind speed 3-11 km/hr	Northern Leopard Frog	Code 1/ 8-10
			American Toad	Code 1 / 3
June 29, 2016	2310	16.0C, Wind speed 3-11km/hr	Green Frog	Code 1/ 5

b) Flora Species Diversity

Flora composition estimations of 2016 (see Appendix 2) did not identify any measurable difference at any of the Wetland Community monitoring plots sites in 2016 as compared to 2015 data. Surface water levels and seep discharge flows were similar to that observed in 2015 at all monitoring sites.

c) Macro-Invertebrate Diversity

Data collection in 2015 was attempted in mid-August during base flow water levels (as per agreed to protocol monitoring frequency), with unsuccessful results due to very dense vegetation growth and low waters conditions within the pond feature, and no waters within the outflow channel itself.

As such, data collection in 2016 was undertaken on June 27 during the high to base flow transition period and the early summer season. Three sweeps with a 500 mc mesh hand dip net was used within the pond area to sample 1 sq m and a 500 mc screen mesh was used in the discharge channel to sample 1 sq. m of channel bottom.

Sampling captured very few Marco-Invertebrates at both monitoring sites, with target levels for proper 'trend through time' data analysis still unachievable, given the dense vegetation and alga growth in the pond and the channel outflow being intermittent. Invertebrate samples and numbers are summarized in Table No. 5 below.

Table No. 5: Maco-Invertebrate Samples

Invertebrate Taxa	Pond Area (S13 feature): Numbers	Discharge Channel (S13-D): Numbers
Pond Snail	3	1
Dragon Fly	4	0
Damselfly	2	0
Mosquito larva	15	0
Crane Fly	1	1
True Bugs (Water Beetles)	1	0
Caddisfly	1	3
Water Mites	1	0

NOTE:

Recommendation at this time is to undertake Year 3 monitoring similar to that of 2016. If sampling captures in Year 3 (2017) continue to be 'low' in numbers and well below the proposed target sampling level of 100 organisms to have a reliable data set for future comparative analysis monitoring, than it is recommended that the steering committee in conjunction with the MNRF consider the value of continuing this monitoring aspect further.

4. Vegetative Screening: Tree Preservation Plan & Replacement Plan

a) Zone 1

The Year 1 (2015) monitoring report provided data collected during the previous summer of 2014, to allow the proponent a preliminary analysis of protocols and guidelines to achieve Niagara Escarpment conditions. Year 1 monitoring identified 5 trees needing replacement protocols to be enacted and 5 trees with action requirement (anticipated replacement protocols given the trees deteriorating health conditions).

Action Item:

- Zone 1 Tree Screening-Preservation data to be updated in summer of 2017
- Replacement protocols to be enacted for Year 1 identified trees and any additional trees through updated data.

b) Zone 2

Year 2 (2016) monitoring data has been provided in Appendix 3. Data analysis demonstrates that 9 trees were identified meeting replacement protocol requirements and 111 trees identified for pending action requirement protocols (Ash trees infected with Emerald Ash Borer).

Action Item:

- Replacement protocols to be enacted

5. Forest Restoration and Woodlot Expansion

Tree planting within 4 identified open areas (Stewardship Plan and Quarry Site Plans) was completed in the spring of 2016 with species numbers, densities, location outlined within Appendix 4, March 21, 2016 letter to the proponent.

Tree planting and planted tree survival rate assessment was undertaken by 'Lands & Forest Consulting'. Also included under Appendix 4 is the Lands & Forest Consulting project sheet noting the final tree planting numbers being consistent with target levels and project tree and planting cost.

The target survival threshold level was set at 80% per planting site. Post planting tree survival rates were also completed by Lands & Forest Consulting in September 2016, with data summarized in Table No. 6 below:

Table No. 6: Forest Restoration Tree Planting Assessment

Planting Site	Plot Sample		Survival Rate
	Live Trees	Dead Trees	
No. 1 (7A)	109	45	71%
No. 2 (7B)	123	33	79%
No. 3 (7C)	91	19	83%
No.4 (7D)	21	4	84%

Action Item:

- Site 1 (7A) requires supplemental tree planting of mortalities
- Site 2 (7B) requires supplemental tree planting of mortalities

6. Year 3 (2017) Monitoring & Action Plan

In accordance to the Ecological Monitoring Network-Frequency of data collection for Year 3, the following survey works should be completed in 2017 in accordance to approved protocols.

Year 3 Monitoring Activity

- EMA-1, Upland Woodland vegetation survey, data collection with comparison analysis to Year 1 and Year 2
- EMA-2: Woodland breeding Bird Survey, data collection with comparison analysis to Year 1
- EMA-3: Flora Diversity, data collection with comparison analysis to Year 1
- EMA-4: Flora Diversity, data collection with comparison analysis to Years 1 and 2
- EMA-5: Anuran calling survey and egg mass data collection with comparison analysis to Year 2
- EMA-5: Water Quantity monitoring data with comparison analysis to Year 2
- EMA-6: Wetland flora survey plots, data collection with comparison analysis to Years 1 and 2

- EMA-6: Wetland macro invertebrate sampling with comparison analysis to Year 2
- Forest Restoration, planting survival rates with comparison to Year 2
- Tree Preservation Plan- Road Corridor Screen Trees
 - o Zone 1: Repeat of Tree Screen Monitoring
 - o Note: Zone 3 Tree Screen monitoring data to be collected prior to extraction operations commencing within the Quarry Extraction Phase Area 2

Action Items identified through Year 1 and Year 2 Monitoring

- Tree Preservation Plan- Road Corridor Screen Trees
 - o Zone 1 & 2 Tree Replacement Protocol strategy to be implemented
- Forest Restoration
 - o Supplemental tree planting required in Sites 1 (7A) and 2 (7B)

Respectfully Submitted



John Morton, President AWS Environmental Consulting Inc.

APPENDIX 1

➤ **EMA-1 Woodland Plots**

Year 2 (2016) EMA-1 Woodland Vegetation Monitoring Plot Data

Plot No.: **F-1**

Date: 2016, August 8

Surveyors: John Morton

GPS Center Point : 500134 Easting,
4942528 Northing +/-7m

Main Plot: 20m x 20m

Upper Main Canopy Live Trees (>10cm dbh)

Basal Area : 18 sq. m/ha

Tree Number	Species		DBH cm	Crown Class	Crown Vigour Rating	Three Tree Heights
	Common Name	Latin Name				
1	Sugar Maple	<i>Acer saccharum</i>	28	1	1	20.0m
2	Sugar Maple	<i>Acer saccharum</i>	22	1	1	
3	Sugar Maple	<i>Acer saccharum</i>	14	2	3	
4	Sugar Maple	<i>Acer saccharum</i>	18	1	1	
5	Sugar Maple	<i>Acer saccharum</i>	34	1	1	21.5m
6	Sugar Maple	<i>Acer saccharum</i>	12	2	2	
7	Sugar Maple	<i>Acer saccharum</i>	14	2	1	
8	Sugar Maple	<i>Acer saccharum</i>	24	1	1	
9	Sugar Maple	<i>Acer saccharum</i>	32	1	1	
10	Sugar Maple	<i>Acer saccharum</i>	24	1	2	
11	Sugar Maple	<i>Acer saccharum</i>	10	3	3	
12	Sugar Maple	<i>Acer saccharum</i>	26	1	1	
13	Sugar Maple	<i>Acer saccharum</i>	20	1	1	
14	Sugar Maple	<i>Acer saccharum</i>	36	1	2	
15	Sugar Maple	<i>Acer saccharum</i>	12	2	2	
16	Sugar Maple	<i>Acer saccharum</i>	22	1	1	19.5m
17	Sugar Maple	<i>Acer saccharum</i>	12	3	2	
18	Sugar Maple	<i>Acer saccharum</i>	26	1	1	
19	Sugar Maple	<i>Acer saccharum</i>	26	1	1	
20	Sugar Maple	<i>Acer saccharum</i>	16	1	1	
						Avg. Ht = 20.3m

Canopy Layer Composition

Canopy Ht.	Species Latin Name / Percentage of Canopy Area Occupied in Plot
>10m	<i>Acer saccharum</i> / 92%
2-10 m	<i>Ostrya virginiana</i> / 20% ; <i>Acer saccharum</i> / 10%
0.5 to 2m	<i>Fraxinus sp.</i> / 3% ; <i>Tilia americana</i> / 1%
0 to 0.5m	<i>Fraxinus sp.</i> / 25% ; <i>Clinopodium vulgare</i> / 20% ;
	<i>Adiantum pedatum</i> / 8% ; <i>Thalictrum dioica</i> / 1%

Standing Dead Trees

	Species (If Determinable)		DBH cm	Total Height m	Decay Class
	Common Name	Latin Name			
1	Sugar Maple	<i>Acer saccharum</i>	8	16	3
2	Sugar Maple	<i>Acer saccharum</i>	8	10	4
3	Sugar Maple	<i>Acer saccharum</i>	6	5	5
4	Sugar Maple	<i>Acer saccharum</i>	8	14	4
5					

Downed Trees & Woody Debris

No.	Logs : > 20cm avg. diameter			Polewood: 10cm to 20cm diameter		
	Length m	Compass Bearing from Main End	Decay Class	Length m	Compass Bearing from Main End	Decay Class
1	3	312 degrees	2			
2	4	250 degrees	1			
3						
4						
5						
6						
Branches : 4cm to 10cm			Woody Debris : < 4cm			
General Quantity		% Coverage of Plot Area	General Quantity		% Coverage of Plot Area	
Minor		10	Moderate		15	

Year 2 (2016) Monitoring, 2m x 2m Plot : Regeneration Trees

Dtae: 2016, August 12

Plot : NE					
Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
<i>Fraxinus sp.</i>	5	3	0	0	0
<i>Acer saccharum</i>	0	0	1	0	0
<i>Cornus alternifolia</i>	2	1	0	0	0
Additional Notes:					

Plot : SE					
Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
<i>Tilia americana</i>	1	2	0	0	0
<i>Fraxinus sp.</i>	2	1	0	0	1
<i>Amelanchier cf. sanguinea</i>	0	0	0	0	1
<i>Cornus alternifolia</i>	0	0	0	0	1
Additional Notes:					

Plot : SW					
Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
<i>Fraxinus sp.</i>	4	2	1	1	1
<i>Cornus alternifolia</i>	2	0	0	0	0
<i>Prunus serotina</i>	0	1	0	0	0
Additional Notes:					

Plot : NW					
Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
<i>Prunus serotina</i>	2	1	0	0	0
<i>Fraxinus sp.</i>	2	0	0	0	0
Additional Notes: 2 clumps of <i>Asplenium scolopendrium</i> on boulder just outside NW corner of this plot					

Plot : Center					
Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
<i>Fraxinus sp.</i>	4	5	1	0	0
<i>Prunus serotina</i>	0	1	0	0	0
Additional Notes:					

Year 2 (2016) , 1m x 1m Plot : Ground Vegetation Composition

Date: 2016, August 12

Plot : NE	
Species Latin Name	Percentage Cover
<i>Thalictrum dioicum</i>	95
<i>Viola blanda</i>	5
<i>Arctium minus</i>	2
<i>Fraxinus sp.</i>	2
<i>Trillium grandiflorum</i>	1
<i>Symphyotrichum lateriflorum</i>	1
<i>Carex arctata</i>	P
* <i>Clinopodium vulgare</i>	P
<i>Carex cf. pedunculata</i>	P

Plot : SE	
Species Latin Name	Percentage Cover
Duff	44
Woody Debris	35
<i>Cornus alternifolia</i>	6
<i>Fraxinus sp.</i>	10
<i>Prunus serotina</i>	4
<i>Amelanchier cf. sanguinea</i>	3
Moss	2
<i>Crataegus sp.</i>	1
* <i>Clinopodium vulgare</i>	P

Plot : SW	
Species Latin Name	Percentage Cover
Duff	56
moss on a boulder	20
<i>Fraxinus sp.</i>	10
<i>Symphyotrichum lateriflorum</i>	5
<i>Cornus alternifolia</i>	3
<i>Carex pedunculata</i>	2
* <i>Verbascum thapsis</i>	2
* <i>Clinopodium vulgare</i>	1
* <i>Solanum dulcamara</i>	1
<i>Melilotus alba</i>	P
<i>Anemone virginiana</i>	P
<i>Ostrya virginiana</i>	P

Plot: NW	
Species Latin Name	Percentage Cover
Duff	60
Bare earth	25
Moss	4
<i>Carex pedunculata</i>	2
<i>Cornus alternifolia</i>	2
<i>Prunus serotina</i>	2
<i>Fraxinus sp.</i>	5
<i>Maianthemum canadense</i>	P

Plot : Center	
Species Latin Name	Percentage Cover
Duff	56
<i>Adiantum pedatum</i>	30
Woody debris	8
<i>Fraxinus sp.</i>	10
<i>Prunus serotina</i>	5
<i>Ostrya virginiana</i>	P
* <i>Clinopodium vulgare</i>	P
<i>Thalictrum dioicum</i>	P

Note: ' * ' denotes a Non-Native Species

Year 2 (2016) EMA-1 Woodland Vegetation Monitoring Plot Data

Plot No.: **F-2**
 Surveyors: John Morton

Date: 2016, August 8
 GPS Center Point: 500095 Easting
 4942660 Northing +/- 3m

Main Plot: 20m x 20m

Upper Main Canopy Live Trees			Basal Area : 24 sq. m/ha			
Tree Number	Species		DBH cm	Crown Class	Crown Vigour Rating	Three Tree Heights
	Common Name	Latin Name				
1	White Ash	<i>Fraxinus americana</i>	33	1	1	21.5m
2	Sugar Maple	<i>Acer saccharum</i>	38	1	1	
3	Sugar Maple	<i>Acer saccharum</i>	14	3	2	
4	Sugar Maple	<i>Acer saccharum</i>	24	1	1	
5	Sugar Maple	<i>Acer saccharum</i>	18	1	1	
6	Sugar Maple	<i>Acer saccharum</i>	26	1	1	
7	Sugar Maple	<i>Acer saccharum</i>	18	1	1	
8	Sugar Maple	<i>Acer saccharum</i>	18	1	1	
9	Sugar Maple	<i>Acer saccharum</i>	12	3	2	
10	Sugar Maple	<i>Acer saccharum</i>	18	2	2	
11	Sugar Maple	<i>Acer saccharum</i>	12	4	1	
12	Sugar Maple	<i>Acer saccharum</i>	12	4	2	
13	Sugar Maple	<i>Acer saccharum</i>	24	1	1	19.0m
14	Sugar Maple	<i>Acer saccharum</i>	16	1	3	
15	Sugar Maple	<i>Acer saccharum</i>	22	1	1	
16	Sugar Maple	<i>Acer saccharum</i>	18	1	1	
17	Sugar Maple	<i>Acer saccharum</i>	14	2	2	
18	Sugar Maple	<i>Acer saccharum</i>	10	4	2	
19	Sugar Maple	<i>Acer saccharum</i>	20	1	2	18.0m
20	Sugar Maple	<i>Acer saccharum</i>	20	1	2	
21	Sugar Maple	<i>Acer saccharum</i>	26	1	1	
22	Sugar Maple	<i>Acer saccharum</i>	26	1	1	
23	Sugar Maple	<i>Acer saccharum</i>	24	1	1	
24	Balsam Poplar	<i>Populus balsamifera</i>	28	1	1	
25	Sugar Maple	<i>Acer saccharum</i>	12	4	2	
26	Sugar Maple	<i>Acer saccharum</i>	10	4	1	
27	Sugar Maple	<i>Acer saccharum</i>	14	1	2	
28	Sugar Maple	<i>Acer saccharum</i>	14	1	2	
Avg. =						19.5m

Canopy Layer Composition		Note : 'P' represents Present or < 1% Coverage
Canopy Ht.	Species Common Name / Percentage of Canopy Area Occupied in Plot	
>10m	<i>Acer saccharum</i> / 88% ; <i>Fraxinus americana</i> / 3% ; <i>Populus balsamifera</i> / 3%	
2-10 m	<i>Ostrya virginiana</i> / 1% ; <i>Acer saccharum</i> / P	
0.5 to 2m	<i>Fraxinus</i> sp. / P ; <i>Brachyelytrum erectum</i> / P ;	
	<i>Symphytotrichum lateriflorum</i> / P ; <i>Ostrya virginiana</i> / P	
0 to 0.5m	<i>Adiantum pedatum</i> / 75% ; <i>Carex pedunculata</i> / 8% ; <i>Viola pubescens</i> / 2% ;	
	<i>Caulophyllum thalictroides</i> / 1% ; <i>Clinopodium vulgare</i> / 1% ; <i>Symphytotrichum lateriflorum</i> / 1%	

Standing Dead Trees

No.	Species (If Determinable)		DBH cm	Total Height m	Decay Class
	Common Name	Latin Name			
1	Sugar Maple	<i>Acer saccharum</i>	12	14	3
2					
3					
4					
5					

Downed Trees & Woody Debris

	Logs : > 20cm avg. diameter			Polewood: 10cm to 20cm diameter		
	Length m	Compass Bearing from Main End	Decay Class	Length m	Compass Bearing from Main End	Decay Class
1	8	300 degrees	3	7	280 degrees	1
2	9	276 degrees	4	3	200 degrees	2
3	4	125 degrees	1	3	140 degrees	1
4	9	85 degrees	5			
5						
6						
Branches : 4cm to 10cm			Woody Debris : < 4cm			
General Quantity		% Coverage of Plot Area	General Quantity		% Coverage of Plot Area	
Minor		10	Minor		15	

Year 2 (2016), 2m x 2m Plot : Regeneration Trees

Date: 2016, August 12

Plot : NE					
Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
<i>Fraxinus sp.</i>	4	2	0	0	0
Additional Notes:					

Plot : SE					
Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
<i>Ostrya virginiana</i>	2	0	0	0	1
<i>Fraxinus sp.</i>	4	2	0	0	0
Additional Notes:					

Plot : SW					
Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
<i>Fraxinus sp.</i>	5	3	0	0	0
Additional Notes:					

Plot : NW					
Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
<i>Ostrya virginiana</i>	1	0	0	0	5
<i>Fraxinus sp.</i>	1	0	0	0	0
Additional Notes:					

Plot : Center					
Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
<i>Prunus serotina</i>	2	1	0	0	0
<i>Cornus alternifolia</i>	1	0	0	0	0
Additional Notes:					

Year 2 (2016) 1m x 1m Plot : Ground Vegetation Composition

Date: 2016, August 12

Plot : NE	
Species Latin Name	Percentage Cover
Duff	45
<i>Fraxinus sp.</i>	25
<i>Geranium robertianum</i>	20
<i>Symphyotrichum cordifolium</i>	1
<i>Viola blanda</i>	1
<i>Eupatorium rugosum</i>	2
<i>Polygonatum pubescens</i>	6
<i>Taraxicum officinale</i>	P
<i>Symphyotrichum lateriflorum</i>	P
<i>Brachyelytrum eretum</i>	P

Plot : SE	
Species Latin Name	Percentage Cover
Duff	82
<i>Ostrya virginiana</i>	12
Bare earth	7
<i>Fraxinus sp.</i>	10
<i>Schizachne purpurascens</i>	1
<i>Epipactis helleborine</i>	P
<i>Geranium robertianum</i>	P
<i>Verbascum thapsis</i>	P
<i>Symphyotrichum lateriflorum</i>	P
<i>Viola pubscens</i>	P

Plot : SW	
Species Latin Name	Percentage Cover
Duff	30
<i>Fraxinus sp.</i>	28
<i>Dryopteris carthusiana</i>	20
moss	20
<i>Viola pubscens</i>	2
<i>Arisaema triphyllum</i>	1
<i>Ostrya virginiana</i>	P
<i>Carex pensylvanica</i>	P
<i>Trillium grandiflorum</i>	P

Plot: NW	
Species Latin Name	Percentage Cover
Duff	80
<i>Ostrya virginiana</i>	50
bare earth	12
* <i>Clinopodium vulgare</i>	4
<i>Maianthemum canadense</i>	1
<i>Fraxinus sp.</i>	1
* <i>Geranium robertianum</i>	1
<i>Symphyotrichum lateriflorum</i>	1
* <i>Taraxicum officinale</i>	P
<i>Trillium grandiflorum</i>	P
<i>Carex pensylvanica</i>	P

Plot : Center	
Species Latin Name	Percentage Cover
Duff	36
moss	30
<i>Caulophyllum thalictroides</i>	12
<i>Prunus serotina</i>	6
<i>Clinopodium vulgare</i>	4
<i>Viola pubscens</i>	3
<i>Brachyelytrum eretum</i>	3
<i>Actaea rubra</i>	2
<i>Maianthemum canadense</i>	2
<i>Hepatica acutiloba</i>	2
<i>Adiantum pedatum</i>	P

Note: ' * ' denotes a Non-Native Species

Year 2 (2016) EMA-1 Woodland Vegetation Monitoring Plot Data

Plot No.: **F-3**

Date: 2016, August 8

Surveyors: John Morton

GPS Center Point: 499935 Easting

4942695 Northing +/- 3m

Main Plot: 20m x 20m

<u>Upper Main Canopy Live Trees</u>						
Basal Area : 12 sq. m/ha						
Tree Number	Species		DBH cm	Crown Class	Crown Vigour Rating	Three Tree Heights
	Common Name	Latin Name				
1	White Ash	<i>Fraxinus americana</i>	20	1	1	18.0m
2	Sugar Maple	<i>Acer saccharum</i>	14	1	1	
3	Sugar Maple	<i>Acer saccharum</i>	12	2	1	
4	Black Cherry	<i>Prunus serotina</i>	14	1	1	
5	Sugar Maple	<i>Acer saccharum</i>	12	1	1	
6	White Ash	<i>Fraxinus americana</i>	36	1	1	22.0m
7	Sugar Maple	<i>Acer saccharum</i>	12	2	1	
8	Sugar Maple	<i>Acer saccharum</i>	16	1	1	
9	Sugar Maple	<i>Acer saccharum</i>	16	2	2	
10	Sugar Maple	<i>Acer saccharum</i>	14	2	3	
11	Basswood	<i>Tilia americana</i>	32	1	1	
12	White Ash	<i>Fraxinus americana</i>	18	1	1	17.5m
13	White Ash	<i>Fraxinus americana</i>	18	2	1	
14	Green Ash	<i>Fraxinus pennsylvanica</i>	16	2	2	
15	Green Ash	<i>Fraxinus pennsylvanica</i>	12	2	2	
16	Green Ash	<i>Fraxinus pennsylvanica</i>	14	1	1	
Avg. Ht. =						19.2m

<u>Canopy Layer Composition</u>		Note: 'P' represents Present or < 1% Coverage
Canopy Ht.	Species Common Name / Percentage of Canopy Area Occupied in Plot	
>10m	<i>Fraxinus americana</i> / 30% ; <i>Acer saccharum</i> / 12% ; <i>Tilia americana</i> / 20% ; <i>Prunus serotina</i> / 3%	
2-10 m	<i>Acer saccharum</i> / 5% ; <i>Ostrya virginiana</i> / 2%	
0.5 to 2m	<i>Prunus virginiana</i> / 3% ; <i>Symphytotrichum lateriflorum</i> / 2% ; <i>Cornus alternifolia</i> / P	
0 to 0.5m	<i>Acer saccharum</i> / 25% ; <i>Geranium robertianum</i> / 5% ; <i>Hypericum perforatum</i> / 1% ;	
	<i>Carex pedunculata</i> / 1% ; mix of others / 3%	

Standing Dead Trees

No.	Species (If Determinable)		DBH cm	Total Height m	Decay Class
	Common Name	Latin Name			
1	Sugar Maple	<i>Acer saccharum</i>	6	14	3
2	White Ash	<i>Fraxinus americana</i>	6	12	4
3					
4					
5					

Downed Trees & Woody Debris

No.	Logs : > 20cm avg. diameter			Polewood: 10cm to 20cm diameter		
	Length m	Compass Bearing from Main End	Decay Class	Length m	Compass Bearing from Main End	Decay Class
1	12	17 degrees	1	14	285 degrees	1
2	8	310 degrees	1	10	275 degrees	1
3				6	300 degrees	1
4				7	250 degrees	2
5				3	200 degrees	4
6						
Branches : 4cm to 10cm			Woody Debris : < 4cm			
General Quantity		% Coverage of Plot Area	General Quantity		% Coverage of Plot Area	
Moderate		15	Moderate		20	

Year 2 (2016), 2m x 2m Plot : Regeneration Trees

Date: 2016, August 12

Plot : NE					
Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
<i>Acer saccharum</i>	0	1	0	0	0
<i>Ulmus americana</i>	1	0	0	0	0
Additional Notes:					

Plot : SE					
Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
<i>Acer saccharum</i>	0	1	0	0	0
<i>Fraxinus sp.</i>	3	1	0	1	0
<i>Prunus serotina</i>	1	0	0	0	0
Additional Notes: A bedrock open crevice runs through this plot					

Plot : SW					
Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
<i>Fraxinus sp.</i>	1	0	0	0	0
Additional Notes:					

Plot : NW					
Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
<i>Acer saccharum</i>	0	1	0	0	0
Additional Notes:					

Plot : Center					
Species Latin Name	Height Range				
	16 to 35cm	36 to 55cm	56 to 75cm	76 to 95 cm	96 to 200cm
<i>Acer saccharum</i>	5	2	0	0	0
<i>Prunus serotina</i>	2	0	0	0	0
Additional Notes:					

Yea4r 2 (2016), 1m x 1m Plot : Ground Vegetation Composition

Plot : NE	
Species Latin Name	Percentage Cover
Rubus strigosus	25
Solidago altissima	25
* Clinopodium vulgare	25
Acer saccharum	15
Duff and bare earth	5
Ulmus americana	3
* Taraxicum officinale	1
Symphyotrichum lateriflorum	1
Fragaria virginiana	P
Geum canadense	P
* Geranium robertianum	P
* Potentilla recta	P
Glyceria striata	P
* Epipactis helleborine	P
Viola pubescens	P
* Ranunculus acris	P

Plot : SE	
Species Latin Name	Percentage Cover
Acer saccharum	45
Symphyotrichum lateriflorum	30
Duff	17
* Geranium robertianum	5
Fraxinus sp.	2
Solidago altissima	1
Asplenium trichomanes	P
* Clinopodium vulgare	P
* Taraxicum officinale	P

Plot : SW	
Species Latin Name	Percentage Cover
Bare earth	80
Woody debris	10
Fraxinus sp.	5
Rubus strigosus	2
* Hypericum perforatum	2
* Clinopodium vulgare	P
sterile grass sp?	P

Plot: NW	
Species Latin Name	Percentage Cover
Duff and bare earth	42
Woody debris	40
Moss	12
* Geranium robertianum	4
Carex interior	2
* Hypericum perforatum	P
Circaea lutetiana	P

Plot : Center	
Species Latin Name	Percentage Cover
Woody debris and Duff	90
Acer saccharum	5
Symphyotrichum lateriflorum	1
* Taraxicum officinale	3
* Geranium robertianum	1

Note: ' * ' denotes a Non-Native Species

Appendix 2

- EMA-6: Wetland Flora Plots

Year 2 (2016) Wetland Flora Monitoring

Vegetation Composition : All Plots are 1m x 1m

Site:

EMA-3 ; The Glen

Date: 2016, August 12

Plot No.: S1		
Species Latin Name	Percentage Cover	
	Emergent	Submergent
<i>Veronica anagalis-aquatica</i>	75	0
* <i>Solanum dulcamara</i>	1	0
* <i>Nasturtium officinale</i>	24	0
GPS Co-ordinates: 500232 E ; 4943487 N		

Plot No. : S2		
Species Latin Name	Percentage Cover	
	Emergent	Submergent
<i>Chrysosplenium americanum</i>	47	0
Moss on logs	28	
* <i>Tussilago farfara</i>	26	0
<i>Impatiens capensis</i>	25	0
* <i>Epilobium hirsutum</i>	16	0
<i>Leersia oryzoides</i>	15	0
<i>Eupatorium perfoliatum</i>	5	0
* <i>Scirpus atrovirens</i>	2	0
* <i>Rumex crispus</i>	1	0
<i>Clematis virginiana</i>	1	0
<i>Symphyotrichum puniceum</i>	1	0
* <i>Solanum dulcamara</i>	P	0
<i>Scutellaria lateriflora</i>	P	0
GPS Co-ordinates: 500246 E ; 4943458 N		

Site:

EMA-4 ; Main Shouldice Wetland

Plot No.: S8		
Species Latin Name	Percentage Cover	
	Emergent	Submergent
<i>Glyceria borealis</i>	35	0
<i>Leersia oryzoides</i>	18	0
<i>Lysimachia sp. Sterile</i>	6	0
<i>Sparganium emersum</i>	5	0
<i>Ludwigia palustris</i>	4	0
<i>Mentha arvensis</i>	2	0
<i>Phalaris arundinacea</i>	2	0
<i>Galium palustris</i>	1	0
* <i>Ranunculus acris</i>	P	0
* <i>Carex spicata</i>	P	0
<i>Poa palustris</i>	P	0
<i>Scutellaria lateriflora</i>	P	0
<i>Cicuta bulbifera</i>	P	0
<i>Typha latifolia</i>	P	0
Bare mud	40	
GPS Co-ordinates: 499521 E ; 4942615 N		

Plot : S9		
Species Latin Name	Percentage Cover	
	Emergent	Submergent
<i>Ludwigia palustris</i>	45	0
<i>Carex hystericina</i>	20	0
<i>Eleocharis palustris</i>	18	0
* <i>Sagittaria latifolia</i>	4	0
<i>Lysimachia sp. sterile</i>	6	0
<i>Sparganium emersum</i>	5	0
<i>Leersia oryzoides</i>	4	0
<i>Asclepias incarnata</i>	P	0
<i>Mentha arvensis</i>	P	0
<i>Typha latifolia</i>	P	0
<i>Galium palustris</i>	P	0
<i>Scutellaria lateriflora</i>	P	0
<i>Cicuta bulbifera</i>	P	0
GPS Co-ordinates: 499519 E ; 4942628 N		

Site:

EMA-6 ; Shouldice Wetland - Pond Area

Date: 2016, August 12

Plot No.: S13-A		
Species Latin Name	Percentage Cover	
	Emergent	Submergent
<i>Juncus alpinoarticulatus</i>	95	0
* <i>Nasturtium officinale</i>	4	0
<i>Salix discolor</i>	4	0
<i>Salix lucida</i>	1	0
<i>Glyceria borealis</i>	2	0
* <i>Agrostis gigantea</i>	P	0
* <i>Solanum dulcamara</i>	P	0
<i>Galium palustris</i>	P	0
<i>Lemna minor</i>	P	0
GPS Co-ordinates: 499757 E ; 4941755 N		

Plot No. : S13-B		
Species Latin Name	Percentage Cover	
	Emergent	Submergent
<i>Juncus alpinoarticulatus</i>	95	0
<i>Leersia oryzoides</i>	1	0
* <i>Nasturtium officinale</i>	7	0
* <i>Agrostis gigantea</i>	1	0
* <i>Solanum dulcamara</i>	3	0
<i>Symphyotrichum puniceum</i>	P	0
GPS Co-ordinates: 499745 E ; 4941742 N		

Plot No.: S13-C		
Species Latin Name	Percentage Cover	
	Emergent	Submergent
* <i>Agrostis gigantea</i>	45	0
<i>Leersia oryzoides</i>	35	0
<i>Scirpus atrovirens</i>	10	0
<i>Ranunculus hispidus</i>	8	0
<i>Impatiens capensis</i>	2	0
<i>Caltha palustris</i>	P	0
<i>Galium palustris</i>	P	0
<i>Sium suave</i>	P	0
GPS Co-ordinates: 499732 E ; 4941708 N		

Plot No. : S13-D		
Species Latin Name	Percentage Cover	
	Emergent	Submergent
<i>Galium palustris</i>	P	0
* <i>Scutellaria lateriflora</i>	P	0
<i>Leersia oryzoides</i>	88	0
* <i>Nasturtium officinale</i>	10	0
Bare mud	6	0
Woody debris	5	0
<i>Ranunculus hispidus</i>	3	0
* <i>Solanum dulcamara</i>	1	0
<i>Ludwigia palustris</i>	1	0
<i>Sium suave</i>	1	0
GPS Co-ordinates: 499722 E ; 4941667 N		

Notes: ' * ' denotes, a Non-Native Species
' P ' denotes, Present but < 1% coverage

Plot Flora Inventory Listing with Floristic Quality Assessment (FQA) Scores

Latin Name	Common Name	Prov. Status	FQA	
			CC	CW
* <i>Agrostis gigantea</i>	Redtop	Exotic	0	0
<i>Asclepias incarnata</i>	Swamp Milkweed	NAR	6	-5
<i>Caltha palustris</i>	Wild Calia	NAR	8	-5
<i>Carex hystericina</i>	Porcupine Sedge	NAR	5	-5
* <i>Carex spicata</i>	Spiked Sedge	Exotic	0	5
<i>Chrysosplenium americanum</i>	American Golden-saxifrage	NAR	8	-5
<i>Cicuta bulbifera</i>	Bulb-bearing Water-hemlock	NAR	5	-5
<i>Clematis virginiana</i>	Virginia Virgins-bower	NAR	3	0
<i>Eleocharis palustris</i>	Creeping Spike-rush	NAR	6	-5
* <i>Epilobium hirsutum</i>	Hairy Willowherb	Exotic	0	-4
<i>Eupatorium perfoliatum</i>	Common Bonset	NAR	2	-4
<i>Galium palustris</i>	Marsh Bedstraw	NAR	5	-5
<i>Glyceria borealis</i>	Northern Manna Grass	NAR	8	-5
<i>Impatiens capensis</i>	Spotted Jewelweed	NAR	4	-3
<i>Juncus alpinoarticulatus</i>	Alpine Rush	NAR	5	-5
<i>Leersia oryzoides</i>	Rice Cutgrass	NAR	3	-5
<i>Lemna minor</i>	Lesser Duckweed	NAR	2	-5
<i>Ludwigia palustris</i>	Marsh Seedbox	NAR	5	-5
<i>Lysimachia sp. sterile</i>	Fringed Loosestrife	NAR	4	-3
<i>Mentha arvensis</i>	Field Mint	NAR	3	-3
* <i>Nasturtium officinale</i>	Watercress	Exotic	0	-5
<i>Phalaris arundinacea</i>	Reed Canary Grass	NAR	0	-4
<i>Poa palustris</i>	Fowl Bluegrass	NAR	5	-4
* <i>Ranunculus acris</i>	Tall Buttercup	Exotic	0	-2
<i>Ranunculus hispidus var. caricetorum</i>	Swamp Buttercup	NAR	5	-5
* <i>Rumex crispus</i>	Curly Dock	Exotic	0	-1
<i>Sagittaria latifolia</i>	Broad-leaved Arrowhead	NAR	4	-5
<i>Salix discolor</i>	Pussy Willow	NAR	3	-3
<i>Salix lucida</i>	Shining Willow	NAR	5	-4
<i>Scirpus atrovirens</i>	Dark-green Bulrush	NAR	3	-5
* <i>Scutellaria lateriflora</i>	Mad Dog Skullcap	NAR	5	-5
<i>Sium suave</i>	Hemlock Water-parsnip	NAR	4	-5
* <i>Solanum dulcamara</i>	Climbing Nightshade	Exotic	0	0
<i>Sparganium emersum</i>	Green-fruited Burreed	NAR	5	-5
<i>Symphotrichum puniceum</i>	Swamp Aster	NAR	6	-5
* <i>Tussilago farfara</i>	Colt's-foot	Exotic	0	3
<i>Typha latifolia</i>	Broad-leaved Cattail	NAR	3	-5
<i>Veronica anagalis-aquatica</i>	Water Speedwell	Exotic	0	-5

Ontario Ministry of Natural Resources, 'Floristic Quality Assessment' (FQA) Scoring System:

CC = Coefficient of Conservatism, ranked 0 (grows anywhere) to 10 (very specific habitat requirements)

CW = Coefficient Wetness Index, values from -5 (very wet) to 5 (very dry)

Appendix 3- Zone 2

- Road Corridor Tree Screening: Preservation & Replacement Plan

H.S.C. Ltd. New Keppel Quarry Tree Preservation Screening, 2016 Baseline Data: Area 2, West Side Corridor along Grey Rd 17

Tree No.	Species	DBH	No. Stems	Total Tree Height	Crown Class (1/2/3/4)	% Live Crown	Evidence of Dieback (Yes/No)				Evidence of Health Stressors				Growing Condition	Comments
							Twigs	Branches	Leaf Defol.	Leaf Discolor.	Wound Type	Visible Insect Impacts	Others			
1	Pw	20	1	5	1	50	N	N	N	N	1	N	Y	Fair	Broken Top	
2	Pw	12	1	5	1	100	N	N	N	N	N	N	N	Exc		
3	Ea	14	2	7	1	100	N	N	N	N	N	N	N	Exc		
4	Pw	16	1	6	1	100	N	N	N	Y	N	N	Blister Rust	Good		
5	Pw	20	1	7	1	100	Y	N	N	Y	N	N	Blister Rust	Good		
6	Pw	22	1	8	1	100	N	N	N	N	N	N	N	Exc		
7	Pw	34	1	11	1	90	Y	Y	N	N	2	N	N	Good		
8	Pw	34	1	10	10	100	N	N	N	N	N	N	N	Exc		
9	Ce	18	1	6	1	100	N	N	N	Y	N	N	N	Exc		
10	Pw	24	1	7	1	100	N	Y	N	N	N	N	N	Good	Branches Trimmed	
11	Pw	16	1	8	2	100	N	N	N	N	N	N	N	Exc		
12	Ce	16	2	8	2	100	N	N	N	N	N	N	N	Exc		
13	Pw	20	1	9	2	100	N	N	N	N	N	N	N	Exc		
14	Pw	24	1	10	2	100	N	N	N	N	N	N	N	Exc		
15	Ce	24	2	12	3	100	N	N	N	N	N	N	N	Exc		
16	Pw	32	1	12	1	100	N	N	N	N	N	N	N	Exc		
17	Pw	28	1	12	2	100	N	N	N	N	N	N	N	Exc		
18	Pw	22	1	11	3	100	N	N	N	N	N	N	N	Exc		
19	Pw	30	1	12	1	100	N	N	N	N	N	N	N	Exc		
20	Pw	32	1	13	1	100	N	N	N	N	N	N	N	Exc		
21	Ag	38	1	16	1	100	Y	N	Y	Y	N	Y	N	Good	EAB	
22	Ea	20	2	14	2	100	N	N	N	N	N	N	N	Exc		
23	Ag	24	1	16	2	100	N	N	N	N	N	N	N	Exc		
24	Ag	34	1	20	1	100	N	N	N	N	N	N	N	Exc		
25	Ag	20	1	14	2	100	N	N	N	N	N	N	N	Exc		
26	Ag	32	1	18	1	85	Y	N	N	Y	N	Y	N	Good	EAB	
27	Ag	24	1	16	1	100	N	N	N	N	N	N	N	Exc		

H.S.C. Ltd. New Keppel Quarry Tree Preservation Screening, 2016 Baseline Data: Area 2, West Side Corridor along Grey Rd 17

Tree No.	Species	DBH	No. Stems	Total Tree Height	Crown Class (1/2/3/4)	% Live Crown	Evidence of Dieback (Yes/No)				Evidence of Health Stressors			Growing Condition	Comments
							Twigs	Branches	Leaf Defol.	Leaf Discolor.	Wound Type	Visible Insect Impacts	Others		
28	Ag	38	1	20	1	100	N	N	N	N	N	N	N	Exc	
29	Ab	26	1	17	2	100	N	N	N	N	N	N	N	Exc	
30	Ms	36	5	21	2	100	N	N	N	N	N	N	N	Exc	
31	Ms	52	1	24	2	100	N	N	N	N	N	N	N	Exc	
32	Ab	30	1	19	2	100	N	N	N	Y	N	N	N	Good	
33	Ab	26	1	18	2	80	Y	N	Y	Y	N	Y	N	Good	EAB
34	Aw	40	1	26	1	100	N	N	N	N	N	N	N	Exc	
35	Ag	26	1	18	2	100	N	N	N	N	N	N	N	Exc	
36	Mh	42	1	24	3	100	N	N	N	N	N	N	N	Exc	
37	Ag	26	1	20	3	100	N	N	N	N	N	N	N	Exc	
38	Aw	32	1	20	3	100	N	N	Y	Y	N	Y	N	Good	EAB
39	Ag	34	1	22	1	100	N	N	N	N	N	N	N	Exc	
40	Mh	26	1	20	2	100	N	N	N	N	N	N	N	Exc	
41	Ab	18	1	16	2	100	N	N	N	N	N	N	N	Exc	
42	Mh	20	1	17	3	100	N	N	N	N	N	N	N	Exc	
43	Aw	38	1	25	2	85	Y	Y	Y	Y	N	Y	N	Fair	EAB
44	Ag	26	1	18	2	100	N	N	N	Y	N	Y	N	Good	EAB
45	Cb	28	1	17	3	90	Y	N	N	N	N	N	N	Good	
46	Aw	34	1	23	3	100	N	N	N	N	N	N	N	Exc	
47	Aw	42	1	26	2	100	N	N	N	N	N	N	N	Exc	
48	Aw	28	1	22	3	100	N	N	N	N	N	N	N	Exc	
49	Ba	44	1	27	2	100	N	N	N	N	N	N	N	Exc	
50	Ba	52	1	28	2	100	N	N	N	N	N	N	N	Exc	
51	Ba	32	1	24	2	100	N	N	N	N	N	N	N	Exc	
52	Mh	30	1	22	2	100	N	N	N	N	N	N	N	Exc	
53	Aw	36	1	24	2	100	N	N	N	Y	N	Y	N	Good	EAB
54	Mh	18	1	15	2	90	Y	Y	N	N	N	N	N	Good	

H.S.C. Ltd. New Keppel Quarry Tree Preservation Screening, 2016 Baseline Data: Area 2, West Side Corridor along Grey Rd 17

Tree No.	Species	DBH	No. Stems	Total Tree Height	Crown Class (1/2/3/4)	% Live Crown	Evidence of Dieback (Yes/No)				Evidence of Health Stressors			Growing Condition	Comments
							Twigs	Branches	Leaf Defol.	Leaf Discolor.	Wound Type	Visable Insect Impacts	Others		
55	Aw	36	1	25	2	100	Y	N	Y	Y	N	Y	N	Good	EAB
56	Ir	26	1	20	3	100	N	N	N	N	N	N	N	Exc	
57	Aw	26	2	23	2	100	N	N	N	N	N	N	N	Exc	
58	Ag	16	1	17	3	100	N	N	N	N	N	N	N	Exc	
59	Aw	52	1	28	1	100	N	N	N	N	N	N	N	Exc	
60	Ba	22	1	14	3	75	Y	N	N	N	1	N	Y	Fair	Broken Top
61	Aw	30	1	19	2	100	N	N	N	N	N	N	N	Exc	
62	Mh	32	3	19	2	100	N	N	N	N	N	N	N	Exc	
63	Mh	38	2	21	2	90	N	N	N	Y	2	N	N	Good	
64	Aw	18	1	20	2	70	Y	N	Y	Y	1	Y	N	Fair	EAB
65	Aw	18	1	18	3	100	Y	N	Y	Y	N	Y	N	Good	EAB
66	Aw	32	1	22	2	100	Y	N	Y	Y	N	Y	N	Good	EAB
67	Cb	38	1	24	2	100	N	N	N	N	N	N	N	Exc	
68	Mh	34	1	24	2	95	N	N	N	Y	N	N	N	Exc	
69	Aw	40	1	28	1	100	N	N	Y	Y	N	Y	N	Good	EAB
70	Mh	54	1	30	1	100	N	N	N	N	N	N	N	Exc	
71	Ag	24	1	22	2	70	N	N	Y	Y	Y	Y	N	Fair	EAB
72	Ba	36	2	28	1	100	Y	N	N	N	2	N	N	Good	
73	Ag	16	1	19	2	100	N	N	Y	Y	N	Y	N	Good	EAB
74	Mh	34	2	25	2	100	N	N	N	N	N	N	N	Exc	
75	Ba	40	1	26	2	100	N	N	N	N	N	N	N	Exc	
76	Ba	36	1	25	2	100	N	N	N	N	2	N	N	Good	
77	Ba	20	1	17	3	100	N	N	N	N	N	N	N	Good	
78	Aw	28	1	23	2	50	Y	Y	Y	Y	N	Y	N	Poor	EAB
79	Ba	36	1	25	2	100	N	N	N	N	N	N	N	Exc	
80	Aw	30	1	25	2	100	Y	N	Y	Y	N	Y	N	Good	EAB
81	Mh	16	1	14	3	100	N	N	N	N	N	N	N	Exc	

H.S.C. Ltd. New Keppel Quarry Tree Preservation Screening, 2016 Baseline Data: Area 2, West Side Corridor along Grey Rd 17

Tree No.	Species	DBH	No. Stems	Total Tree Height	Crown Class (1/2/3/4)	% Live Crown	Evidence of Dieback (Yes/No)				Evidence of Health Stressors				Growing Condition	Comments
							Twigs	Branches	Leaf Defol.	Leaf Discolor.	Wound Type	Visible Insect Impacts	Others			
82	Ba	36	2	23	2	100	N	N	N	N	N	N	N	Exc		
83	Mh	16	1	15	3	100	N	N	N	N	N	N	N	Exc		
84	Mh	46	1	25	1	100	N	N	N	N	2	N	N	Exc		
85	Aw	26	1	24	1	100	N	N	N	N	N	N	N	Exc		
86	Mh	24	3	22	2	100	N	N	N	N	N	N	N	Exc		
87	Aw	38	1	25	1	100	N	N	N	N	N	N	N	Exc		
88	Ir	26	1	20	2	100	N	N	N	N	N	N	N	Exc		
89	Ir	22	1	18	1	100	Y	Y	Y	N	N	N	N	Good		
90	Mh	32	1	23	2	100	N	N	N	N	N	N	N	Exc		
91	Mh	32	1	24	2	95	Y	N	N	N	N	N	N	Good		
92	Mh	26	4	20	2	95	Y	N	N	N	1	N	N	Good		
93	Mh	22	1	20	2	100	N	N	N	N	N	N	N	Exc		
94	Mh	18	2	20	2	100	N	N	N	N	N	N	N	Exc		
95	Ir	22	1	17	2	100	Y	N	N	N	2	N	N	Good		
96	Mh	26	1	20	2	100	N	N	N	N	2	N	N	Good		
97	Ir	20	1	22	2	100	N	N	N	N	2	N	N	Good		
98	Ir	18	1	18	2	100	N	N	N	N	N	N	Y	Good	Frost Crack	
99	Mh	32	1	24	2	100	N	N	N	N	N	N	N	Exc		
100	Ir	20	2	18	2	80	Y	Y	Y	Y	2	N	N	Good		
101	Aw	20	1	20	1	100	N	N	Y	Y	N	Y	N	Good	EAB	
102	Aw	20	1	20	1	100	N	N	N	N	N	N	N	Exc		
103	Mh	32	4	22	2	100	N	N	N	N	N	N	N	Good		
104	Ir	22	1	15	2	80	Y	Y	N	N	N	N	N	Good		
105	Mh	14	3	17	2	100	N	N	N	N	N	N	N	Exc		
106	Mh	12	3	16	2	100	N	N	Y	Y	N	Y	Y	Good	Canker	
107	Mh	22	1	21	2	100	N	N	N	N	N	N	N	Exc		
108	Aw	20	1	22	2	100	N	N	N	N	N	N	N	Exc		

H.S.C. Ltd. New Keppel Quarry Tree Preservation Screening, 2016 Baseline Data: Area 2, West Side Corridor along Grey Rd 17

Tree No.	Species	DBH	No. Stems	Total Tree Height	Crown Class (1/2/3/4)	% Live Crown	Evidence of Dieback (Yes/No)				Evidence of Health Stressors				Growing Condition	Comments
							Twigs	Branches	Leaf Defol.	Leaf Discolor.	Wound Type	Visible Insect Impacts	Others			
109	Mh	16	1	20	2	100	N	N	N	N	N	N	N	Exc		
110	Aw	16	1	20	1	100	N	N	N	N	N	N	N	Exc		
111	Mh	18	3	20	2	100	Y	Y	N	N	N	N	N	Good		
112	Aw	16	1	20	2	100	N	N	N	N	N	N	Y	Good	Interwoven	
113	Mh	36	1	25	2	100	N	N	N	N	N	N	N	Exc		
114	Mh	28	1	25	2	80	Y	Y	Y	Y	2	N	Y	Good	Frost Crack	
115	Aw	20	1	17	2	85	N	N	N	Y	N	Y	N	Good	EAB	
116	Aw	14	1	14	1	100	N	N	N	N	N	N	N	Exc		
117	Aw	48	1	27	1	100	N	N	N	N	N	N	N	Exc		
118	Mh	18	1	19	2	100	N	N	N	N	N	N	N	Exc		
119	Aw	32	1	25	2	100	N	N	N	N	N	N	N	Exc		
120	Mh	22	1	21	3	100	N	N	N	N	N	N	N	Exc		
121	Aw	26	1	22	2	100	N	N	N	N	N	N	N	Exc		
122	Aw	48	3	27	2	85	Y	Y	Y	Y	2	N	N	Good		
123	Aw	30	1	24	2	85	Y	Y	Y	Y	N	Y	N	Good	EAB	
124	Aw	28	1	22	2	100	N	N	N	N	N	N	N	Exc		
125	Aw	26	1	22	2	100	N	N	N	N	N	Y	N	Good	EAB	
126	Ag	28	1	23	2	100	N	N	N	N	N	Y	N	Good	EAB	
127	Ag	30	1	24	2	100	N	N	N	N	N	N	N	Exc		
128	Ag	28	1	23	2	100	N	N	N	N	N	N	N	Exc		
129	Ag	34	1	25	2	100	N	N	N	N	N	Y	N	Good	EAB	
130	Aw	38	1	27	2	100	N	N	N	N	N	N	N	Exc		
131	Ag	22	1	20	2	100	N	N	N	N	N	N	N	Exc		
132	Ab	18	1	20	3	100	N	N	N	N	N	N	N	Exc		
133	Ab	16	1	17	3	100	N	N	N	N	N	N	N	Exc		
134	Ab	16	1	17	3	100	N	N	N	N	N	N	N	Exc		
135	Ea	22	1	20	3	100	N	N	N	N	N	N	N	Exc		

H.S.C. Ltd. New Keppel Quarry Tree Preservation Screening, 2016 Baseline Data: Area 2, West Side Corridor along Grey Rd 17

Tree No.	Species	DBH	No. Stems	Total Tree Height	Crown Class (1/2/3/4)	% Live Crown	Evidence of Dieback (Yes/No)				Evidence of Health Stressors				Growing Condition	Comments
							Twigs	Branches	Leaf Defol.	Leaf Discolor.	Wound Type	Visible Insect Impacts	Others			
136	Ab	20	1	18	3	100	N	N	Y	Y	N	Y	N	Good	EAB	
137	Ab	16	1	15	2	100	N	N	N	N	N	N	N	Exc		
138	Ab	22	1	16	2	80	N	N	Y	Y	Y	Y	N	Good	EAB	
139	Ab	18	1	15	3	80	Y	Y	Y	Y	Y	Y	N	Fair	EAB	
140	Ag	22	1	17	2	100	N	N	Y	Y	Y	N	N	Good		
141	Ag	14	1	15	3	100	N	N	N	N	N	N	N	Exc		
142	Ab	16	1	15	3	100	N	N	N	N	N	N	N	Exc		
143	Sr	18	1	12	3	100	N	N	N	N	N	N	N	Exc		
144	Ag	14	1	15	2	100	N	N	N	N	N	N	N	Exc		
145	Ag	28	2	21	2	100	N	N	N	N	N	N	N	Exc		
146	Ag	24	1	20	2	100	N	N	N	N	N	N	N	Exc		
147	Ag	16	1	15	3	60	Y	Y	Y	Y	Y	Y	N	Poor	EAB	
148	Ag	16	1	19	3	100	N	N	N	N	N	N	N	Exc		
149	Ap	14	3	9	2	80	Y	N	N	Y	Y	N	N	Good		
150	Cp	10	4	5	2	100	N	N	N	N	N	N	N	Exc		
151	Ab	16	1	15	2	100	N	N	N	N	N	N	N	Exc		
152	Ab	20	1	16	2	100	N	N	N	N	N	N	N	Exc		
153	Aw	22	1	12	1	100	N	N	N	N	N	N	N	Exc		
154	Aw	14	1	10	1	100	N	N	N	N	N	N	N	Exc		
155	Aw	16	2	10	1	70	Y	Y	Y	Y	Y	Y	N	Poor	EAB	
156	Aw	18	1	12	1	100	N	N	N	N	N	N	N	Exc		
157	Aw	10	1	10	1	100	N	N	N	N	N	N	N	Exc		
158	Mh	14	1	9	1	100	N	N	N	N	N	N	N	Exc		
159	Mh	18	1	13	1	100	N	N	N	N	N	N	N	Exc		
160	Aw	14	1	11	2	100	N	N	N	N	N	N	N	Exc		
161	Mh	10	1	9	2	100	N	N	N	N	N	N	Y	Good	Canker	
162	Mh	10	1	9	2	100	N	N	N	N	N	N	N	Exc		

H.S.C. Ltd. New Keppel Quarry Tree Preservation Screening, 2016 Baseline Data: Area 2, West Side Corridor along Grey Rd 17

Tree No.	Species	DBH	No. Stems	Total Tree Height	Crown Class (1/2/3/4)	% Live Crown	Evidence of Dieback (Yes/No)				Evidence of Health Stressors				Growing Condition	Comments
							Twigs	Branches	Leaf Defol.	Leaf Discolor.	Wound Type	Visible Insect Impacts	Others			
163	Aw	14	1	14	1	100	N	N	N	N	N	N	N	Exc		
164	Aw	16	1	15	1	100	N	N	N	N	N	N	N	Exc		
165	Aw	28	1	20	1	80	Y	Y	Y	Y	N	Y	N	Good	EAB	
166	Aw	14	1	9	1	100	N	N	N	N	N	N	N	Exc		
167	Aw	34	1	18	1	90	Y	Y	N	Y	N	N	N	Good		
168	Mh	14	1	9	2	100	N	N	N	N	N	N	N	Exc		
169	Mh	12	1	8	2	70	Y	Y	N	N	2	N	N	Good		
170	Mh	40	2	21	1	100	Y	N	N	N	N	N	N	Exc		
171	Aw	12	1	10	1	100	N	N	N	N	N	N	N	Exc		
172	Aw	14	1	12	1	100	N	N	N	N	N	N	N	Exc		
173	Mh	32	3	21	2	100	Y	Y	N	N	N	N	N	Good		
174	Aw	14	1	14	2	100	N	N	N	N	N	N	N	Exc		
175	Ea	14	1	13	1	100	Y	Y	N	N	N	N	N	Good	Branches Trimmed	
176	Mh	32	2	22	1	100	N	N	N	N	N	Y	N	Exc		
177	Mh	44	1	22	1	100	N	N	N	N	N	N	N	Exc		
178	Ce	12	1	9	3	100	N	N	N	N	N	N	N	Exc		
179	Ap	14	4	7	3	80	Y	Y	N	Y	N	N	N	Good		
180	Ap	12	1	5	3	100	N	N	N	N	N	N	N	Exc		
181	Mh	18	1	15	2	100	Y	Y	N	Y	N	N	N	Good		
182	Ba	12	1	11	3	100	N	N	N	N	N	N	N	Exc		
183	Aw	16	1	13	3	100	N	N	N	N	N	N	N	Exc		
184	Aw	20	1	14	2	100	N	N	N	N	N	N	N	Exc		
185	Ba	46	5	24	1	90	Y	Y	Y	Y	N	N	N	Good		
186	Ap	18	1	7	3	60	Y	Y	Y	Y	N	N	N	Fair		
187	Ea	12	1	9	3	100	Y	Y	N	Y	N	N	N	Good		
188	Bw	20	1	19	2	100	N	N	N	N	N	N	N	Exc		
189	Aw	12	1	8	1	100	N	Y	N	N	N	N	N	Good		

H.S.C. Ltd. New Keppel Quarry Tree Preservation Screening, 2016 Baseline Data: Area 2, West Side Corridor along Grey Rd 17

Tree No.	Species	DBH	No. Stems	Total Tree Height	Crown Class (1/2/3/4)	% Live Crown	Evidence of Dieback (Yes/No)				Evidence of Health Stressors				Growing Condition	Comments
							Twigs	Branches	Leaf Defol.	Leaf Discolor.	Wound Type	Visible Insect Impacts	Others			
190	Aw	14	1	11	1	100	N	N	N	N	N	N	N	Exc		
191	Cb	18	1	12	2	80	N	Y	N	N	N	N	N	Good		
192	Aw	20	1	16	1	100	N	N	N	N	N	N	N	Exc		
193	Aw	12	1	15	1	100	N	N	N	N	N	N	N	Exc		
194	Aw	30	1	21	1	100	Y	Y	N	Y	N	N	N	Good		
195	Aw	12	1	13	2	100	N	N	N	N	N	N	N	Exc		
196	Aw	14	1	13	2	100	N	N	N	N	N	N	N	Exc		
197	Aw	14	1	13	2	100	N	N	N	N	N	N	N	Exc		
198	Ea	20	4	11	2	90	Y	Y	N	Y	N	N	N	Good		
199	Aw	12	1	18	2	100	N	N	N	N	N	N	N	Exc		
200	Ea	24	1	18	2	70	Y	Y	Y	Y	1	Y	N	Fair		
201	Ap	14	2	7	3	90	Y	Y	N	N	N	N	N	Good		
202	Aw	22	1	18	1	100	Y	Y	N	N	N	N	N	Good		
203	Ea	16	1	11	2	80	Y	Y	N	Y	N	N	N	Good		
204	Aw	12	1	12	2	100	N	N	N	N	N	N	N	Exc		
205	Mh	14	1	16	2	100	N	N	N	N	N	N	N	Exc		
206	Aw	20	1	18	2	100	Y	Y	N	N	N	N	N	Exc		
207	Aw	12	1	11	2	90	N	N	N	N	N	N	Twisted	Good		
208	Aw	20	1	19	2	100	N	N	N	N	N	N	N	Exc		
209	Aw	22	1	19	2	100	N	N	N	N	N	N	N	Exc		
210	Aw	12	1	10	3	100	Y	Y	N	Y	N	N	N	Good		
211	Ea	24	1	18	2	50	Y	Y	Y	Y	N	Y	N	Poor		
212	Cbl	12	1	7	3	80	Y	Y	N	N	N	N	N	Good		
213	Bp	20	1	20	2	90	Y	Y	N	N	N	N	N	Exc		
214	Aw	18	1	19	2	100	N	N	N	N	N	N	N	Exc		
215	Aw	28	1	22	1	100	N	N	N	N	N	N	N	Exc		
216	lr	16	1	19	3	90	Y	N	N	N	N	N	N	Good		

H.S.C. Ltd. New Keppel Quarry Tree Preservation Screening, 2016 Baseline Data: Area 2, West Side Corridor along Grey Rd 17

Tree No.	Species	DBH	No. Stems	Total Tree Height	Crown Class (1/2/3/4)	% Live Crown	Evidence of Dieback (Yes/No)				Evidence of Health Stressors			Growing Condition	Comments
							Twigs	Branches	Leaf Defol.	Leaf Discolor.	Wound Type	Visible Insect Impacts	Others		
217	Ir	16	1	15	3	100	N	N	N	N	N	N	N	Exc	
218	Ir	12	2	11	3	100	N	N	N	N	N	N	N	Exc	
219	Aw	18	1	16	2	100	N	N	N	N	N	N	N	Exc	
220	Aw	16	2	14	2	100	N	N	N	N	N	N	N	Exc	
221	Mh	14	1	12	2	100	N	N	N	N	N	N	N	Exc	
222	Aw	14	1	12	2	100	N	N	N	N	N	N	N	Exc	
223	Aw	12	1	10	3	100	N	N	N	N	N	N	N	Exc	
224	Aw	14	1	12	2	100	N	N	N	N	N	N	N	Exc	
225	Aw	20	1	16	1	100	Y	Y	N	N	N	N	N	Good	
226	Ir	16	1	12	2	100	N	N	N	N	N	N	N	Exc	
227	Ir	10	1	10	3	100	N	N	N	N	N	N	N	Exc	
228	Aw	20	1	16	1	100	N	N	N	N	N	N	N	Exc	
229	Ir	12	1	13	2	100	N	N	N	N	N	N	N	Exc	
230	Ir	28	3	16	2	90	Y	N	N	N	N	N	N	Exc	
231	Aw	18	1	14	2	100	N	N	N	N	N	N	N	Exc	
232	Aw	34	1	21	1	100	N	N	N	N	N	N	N	Exc	
233	Aw	28	1	20	1	100	N	N	N	N	N	N	N	Exc	
234	Aw	20	1	18	2	80	Y	Y	Y	Y	N	Y	N	Good	EAB
235	Aw	16	1	15	2	100	N	N	N	N	N	N	N	Exc	
236	Bp	18	1	16	2	60	Y	Y	Y	Y	N	N	Y	Fair	
237	Aw	26	1	21	1	100	N	N	N	N	N	N	N	Exc	
238	Aw	24	1	20	1	100	N	N	N	N	N	N	N	Exc	
239	Aw	20	1	20	1	100	N	N	N	N	N	N	N	Exc	
240	Ag	14	1	12	1	100	N	N	N	N	N	N	N	Exc	
241	Aw	16	1	13	2	100	N	N	N	N	N	N	N	Exc	
242	Aw	34	1	22	1	80	Y	Y	Y	Y	2	Y	N	Good	EAB
243	Aw	18	1	17	2	100	N	N	N	N	N	N	N	Exc	

H.S.C. Ltd. New Keppel Quarry Tree Preservation Screening, 2016 Baseline Data: Area 2, West Side Corridor along Grey Rd 17

Tree No.	Species	DBH	No. Stems	Total Tree Height	Crown Class (1/2/3/4)	% Live Crown	Evidence of Dieback (Yes/No)				Evidence of Health Stressors				Growing Condition	Comments
							Twigs	Branches	Leaf Defol.	Leaf Discolor.	Wound Type	Visible Insect Impacts	Others			
244	Bp	16	2	15	2	100	N	N	N	N	N	N	N	Exc		
245	Ag	28	1	20	1	100	N	N	N	N	N	N	N	Exc		
246	Aw	16	1	18	2	100	N	N	N	N	N	N	N	Exc		
247	Aw	14	1	11	3	60	Y	Y	Y	Y	N	Y	N	Fair	EAB	
248	Mh	44	3	23	1	100	N	N	N	N	N	N	N	Exc		
249	Aw	28	1	20	1	100	N	N	N	N	N	N	N	Exc		
250	Aw	14	1	11	2	100	N	N	N	N	N	N	N	Exc		
251	Aw	26	4	18	1	80	Y	Y	N	Y	N	Y	N	Good	EAB	
252	Aw	12	1	11	1	100	N	N	N	N	N	N	N	Exc		
253	Aw	10	1	10	2	100	N	N	N	N	N	N	N	Exc		
254	Bp	10	1	12	2	100	N	N	N	N	N	N	N	Exc		
255	Bp	22	1	20	2	90	Y	N	Y	N	N	N	N	Exc		
256	Bp	24	1	20	1	70	Y	Y	Y	N	N	N	N	Good		
257	Aw	30	1	20	1	80	Y	Y	Y	N	N	Y	N	Good	EAB	
258	Aw	30	1	20	1	100	N	N	N	N	N	N	N	Exc		
259	Bp	16	1	15	2	80	Y	Y	Y	N	N	N	N	Good		
260	Bp	14	1	16	2	100	N	N	N	N	N	N	N	Exc		
261	Bp	16	1	15	2	100	N	N	N	N	N	N	N	Exc		
262	Bp	12	1	13	3	100	N	N	N	N	N	N	N	Exc		
263	Ba	30	7	18	2	80	Y	Y	N	Y	2	N	N	Good		
264	Mh	12	1	14	3	100	N	N	N	N	N	N	N	Exc		
265	Bp	16	1	18	2	100	N	N	N	N	N	N	N	Exc		
266	Aw	20	1	16	2	100	N	N	N	N	N	N	N	Exc		
267	Aw	18	1	19	2	100	N	N	N	N	N	N	N	Exc		
268	Ap	14	2	9	2	60	Y	Y	Y	Y	2	N	N	Poor		
269	Ea	22	1	16	1	100	N	N	N	N	N	N	N	Exc		
270	Cb	26	1	17	1	80	Y	Y	N	Y	N	N	N	Good		

H.S.C. Ltd. New Keppel Quarry Tree Preservation Screening, 2016 Baseline Data: Area 2, West Side Corridor along Grey Rd 17

Tree No.	Species	DBH	No. Stems	Total Tree Height	Crown Class (1/2/3/4)	% Live Crown	Evidence of Dieback (Yes/No)				Evidence of Health Stressors			Growing Condition	Comments
							Twigs	Branches	Leaf Defol.	Leaf Discolor.	Wound Type	Visible Insect Impacts	Others		
271	Ob	20	3	17	2	70	Y	Y	Y	Y	N	N	N	Good	
272	Aw	42	1	23	1	100	N	N	N	N	N	N	N	Exc	
273	Ce	14	1	9	1	100	N	N	N	N	N	N	N	Exc	
274	Ce	24	3	11	1	100	N	N	N	N	N	N	N	Exc	
275	Ce	12	5	9	1	100	N	N	N	N	N	N	Y	Good	Woodpecker Damage
276	Ce	14	1	9	1	100	N	N	N	N	N	N	N	Exc	
277	Aw	18	1	15	1	100	N	N	N	N	N	N	N	Exc	

NOTES:

- 1) Trees are all number with Forestry Aluminum Tags at eye level
- 2) Tree numbering sequence commenced at the south end proceeding northward along the West Side of County Rd 17 Corridor to station 760 or the ANSI Buffer Zone limit
- 3) Tree numbers 1 to 152 are situated south of the New Quarry Entrance
- 4) Tree numbers 153 to 277 are situated north of the New Quarry Entrance
- 5) Though only trees >15cm dbh are required for Screening Purposes, given the extent of Ash within Zone 2 and the presence of Emerald Ash Borer (anticipated future high mortality of Ashes), data was also collected on candidate Screening Trees down to a dbh of 10cm

Definitions

Species Codes: Mh = Sugar (hard) Maple Ea = American Elm Ap = Apple Bw = White (paper) Birch
 Ms = Red (soft) Maple Ba = Basswood Cb = Black Cherry Bp = Balsam Poplar
 Aw = White Ash Ob = Bur Oak Cp = Pin Cherry Ce = White Cedar
 Ag = Green Ash Ir = Ironwood Sr = Serviceberry, Downy
 Ab = Black Ash

Crown Class: 1 = Dominate, Full Sun 3 = Intermediate, Sun from Above
 2 = Co-Dominate, Sun on 2 Sides 4 = Suppressed, Shaded

% Live Crown : Those in Red Text demonstrate concern for Tree Preservation, Protocol Measures To Be Activated

Wounds: Type 1 = Open: Cambium layer exposed

Type 2 = Callous: Closed Wound, Scar Tissue

Insect Impacts:

Cat. = Forest Caterpillar

EAB = Emerald Ash Borer

Note: EAB monitoring followed published guide ' Survey Guide

for Detection of Emerald Ash Borer, Natural Resources Canada, 2007'

Growing Condition:

Overall visible health and tree growth comparison to optimum provincial standards

Exc : Excellent health and growth

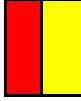
Good: Good health and good to excellent growth

Fair: Exhibiting health concern and below standards for growth

Poor: Poor health or growth, probable mortality in near future

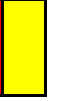
Tree Screening Protocols

Tree Number



Those highlighted in Red require Tree Preservation Replacement, for Screening Purposes = 9 trees

Tree Number



Those highlighted in Yellow require Tree Preservation Action, for Screening Purposes =

68 trees south of the entrance and 43 trees north of the entrance

Ash-Screen Trees



Ash species highlighted in Orange with anticipated mortality due to EAB, Pending Screening Replacement

Appendix 4- Forest Restoration

- Tree Planting targets, March 21/16 letter



AWS Environmental Consulting Inc.
(Operating as Aquatic and Wildlife Services)

242090 Concession Rd. 3 Keppel,
R.R. # 1, Shallow Lake, Ontario, Canada, N0H 2K0

Office: 519-372-2303, Email: aws@gbtel.ca

Web site: www.awsenvironmental.ca

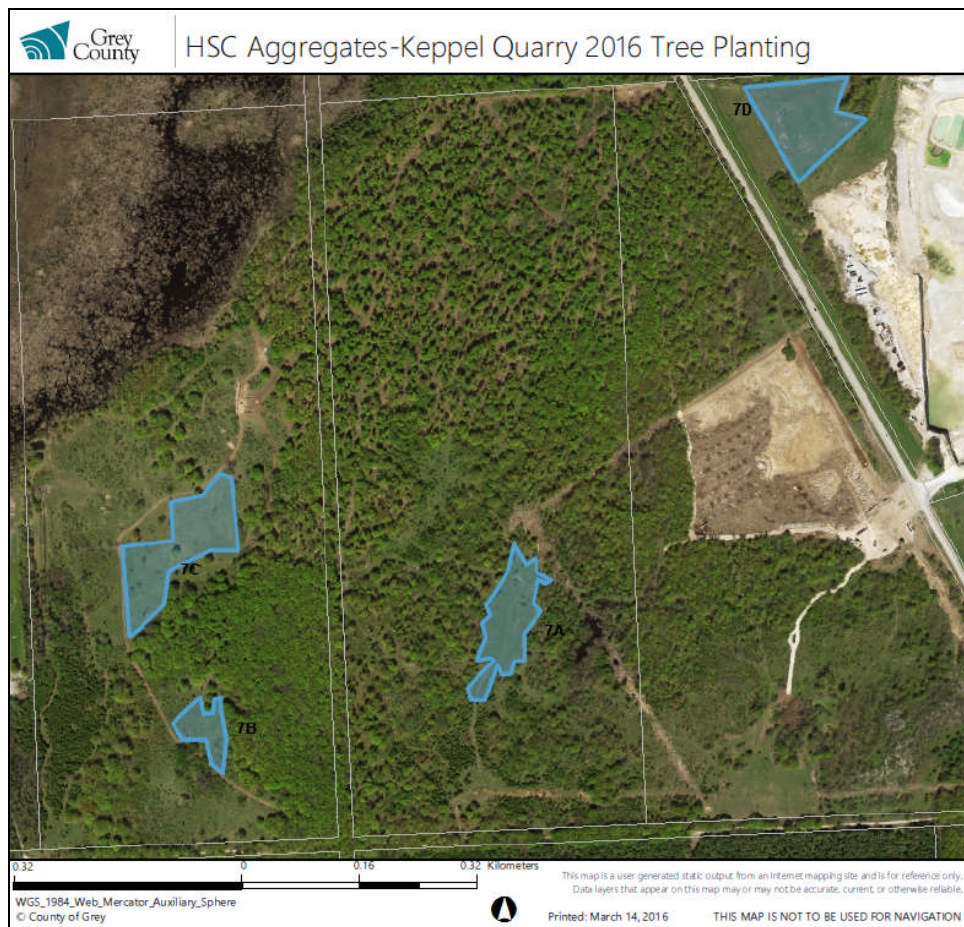
March 21, 2016

H.S.C Aggregates Ltd.

Memo To : Dave Munro, Aggregate Sales & Compliance

Re: 2016 Tree Planting Schedule

In conjunction with the Stewardship Management Plan (SMP), the following provides greater detail of tree planting targets to meet the Site Plan condition No. 1.10 under Natural Environment Mitigation, with minor modifications to the 'planting areas' as per outlined in the 2015 Ecological Monitoring Report (section 5) and management compartment No. 7 under the SMP. Tree planting compartment 7A, 7B, 7C and 7D mapped below with planting targets for each sub-compartment.



Sub-compartment 7A



- Area = 0.95 ha or 2.35 ac
- Full or 100% planting stocking density required
- Average tree planting density at 2.5m between rows and 1.7m spacing between trees
- Density target = $0.95 \times (10000/4.25) =$ approximately 2235
- Planting requirement of 2200 trees, with a minimum height of 25cm at time of planting, composition being :
 - Native Conifers seedlings = 2000
 - White Pine = 1500
 - White Cedar = 250
 - White Spruce = 250
 - Native Hardwood seedlings = 200
 - A mix of various species which could be: Red Oak, White Birch, Black Cherry, Sugar Maple, Aspen/Poplar (non-hybrid)

Sub-Compartment 7B



- Area = 0.37 ha or 0.9 ac
- Scattered trees/tall shrubs existing throughout compartment, thus target density level of 60% planting of total area
- Average tree planting density at 2.5m between rows and 1.7m spacing between trees
- Density target = $(0.37 \times (10000/4.25)) \times 0.6 = 522$

- Approximately 500 trees, with a minimum height of 25cm at time of planting, composition being :
 - o Conifers = 400
 - White Pine = 200
 - White Cedar = 100
 - White Spruce = 100
 - o Hardwood = 100
 - A mix of various species which could be: Red Oak, White Birch, Black Cherry, Sugar Maple, Aspen/Poplar (non-hybrid)

Sub-Compartment 7C



- Area = 1.47 ha or 3.63ac
- A few scattered mature trees and tall shrubs through compartment, thus target density level of 90% planting of total area.
- Average tree planting density at 2.5m between rows and 1.7m spacing between trees
- Planting density target = $(1.47 \times (10000/4.25)) \times 0.9 = 3113$
- Planting requirement of 3100 trees, with a minimum height of 25cm at time of planting, composition being:
 - o Conifers = 2800
 - White Pine = 2000
 - White Cedar = 300
 - White Spruce = 500
 - o Hardwood = 300
 - A mix of various species which could be: Red Oak, White Birch, Black Cherry, Sugar Maple, Aspen/Poplar (non-hybrid)

Sub-Compartment 7D



- Area = 1.28 ha or 3.16ac
- Full or 100% planting stocking density required
- Average tree planting density at 2.5m between rows and 1.7m spacing between trees
- Density target = $1.28 \times (10000/4.25) = 3011$
- Planting requirement of 3000 trees, with a minimum height of 25cm at time of planting, composition being:
 - o Conifers = 2500
 - White Pine = 1800
 - White Cedar = 200
 - White Spruce = 500
 - o Hardwood = 500
 - A mix of various species which could be: Red Oak, White Birch, Black Cherry, Sugar Maple, Aspen/Poplar (non-hybrid)

Total Planting Numbers:

Total Planting area = 4.07ha (10.06 ac) for 8,800 trees

Conifers = 7,700 trees at a 25cm minimum height, composition of:

- White Pine seedlings = 5,500 ; White Cedar seedlings = 850 ; White Spruce seedlings = 1,350

Hardwoods = 1,100 trees at a 25cm minimum height, mix of species which could be :

- Red Oak, White Birch, Black Cherry, Sugar Maple and/or Aspen/Poplar seedlings, 25cm minimum height = 300

Average planting density = 2162 trees /ha or 875 trees/ac

Respectfully Submitted



John Morton,
President, AWS Environmental Consulting Inc.

Lands & Forests Consulting

AWS Environmental Consulting

H.S.C. Aggregates Ltd.

Tree Planting Project

- 10.0 acres of tree planting in old fields.
 - 9.1 acres – Machine Planting = 8300 trees @ \$0.35/ tree
 - 0.9 acres – Hand planting = 500 trees @ \$0.50 / tree

Tree Species	# of Trees
white pine	5500
white cedar	850
white spruce	1350
sugar maple	600
red oak	225
white birch	275
TOTAL	8800

- The planting will follow the guidelines developed by AWS.
- The machine planting areas will be band sprayed with simazine.
- Cost:
 - Machine Planting – $8300 \times \$0.35 = \2905
 - Hand Planting – $500 \times \$0.50 = \250
 - TOTAL = $\$3155 + \text{HST}$



APPENDIX E

BLAST MONITORING PROGRAM



APPENDIX E1

EVENT REPORTS

Date/Time Tran at 15:57:38 May 19, 2016
 Trigger Source Geo: 2.000 mm/s, Mic: 120.0 dB(L)
 Range Geo: 254.0 mm/s
 Record Time 7.0 sec at 1024 sps
 Job Number: 1

Serial Number BE19233 V 10.72-1.1 Minimate Blaster
 Battery Level 6.2 Volts
 Unit Calibration January 8, 2016 by InstanTel
 File Name U233GDLB.020

Notes
 Location: **RITCHIE PROPERTY**
 Client: **WSEL**
 User Name:
 General:

Post Event Notes
 Bolted to Bedrock at 178841 Grey Road 17

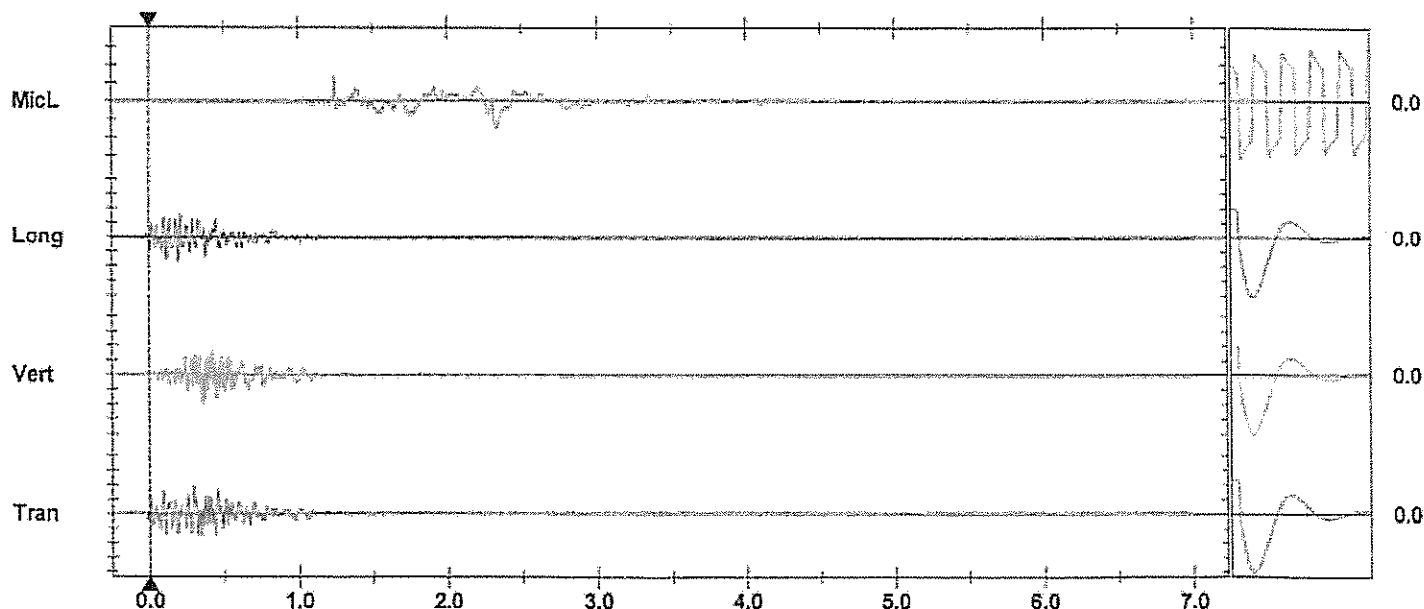
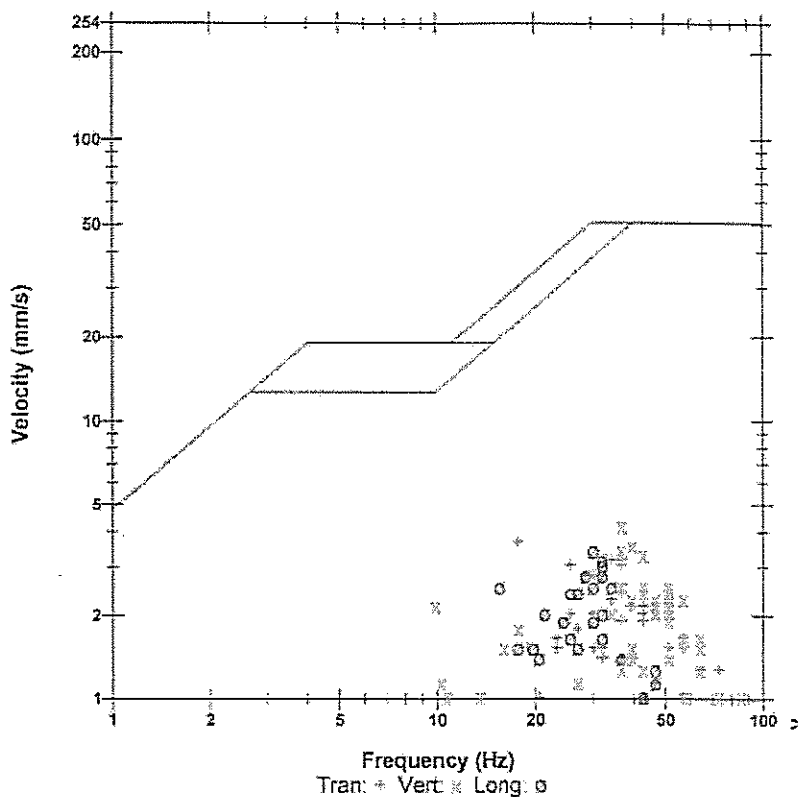
Extended Notes

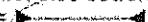
Microphone Linear Weighting
 PSPL 117.8 dB(L) at 2.335 sec
 ZC Freq 4.2 Hz
 Channel Test Passed (Freq = 19.7 Hz Amp = 567 mv)

	Tran	Vert	Long	
PPV	3.683	4.191	3.429	mm/s
ZC Freq	18	37	30	Hz
Time (Rel. to Trig)	0.294	0.352	0.196	sec
Peak Acceleration	0.106	0.106	0.066	g
Peak Displacement	0.029	0.026	0.019	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.6	7.6	7.6	Hz
Overswing Ratio	3.3	3.5	3.7	

Peak Vector Sum 4.787 mm/s at 0.450 sec

USBM RI8507 And OSMRE



Time Scale: 0.50 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
 Trigger = 

Sensor Check

Date/Time Long at 15:59:01 May 19, 2016
 Trigger Source Geo: 1.000 mm/s, Mic: 115.0 dB(L)
 Range Geo: 254.0 mm/s
 Record Time 6.0 sec at 1024 sps

Serial Number BE11783 V 10.72-1.1 Minimate Blaster
 Battery Level 6.2 Volts
 Unit Calibration January 8, 2016 by Instantel
 File Name M783GDLB.2D0
 Post Event Notes
 Set at 178706 Gray Road 17

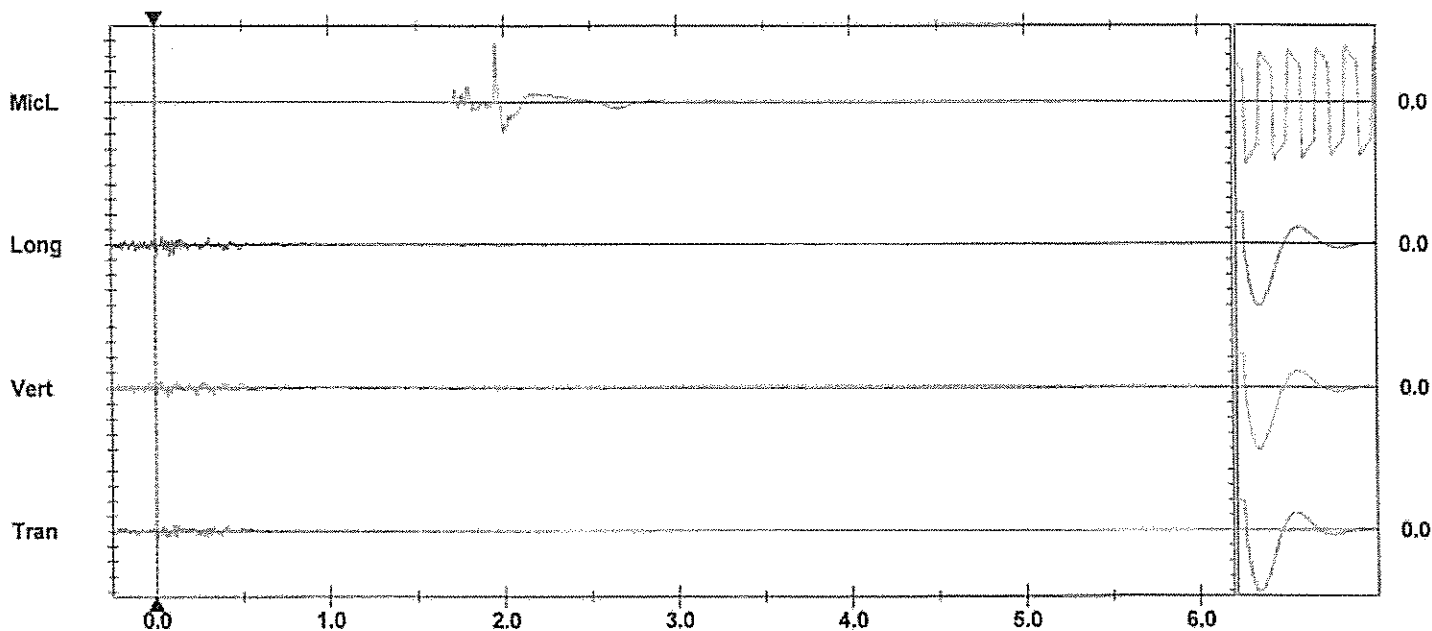
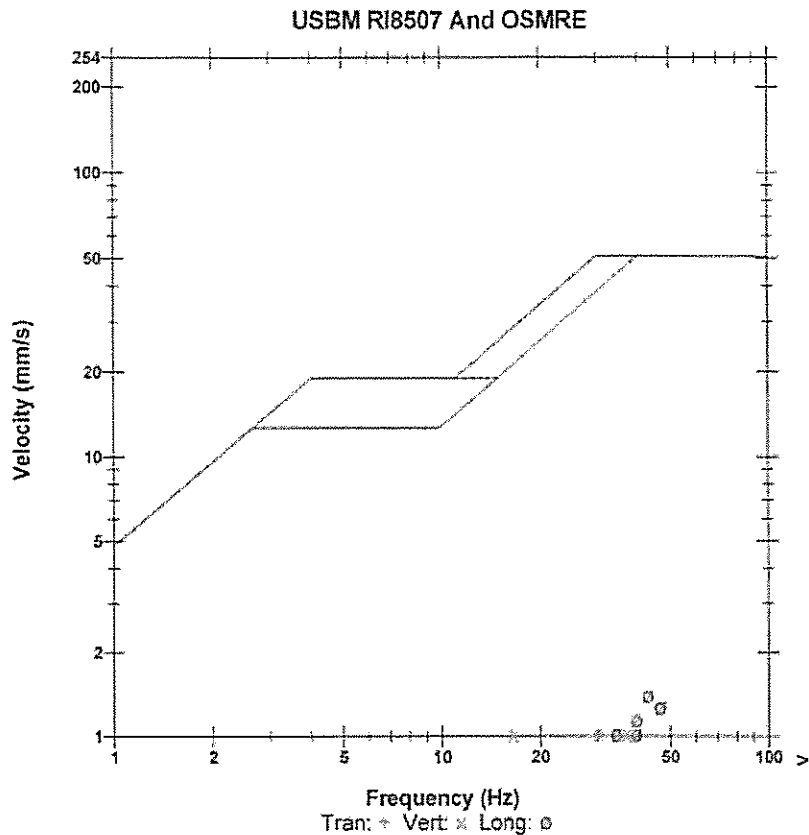
Notes
 Location: **CAMP PROPERTY**
 Client: **ASCL**
 User Name:
 General: Blast Vibration Monitoring

Extended Notes

Microphone Linear Weighting
 PSPL 139.6 dB(L) at 1.953 sec
 ZC Freq 16 Hz
 Channel Test Passed (Freq = 20.1 Hz Amp = 634 mv)

	Tran	Vert	Long	
PPV	1.016	1.016	1.397	mm/s
ZC Freq	30	17	43	Hz
Time (Rel. to Trig)	0.012	0.021	0.089	sec
Peak Acceleration	0.027	0.040	0.040	g
Peak Displacement	0.005	0.011	0.007	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.7	7.4	7.2	Hz
Overswing Ratio	3.6	4.0	3.8	

Peak Vector Sum 1.769 mm/s at 0.012 sec



Time Scale: 0.50 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 50.00 pa.(L)/div
 Trigger = 

Sensor Check



AUSTIN POWDER LTD.
BLAST REPORT



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2016-03

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND
CONST.-KEPPLER
(HAR1525-001)

Date/Time: 06/14/2016 13:49

Pit/Permit: KEPPLER QUARRY / SHOT SERVICE

Location: Top Bench

SEISMOGRAPH 1 - 178841 GREY ROAD #17

Data Type:	Seismic Record	Seismograph Type:	Instantel - Minimate Blaster		
Date:	06/14/16	Trigger Level:	2.00 mm/s 120.00 dB	Transverse:	2.286 mm/s 28.0 Hz
Time:	13:49	Calibration Date:	01/20/16	Vertical:	1.778 mm/s 24.0 Hz
Distance From Blast:	607.16 m	Calibration Signal:	OK	Longitudinal:	2.54 mm/s 28.0 Hz
Direction From Blast:	NW	Geophone Min. Freq.:	--- Hz	PPV:	--- mm/s --- Hz
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz	Acoustic:	119 dB
Location:	Bolted			Vector Sum:	3.401 mm/s
Lat./Long.:	44° 38' 25.645" N		80° 59' 55.415" W		
Reader and Firm:	Evan Smart, AUSTIN POWDER				
Analyst and Firm:					
Installer and Firm:	Al Romphf, Austin Powder Ltd.				

SEISMOGRAPH 2 - 178706 GREY RD #17

Data Type:	Seismic Record	Seismograph Type:	White Seismograph		
Date:	06/14/16	Trigger Level:	1.52 mm/s 118.00 dB	Transverse:	1.778 mm/s 42.6 Hz
Time:	13:49	Calibration Date:	01/20/16	Vertical:	1.27 mm/s 51.2 Hz
Distance From Blast:	635.81 m	Calibration Signal:	OK	Longitudinal:	0.254 mm/s 0.0 Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	--- Hz	PPV:	--- mm/s --- Hz
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz	Acoustic:	120 dB
Location:				Vector Sum:	--- mm/s
Lat./Long.:	44° 37' 49.994" N		80° 59' 30.045" W		
Reader and Firm:	Evan Smart, AUSTIN POWDER				
Analyst and Firm:					
Installer and Firm:	Evan Smart, Austin Powder Ltd.				

SEISMOGRAPH 3 - 283197 CONC. RD. #10

Data Type:	No Trigger	Seismograph Type:	White Seismograph		
Date:	06/14/16	Trigger Level:	2.00 mm/s 120.00 dB	Transverse:	--- mm/s --- Hz
Time:	13:49	Calibration Date:	01/20/16	Vertical:	--- mm/s --- Hz
Distance From Blast:	907.39 m	Calibration Signal:	OK	Longitudinal:	--- mm/s --- Hz
Direction From Blast:	SE	Geophone Min. Freq.:	--- Hz	PPV:	--- mm/s --- Hz
Readout:		Mic. Min. Freq.:	--- Hz	Acoustic:	--- dB
Location:				Vector Sum:	--- mm/s
Lat./Long.:	44° 37' 49.797" N		80° 59' 9.304" W		
Reader and Firm:	Evan Smart, AUSTIN POWDER				
Analyst and Firm:					
Installer and Firm:	Evan Smart, Austin Powder Ltd.				



AUSTIN POWDER LTD. BLAST REPORT



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2016-04

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND
CONST.-KEPPLE
(HAR1525-001)

Date/Time: 07/21/2016 14:00

Pit/Permit: KEPPLE QUARRY / SHOT SERVICE

Location: Top Bench

SEISMOGRAPH 1 - 178841 GREY ROAD #17

Data Type: Seismic Record Seismograph Type: Instanetel - Minimate Blaster

Date: 07/21/16

Trigger Level: 2.00 mm/s 120.00 dB

Transverse: 4.953 mm/s 30.0 Hz

Time: 14:00

Calibration Date: 01/20/16

Vertical: 3.81 mm/s 39.0 Hz

Distance From Blast: 447.75 m

Calibration Signal: OK

Longitudinal: 6.985 mm/s 27.0 Hz

Direction From Blast: NW

Geophone Min. Freq.: --- Hz

PPV: --- mm/s --- Hz

Readout: Printed Copy

Mic. Min. Freq.: --- Hz

Acoustic: 120 dB

Location: Bolted to Bedrock

Vector Sum: 7.73 mm/s

Lat./Long.: 44° 38' 25.645" N

80° 59' 55.415" W

Reader and Firm: Evan Smart, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: John Newton, Austin Powder Ltd.

SEISMOGRAPH 2 - 178717 GREY RD #17

Data Type: Seismic Record Seismograph Type: Instanetel - Minimate Blaster

Date: 07/21/16

Trigger Level: 2.00 mm/s 120.00 dB

Transverse: 0.127 mm/s 0.0 Hz

Time: 14:00

Calibration Date: 01/20/16

Vertical: 0.127 mm/s 0.0 Hz

Distance From Blast: 722.68 m

Calibration Signal: OK

Longitudinal: 0.127 mm/s 0.0 Hz

Direction From Blast: SSE

Geophone Min. Freq.: --- Hz

PPV: --- mm/s --- Hz

Readout: Printed Copy

Mic. Min. Freq.: --- Hz

Acoustic: 123 dB

Location:

Vector Sum: 0.22 mm/s

Lat./Long.: 44° 37' 52.587" N

80° 59' 30.045" W

Reader and Firm: Evan Smart, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: John Newton, Austin Powder Ltd.

SEISMOGRAPH 3 - 178706 GREY RD #17

Data Type: Seismic Record Seismograph Type: Instanetel - Minimate Blaster

Date: 07/21/16

Trigger Level: 2.00 mm/s 120.00 dB

Transverse: 0.127 mm/s 0.0 Hz

Time: 14:00

Calibration Date: 01/20/16

Vertical: 0.127 mm/s 0.0 Hz

Distance From Blast: 796.44 m

Calibration Signal: OK

Longitudinal: 0.127 mm/s 0.0 Hz

Direction From Blast: SSE

Geophone Min. Freq.: --- Hz

PPV: --- mm/s --- Hz

Readout: Printed Copy

Mic. Min. Freq.: --- Hz

Acoustic: 121 dB

Location:

Vector Sum: 0.22 mm/s

Lat./Long.: 44° 37' 49.994" N

80° 59' 30.045" W

Reader and Firm: Evan Smart, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: John Newton, Austin Powder Ltd.

Date/Time Tran at 14:13:07 August 18, 2016
Trigger Source Geo: 1.500 mm/s
Range Geo: 254.0 mm/s
Record Time 3.0 sec at 1024 sps
Job Number: 1

Serial Number BE12756 V 10.72-8.17 MiniMate Plus
Battery Level 6.3 Volts
Unit Calibration March 15, 2016 by Instantel
File Name N756GI9O.TV0

Notes

Location: Keppel Quarry
Client: Harold Sutherland Construction
User Name: ROBERT MANTHA
General: Set-up at DOUG WYLOE RESIDENCE
 COPPER KETTLE

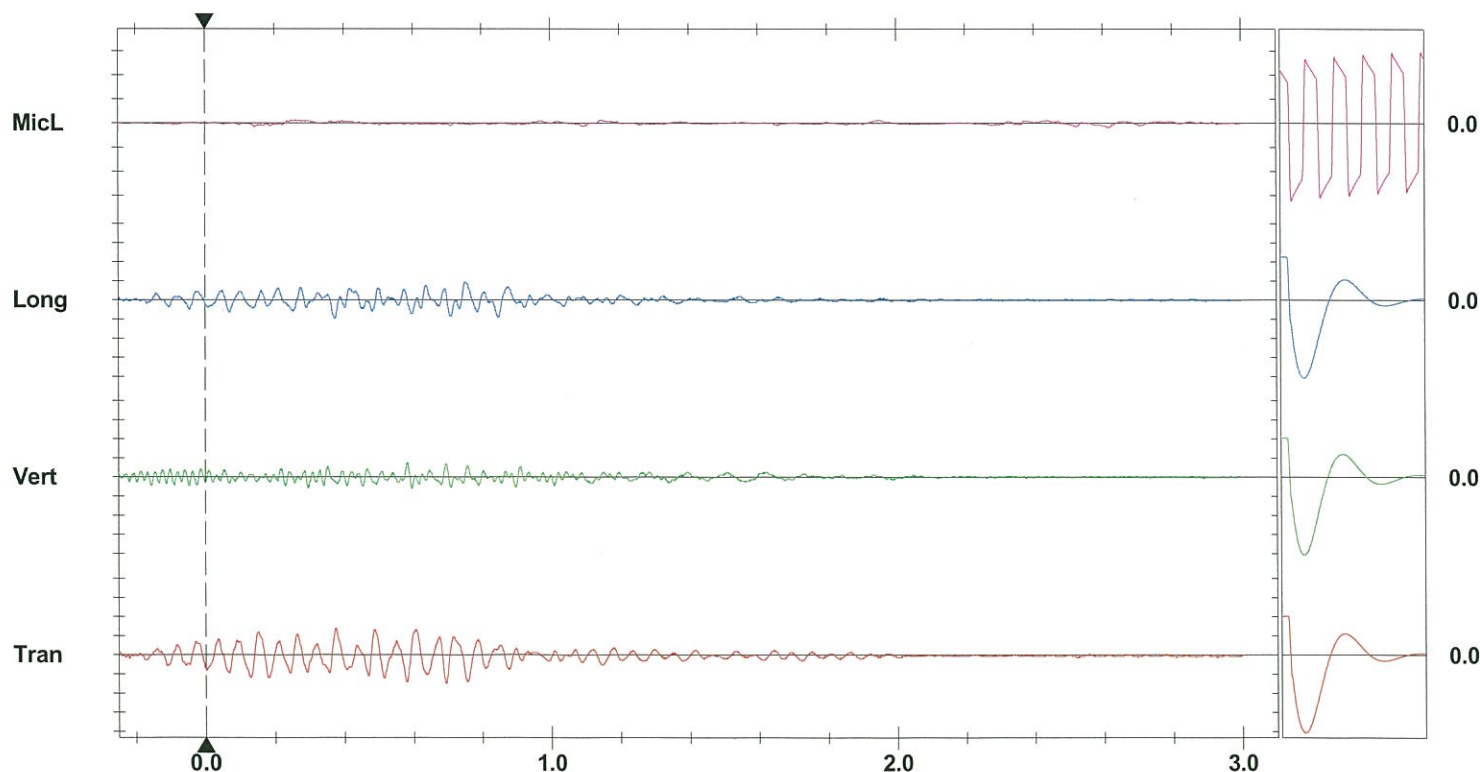
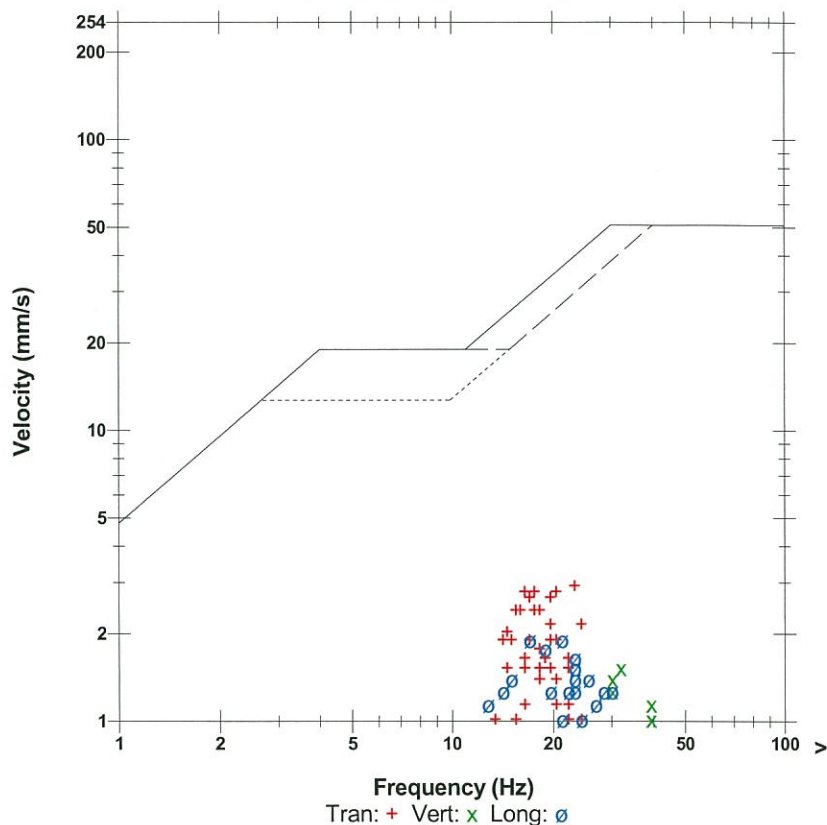
Extended Notes

Microphone Linear Weighting
PSPL 98.84 dB(L) at 2.615 sec
ZC Freq 7.8 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 482 mv)

	Tran	Vert	Long	
PPV	2.921	1.524	1.905	mm/s
ZC Freq	23	32	21	Hz
Time (Rel. to Trig)	0.691	0.581	0.372	sec
Peak Acceleration	0.053	0.040	0.040	g
Peak Displacement	0.026	0.008	0.018	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.7	7.3	Hz
Overswing Ratio	3.7	3.4	3.8	

Peak Vector Sum 3.503 mm/s at 0.755 sec

USB RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger = 

Sensor Check



AUSTIN POWDER LTD. BLAST REPORT



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2016-05

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND
CONST.-KEPPLE
(HAR1525-001)

Date/Time: 08/18/2016 14:25

Pit/Permit: KEPPLE QUARRY / SHOT SERVICE

Location: Top Bench

SEISMOGRAPH 1 - 178841 GREY ROAD #17

Data Type:	Seismic Record	Seismograph Type:	InstanTel - Minimate Blaster		
Date:	08/18/16	Trigger Level:	2.00 mm/s 120.00 dB	Transverse:	4.064 mm/s 28.0 Hz
Time:	14:25	Calibration Date:	01/20/16	Vertical:	2.921 mm/s 32.0 Hz
Distance From Blast:	437.69 m	Calibration Signal:	OK	Longitudinal:	5.207 mm/s 30.0 Hz
Direction From Blast:	NW	Geophone Min. Freq.:	--- Hz	PPV:	--- mm/s --- Hz
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz	Acoustic:	121 dB
Location:	Bolted to bedrock.			Vector Sum:	5.52 mm/s
U.T.M.:	17N 500101 mE 4943011 mN				
Reader and Firm:	John Newton, AUSTIN POWDER				
Analyst and Firm:					
Installer and Firm:	John Newton, Austin Powder Ltd.				

SEISMOGRAPH 2 - 178717 GREY RD #17

Data Type:	Seismic Record	Seismograph Type:	InstanTel - Minimate Blaster		
Date:	08/18/16	Trigger Level:	2.00 mm/s 120.00 dB	Transverse:	0.127 mm/s --- Hz
Time:	14:25	Calibration Date:	01/20/16	Vertical:	0.381 mm/s 85.0 Hz
Distance From Blast:	739.75 m	Calibration Signal:	OK	Longitudinal:	0.254 mm/s --- Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	--- Hz	PPV:	--- mm/s --- Hz
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz	Acoustic:	128 dB
Location:	Spiked and buried.			Vector Sum:	--- mm/s
U.T.M.:	17N 500660 mE 4941991 mN				
Reader and Firm:	John Newton, AUSTIN POWDER				
Analyst and Firm:					
Installer and Firm:	John Newton, Austin Powder Ltd.				

SEISMOGRAPH 3 - 283197 CONC. RD. #10

Data Type:	Seismic Record	Seismograph Type:	White Seismograph		
Date:	08/18/16	Trigger Level:	2.00 mm/s 120.00 dB	Transverse:	0.254 mm/s --- Hz
Time:	14:25	Calibration Date:	01/20/16	Vertical:	0.381 mm/s --- Hz
Distance From Blast:	1,064.67 m	Calibration Signal:	OK	Longitudinal:	0.127 mm/s --- Hz
Direction From Blast:	SE	Geophone Min. Freq.:	--- Hz	PPV:	--- mm/s --- Hz
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz	Acoustic:	127 dB
Location:	Spiked and buried.			Vector Sum:	--- mm/s
U.T.M.:	17N 501117 mE 4941905 mN				
Reader and Firm:	John Newton, AUSTIN POWDER				
Analyst and Firm:					
Installer and Firm:	John Newton, Austin Powder Ltd.				



AUSTIN POWDER LTD. BLAST REPORT



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2016-06

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND
CONST.-KEPPLE
(HAR1525-001)

Date/Time: 09/22/2016 13:31

Pit/Permit: KEPPLE QUARRY / SHOT SERVICE

Location: 45' Bench

SEISMOGRAPH 1 - 178841 GREY ROAD #17

Data Type: Seismic Record Seismograph Type: InstanTel - Minimate Blaster

Date: 09/22/16 Trigger Level: 2.00 mm/s 120.00 dB Transverse: 5.207 mm/s 32.0 Hz

Time: 13:31 Calibration Date: 01/20/16 Vertical: 3.302 mm/s 37.0 Hz

Distance From Blast: 437.08 m Calibration Signal: OK Longitudinal: 6.35 mm/s 37.0 Hz

Direction From Blast: NW Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz

Readout: Printed Copy Mic. Min. Freq.: --- Hz Acoustic: 119 dB

Location: Bolted to bedrock. Vector Sum: 7.073 mm/s

Lat./Long.: 44° 38' 25.645" N 80° 59' 55.415" W

Reader and Firm: Evan Smart, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Evan Smart, Austin Powder Ltd.

SEISMOGRAPH 2 - 178717 GREY RD #17

Data Type: Seismic Record Seismograph Type: InstanTel - Minimate Blaster

Date: 09/22/16 Trigger Level: 2.00 mm/s 120.00 dB Transverse: 0.127 mm/s 0.0 Hz

Time: 13:31 Calibration Date: 01/20/16 Vertical: 0.127 mm/s 0.0 Hz

Distance From Blast: 755.29 m Calibration Signal: OK Longitudinal: 0.127 mm/s 0.0 Hz

Direction From Blast: SSE Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz

Readout: Printed Copy Mic. Min. Freq.: --- Hz Acoustic: 123 dB

Location: Spiked and buried. Vector Sum: 0.311 mm/s

Lat./Long.: 44° 37' 52.587" N 80° 59' 30.045" W

Reader and Firm: Evan Smart, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Evan Smart, Austin Powder Ltd.

SEISMOGRAPH 3 - 178706 GREY RD #17

Data Type: Seismic Record Seismograph Type: InstanTel - Minimate Blaster

Date: 09/22/16 Trigger Level: 2.00 mm/s 120.00 dB Transverse: 0.127 mm/s 0.0 Hz

Time: 13:31 Calibration Date: 01/20/16 Vertical: 0.127 mm/s 0.0 Hz

Distance From Blast: 831.49 m Calibration Signal: OK Longitudinal: 0.127 mm/s 0.0 Hz

Direction From Blast: SSE Geophone Min. Freq.: --- Hz PPV: --- mm/s --- Hz

Readout: Printed Copy Mic. Min. Freq.: --- Hz Acoustic: 122 dB

Location: Vector Sum: 0.22 mm/s

Lat./Long.: 44° 37' 49.994" N 80° 59' 30.045" W

Reader and Firm: Evan Smart, AUSTIN POWDER

Analyst and Firm:

Installer and Firm: Evan Smart, Austin Powder Ltd.

Date/Time Long at 14:18:33 October 14, 2016
Trigger Source Geo: 1.500 mm/s
Range Geo: 254.0 mm/s
Record Time 3.0 sec at 1024 sps
Job Number: 1

Serial Number BE12756 V 10.72-8.17 MiniMate Plus
Battery Level 6.2 Volts
Unit Calibration March 15, 2016 by InstanTel
File Name __TEMP.EVT

Notes

Location: Keppel Quarry
Client: Harold Sutherland Construction
User Name: Dave Munro
General: Set up at McGregor House, front yard
 DINA WILDE HOUSE

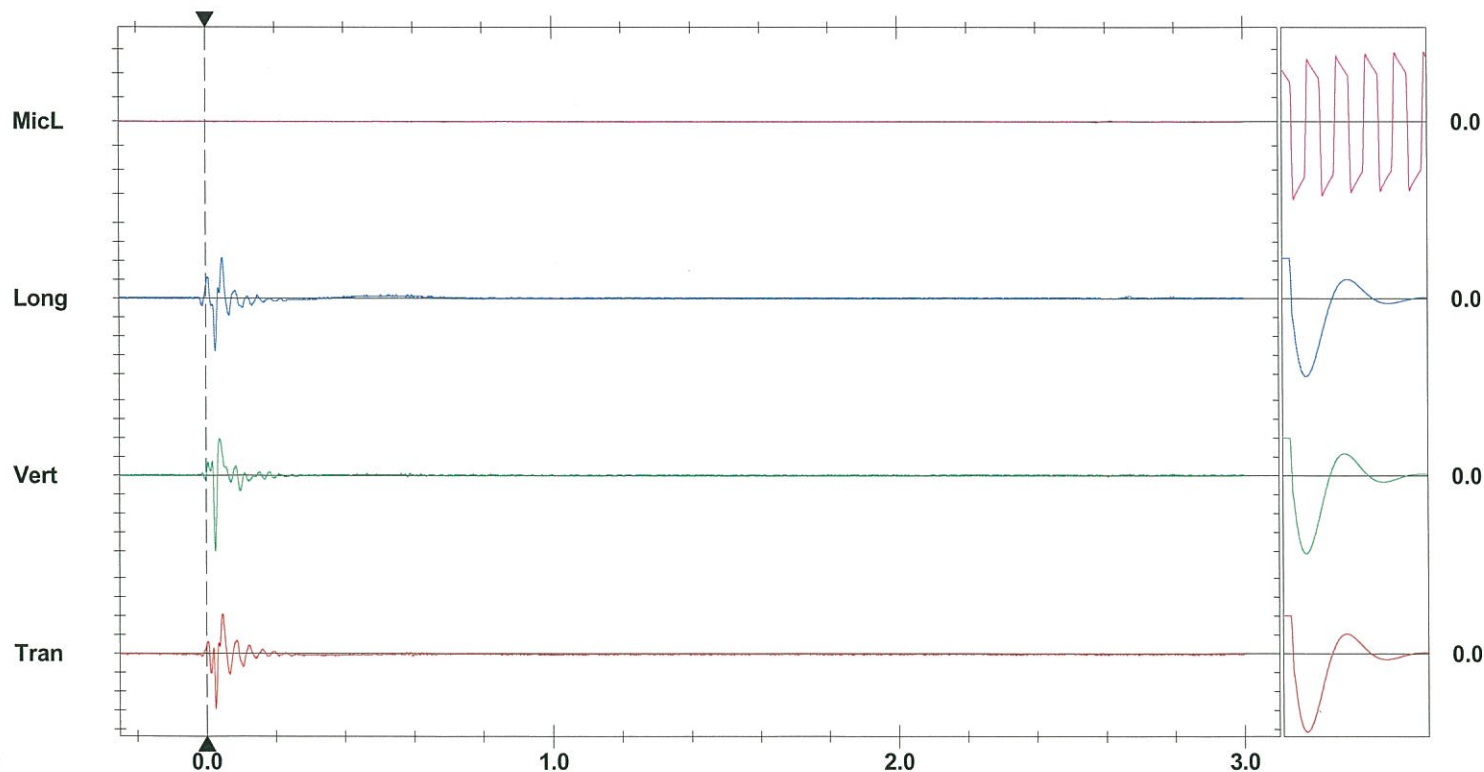
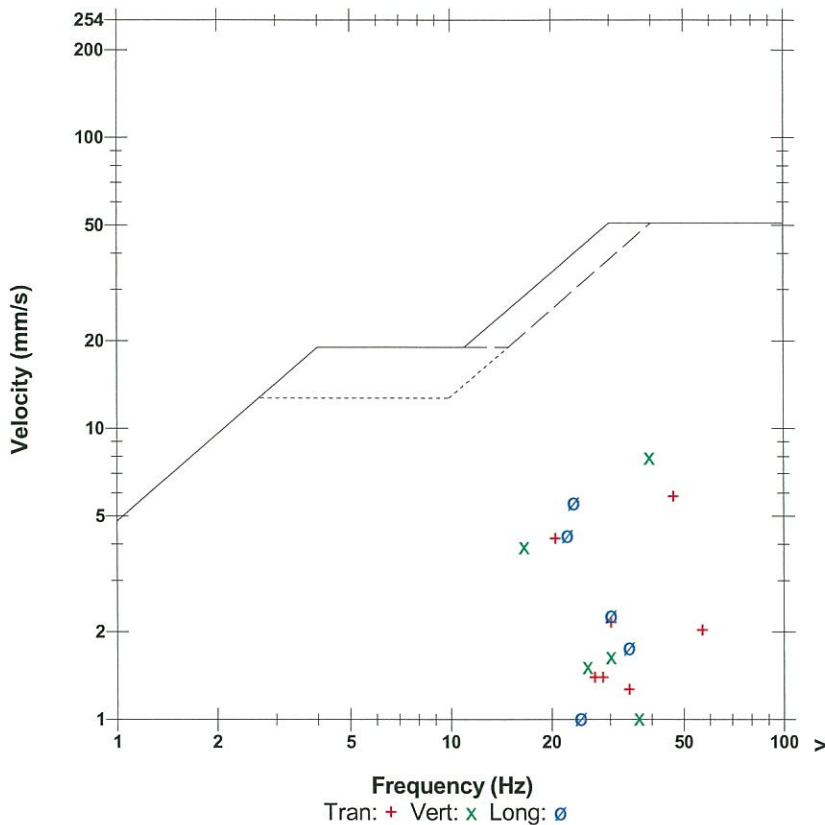
Extended Notes

Microphone Linear Weighting
PSPL <88 dB(L)
ZC Freq >100 Hz
Channel Test Passed (Freq = 20.5 Hz Amp = 578 mv)

	Tran	Vert	Long	
PPV	5.842	8.001	5.588	mm/s
ZC Freq	47	39	23	Hz
Time (Rel. to Trig)	0.026	0.025	0.027	sec
Peak Acceleration	0.159	0.186	0.133	g
Peak Displacement	0.024	0.030	0.024	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.6	7.1	Hz
Overswing Ratio	3.9	3.5	4.1	

Peak Vector Sum 11.22 mm/s at 0.026 sec
N/A: Not Applicable

USBM RI8507 And OSMRE



Sensor Check



AUSTIN POWDER LTD. BLAST REPORT



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2016-07

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND
CONST.-KEPPLER
(HAR1525-001)

Date/Time: 10/14/2016 14:17

Pit/Permit: KEPPLER QUARRY / SHOT SERVICE

Location: Top Bench

SEISMOGRAPH 1 - 178841 GREY ROAD #17

Data Type:	Seismic Record	Seismograph Type:	InstanTel - Minimate Blaster		
Date:	10/14/16	Trigger Level:	2.00 mm/s 120.00 dB	Transverse:	5.715 mm/s 34.0 Hz
Time:	14:17	Calibration Date:	01/20/16	Vertical:	3.429 mm/s 43.0 Hz
Distance From Blast:	387.10 m	Calibration Signal:	OK	Longitudinal:	5.207 mm/s 39.0 Hz
Direction From Blast:	NW	Geophone Min. Freq.:	--- Hz	PPV:	--- mm/s --- Hz
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz	Acoustic:	119 dB
Location:	Bolted to bedrock.			Vector Sum:	6.157 mm/s
U.T.M.:	17N 500101 mE 4943011 mN				
Reader and Firm:	Evan Smart, AUSTIN POWDER				
Analyst and Firm:					
Installer and Firm:	Evan Smart, Austin Powder Ltd.				

SEISMOGRAPH 2 - 178717 GREY RD #17

Data Type:	Seismic Record	Seismograph Type:	InstanTel - Minimate Blaster		
Date:	10/14/16	Trigger Level:	2.00 mm/s 120.00 dB	Transverse:	0.254 mm/s 0.0 Hz
Time:	14:17	Calibration Date:	01/20/16	Vertical:	0.254 mm/s 0.0 Hz
Distance From Blast:	782.73 m	Calibration Signal:	OK	Longitudinal:	0.254 mm/s 0.0 Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	--- Hz	PPV:	--- mm/s --- Hz
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz	Acoustic:	125 dB
Location:	Spiked and buried.			Vector Sum:	0.331 mm/s
U.T.M.:	17N 500660 mE 4941991 mN				
Reader and Firm:	Evan Smart, AUSTIN POWDER				
Analyst and Firm:					
Installer and Firm:	Evan Smart, Austin Powder Ltd.				

SEISMOGRAPH 3 - 178706 GREY RD #17

Data Type:	Seismic Record	Seismograph Type:	InstanTel - Minimate Blaster		
Date:	10/14/16	Trigger Level:	2.00 mm/s 120.00 dB	Transverse:	0.127 mm/s 0.0 Hz
Time:	14:17	Calibration Date:	01/08/16	Vertical:	0.127 mm/s 0.0 Hz
Distance From Blast:	856.18 m	Calibration Signal:	OK	Longitudinal:	0.127 mm/s 0.0 Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	--- Hz	PPV:	--- mm/s --- Hz
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz	Acoustic:	123 dB
Location:				Vector Sum:	0.18 mm/s
U.T.M.:	17N 500660 mE 4941911 mN				
Reader and Firm:	Evan Smart, AUSTIN POWDER				
Analyst and Firm:					
Installer and Firm:	Evan Smart, Austin Powder Ltd.				

Date/Time Long at 13:22:42 November 10, 2016
Trigger Source Geo: 1.000 mm/s
Range Geo: 254.0 mm/s
Record Time 3.0 sec at 1024 sps
Job Number: 1

Serial Number BE12756 V 10.72-8.17 MiniMate Plus
Battery Level 6.2 Volts
Unit Calibration March 15, 2016 by Instantel
File Name N756GML6.HU0

Notes

Location: Keppel Quarry
Client: Harold Sutherland Construction
User Name: Dave Munro
General: Setup 100 metres east of Wylde Residence

Extended Notes

Combo Mode November 10, 2016 12:45:51

Microphone Linear Weighting

PSPL 93.98 dB(L) at 1.011 sec

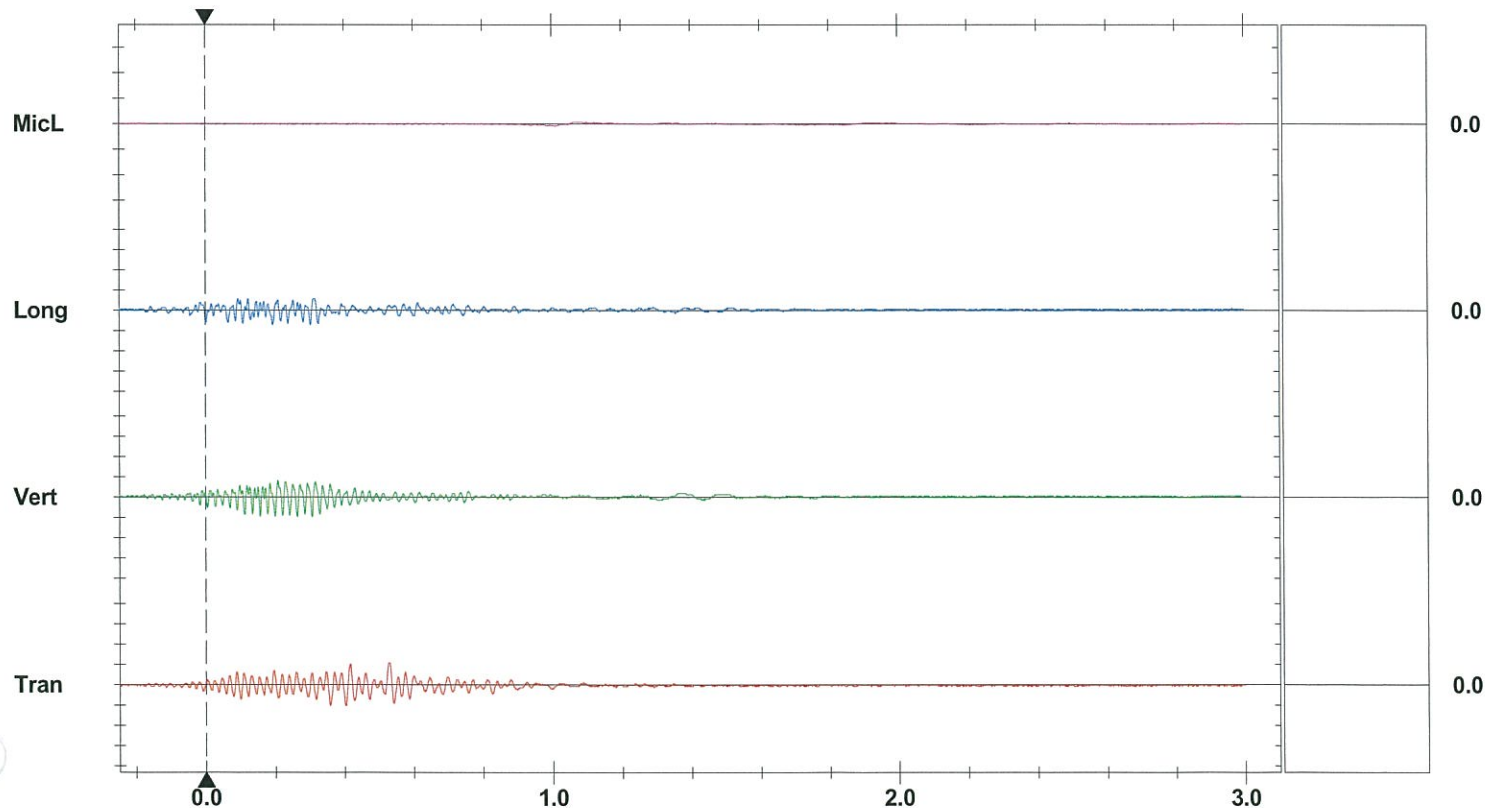
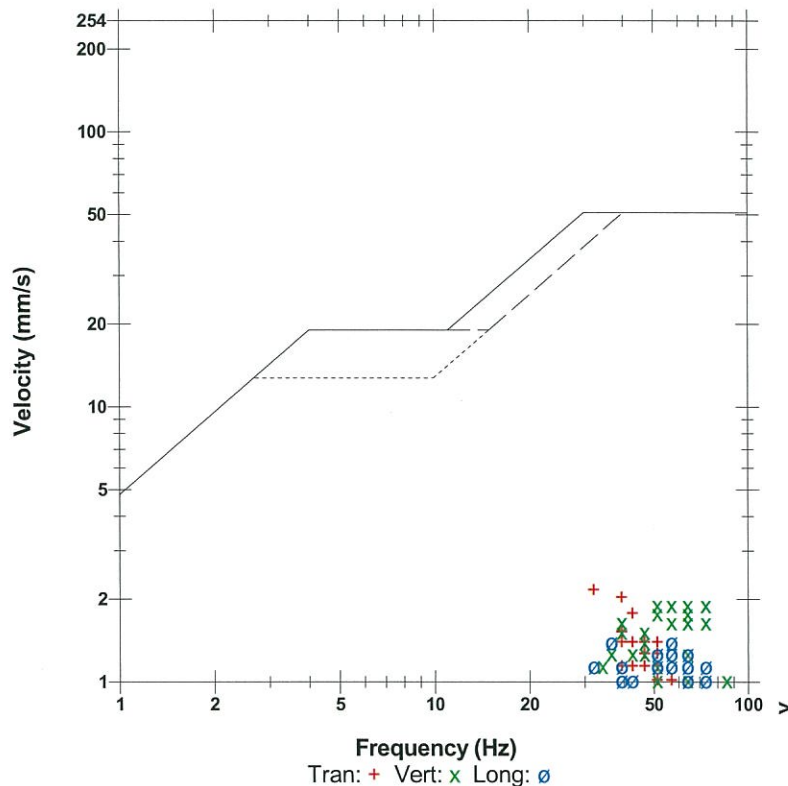
ZC Freq 11 Hz

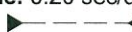
Channel Test Disabled

	Tran	Vert	Long	
PPV	2.159	1.905	1.397	mm/s
ZC Freq	32	73	37	Hz
Time (Rel. to Trig)	0.527	0.155	0.194	sec
Peak Acceleration	0.053	0.080	0.066	g
Peak Displacement	0.011	0.008	0.006	mm
Sensor Check	Disabled	Disabled	Disabled	
Frequency	***	***	***	Hz
Overswing Ratio	***	***	***	

Peak Vector Sum 2.426 mm/s at 0.358 sec

USBM RI8507 And OSMRE



Time Scale: 0.20 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
Trigger = 

Sensor Check



AUSTIN POWDER LTD.
BLAST REPORT



327-Orillia

RR #4 ON, Orillia, Canada L3V 1- 84

Blast No.: 2016-08

Blast Type: Stone Quarry/Stone Mine - Production

Customer: HAROLD SUTHERLAND
CONST.-KEPPLE
(HAR1525-001)

Date/Time: 11/10/2016 13:25

Pit/Permit: KEPPLE QUARRY / SHOT SERVICE

Location: North Bench

SEISMOGRAPH 1 - 178841 GREY ROAD #17

Data Type:	Seismic Record	Seismograph Type:	Instantel - Minimate Blaster		
Date:	11/10/16	Trigger Level:	2.00 mm/s 120.00 dB	Transverse:	4.572 mm/s 32.0 Hz
Time:	13:25	Calibration Date:	01/20/16	Vertical:	3.556 mm/s 37.0 Hz
Distance From Blast:	396.24 m	Calibration Signal:	OK	Longitudinal:	6.477 mm/s 28.0 Hz
Direction From Blast:	NW	Geophone Min. Freq.:	--- Hz	PPV:	--- mm/s --- Hz
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz	Acoustic:	119 dB
Location:	Bolted to bedrock.			Vector Sum:	6.736 mm/s
U.T.M.:	17N 500101 mE 4943011 mN				
Reader and Firm:	Evan Smart, AUSTIN POWDER				
Analyst and Firm:					
Installer and Firm:	Evan Smart, Austin Powder Ltd.				

SEISMOGRAPH 2 - 178717 GREY RD #17

Data Type:	Seismic Record	Seismograph Type:	Instantel - Minimate Blaster		
Date:	11/10/16	Trigger Level:	2.00 mm/s 120.00 dB	Transverse:	0.508 mm/s 34.0 Hz
Time:	13:25	Calibration Date:	01/20/16	Vertical:	1.143 mm/s 24.0 Hz
Distance From Blast:	787.60 m	Calibration Signal:	OK	Longitudinal:	0.762 mm/s 13.0 Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	--- Hz	PPV:	--- mm/s --- Hz
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz	Acoustic:	121 dB
Location:	Spiked and buried.			Vector Sum:	1.38 mm/s
U.T.M.:	17N 500660 mE 4941991 mN				
Reader and Firm:	Evan Smart, AUSTIN POWDER				
Analyst and Firm:					
Installer and Firm:	Evan Smart, Austin Powder Ltd.				

SEISMOGRAPH 3 - 178706 GREY RD #17

Data Type:	Seismic Record	Seismograph Type:	Instantel - Minimate Blaster		
Date:	11/10/16	Trigger Level:	2.00 mm/s 120.00 dB	Transverse:	1.016 mm/s 51.0 Hz
Time:	13:25	Calibration Date:	01/08/16	Vertical:	0.762 mm/s 12.0 Hz
Distance From Blast:	862.89 m	Calibration Signal:	OK	Longitudinal:	0.762 mm/s 57.0 Hz
Direction From Blast:	SSE	Geophone Min. Freq.:	--- Hz	PPV:	--- mm/s --- Hz
Readout:	Printed Copy	Mic. Min. Freq.:	--- Hz	Acoustic:	119 dB
Location:				Vector Sum:	1.276 mm/s
U.T.M.:	17N 500660 mE 4941911 mN				
Reader and Firm:	Evan Smart, AUSTIN POWDER				
Analyst and Firm:					
Installer and Firm:	Evan Smart, Austin Powder Ltd.				

Date/Time MicL at 15:13:12 December 8, 2016
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 6.0 sec at 1024 sps
Job Number: 1

Serial Number BE19233 V 10.72-1.1 Minimate Blaster
Battery Level 6.1 Volts
Unit Calibration January 8, 2016 by InstanTel
File Name U233GO16.A00

Post Event Notes
 Set at 178706 Grey Rd #17

Notes

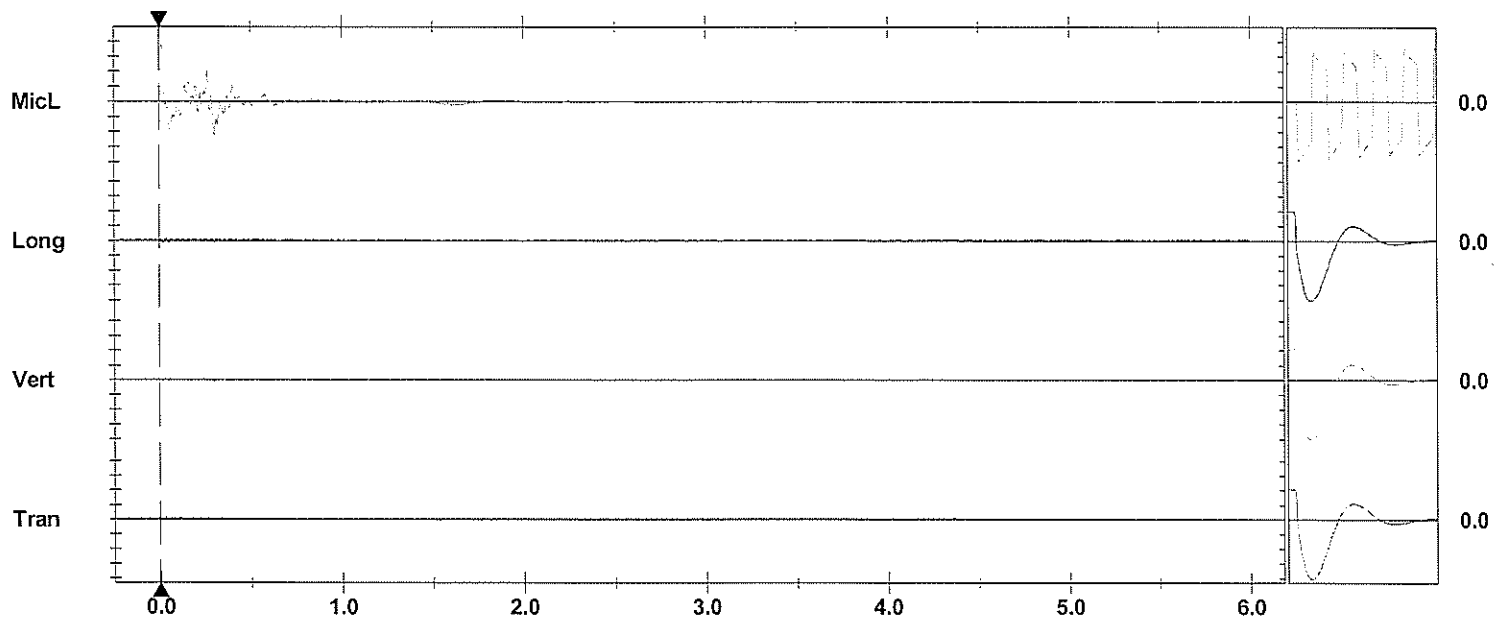
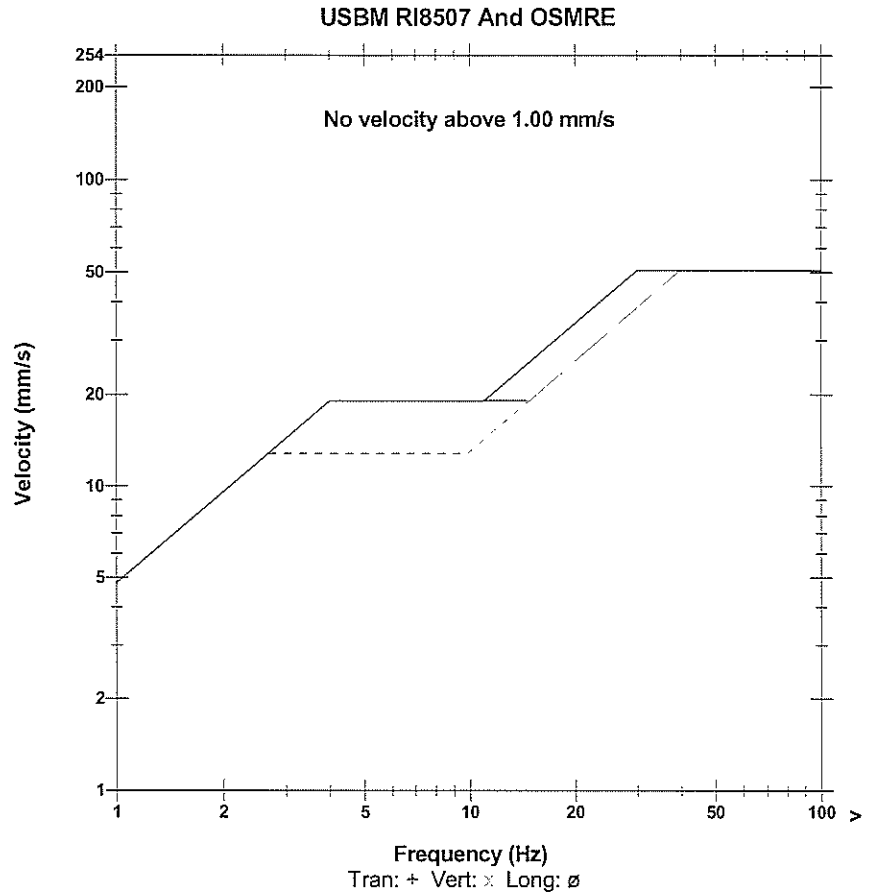
Location:
 Client:
 User Name:
 General:

Extended Notes

Microphone Linear Weighting
PSPL 131.7 dB(L) at 0.010 sec
ZC Freq 17 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 703 mv)

	Tran	Vert	Long	
PPV	0.254	0.254	0.254	mm/s
ZC Freq	>100	>100	>100	Hz
Time (Rel. to Trig)	0.005	0.019	0.029	sec
Peak Acceleration	0.013	0.013	0.013	g
Peak Displacement	0.001	0.000	0.000	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.5	7.3	Hz
Overswing Ratio	3.7	3.8	4.1	

Peak Vector Sum 0.381 mm/s at 0.029 sec



Time Scale: 0.50 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 20.00 pa.(L)/div
 Trigger =

Sensor Check

Date/Time Long at 15:13:14 December 8, 2016
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 6.0 sec at 1024 sps

Serial Number BE19231 V 10.72-1.1 Minimate Blaster
Battery Level 5.9 Volts
Unit Calibration January 20, 2016 by InstanTel
File Name U231GO16.A20
Post Event Notes
 Set at 178841 Grey Rd #17

Notes

Location:
Client:
User Name:
General: Blast Vibration Monitoring

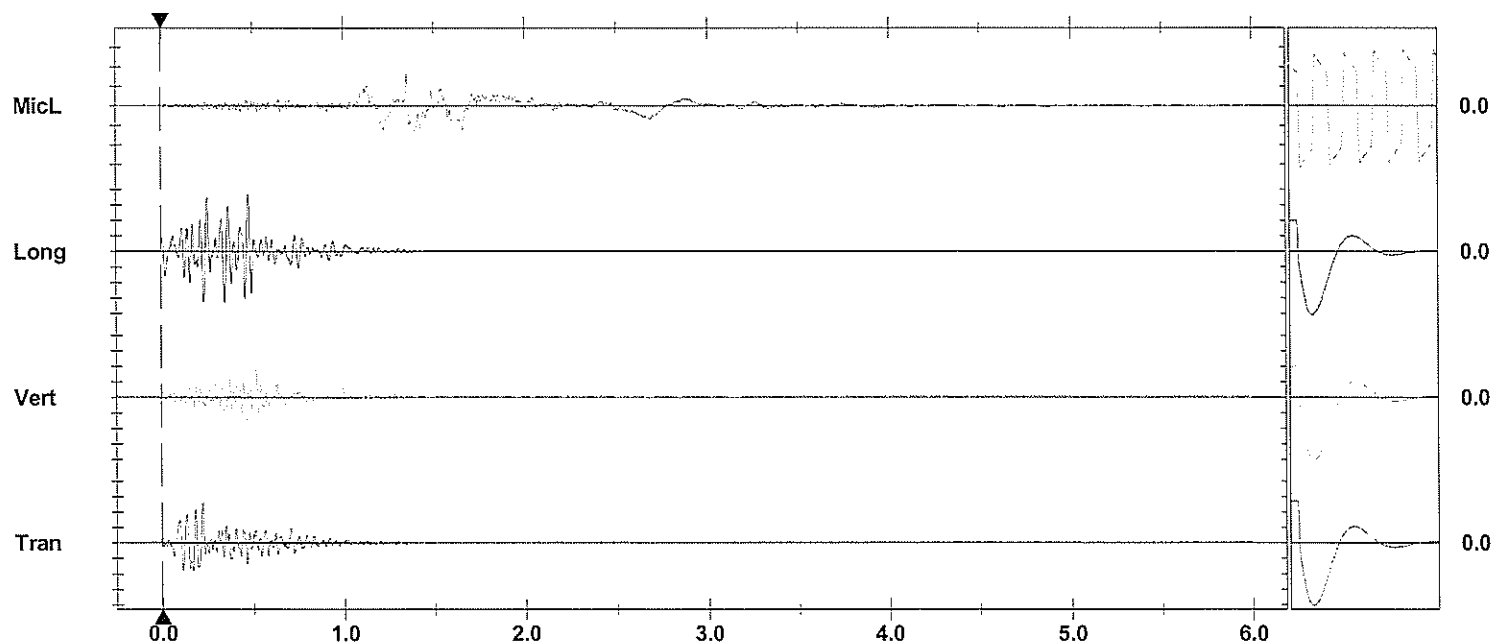
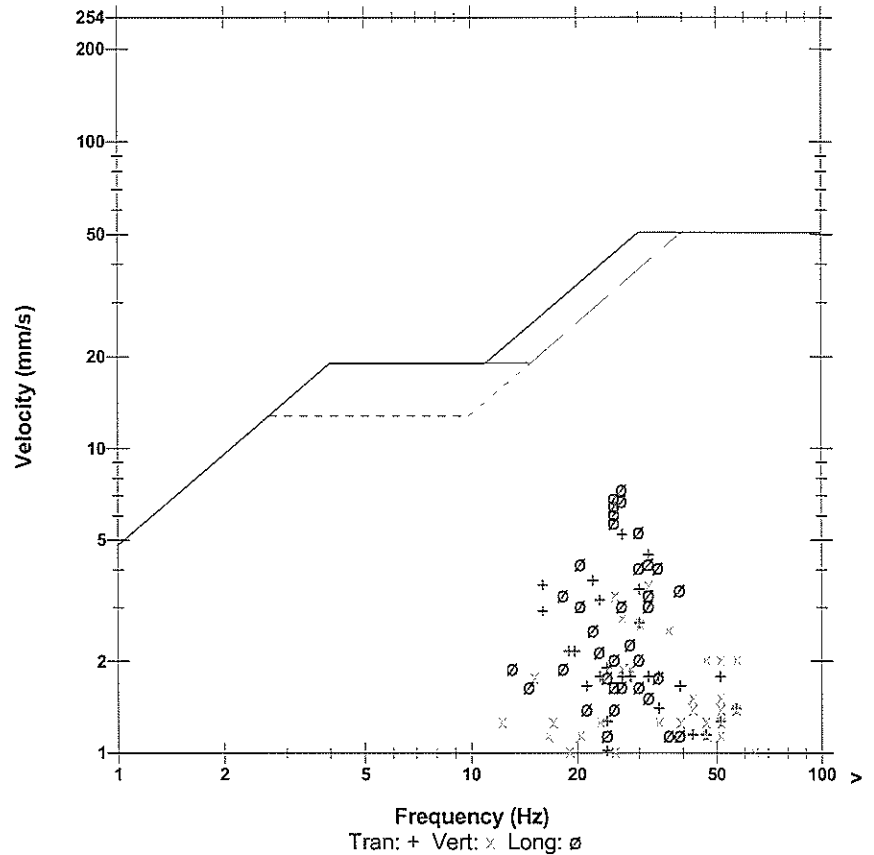
Extended Notes

Microphone Linear Weighting
PSPL 118.5 dB(L) at 1.348 sec
ZC Freq 5.2 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 683 mv)

	Tran	Vert	Long	
PPV	5.207	3.556	7.366	mm/s
ZC Freq	27	32	27	Hz
Time (Rel. to Trig)	0.219	0.515	0.475	sec
Peak Acceleration	0.106	0.080	0.133	g
Peak Displacement	0.039	0.020	0.043	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.6	7.4	7.7	Hz
Overswing Ratio	3.8	4.0	4.1	

Peak Vector Sum 7.855 mm/s at 0.476 sec

USBM RI8507 And OSMRE



Time Scale: 0.50 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div
 Trigger = 

Sensor Check

Date/Time MicL at 15:13:48 December 8, 2016
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 6.0 sec at 1024 sps

Serial Number BE19232 V 10.72-1.1 Minimate Blaster
Battery Level 6.1 Volts
Unit Calibration January 20, 2016 by InstanTel
File Name U232GO16.B00
Post Event Notes
 Set at 178717 Grey Rd #17

Notes

Location:
Client:
User Name:
General: Blast Vibration Monitoring

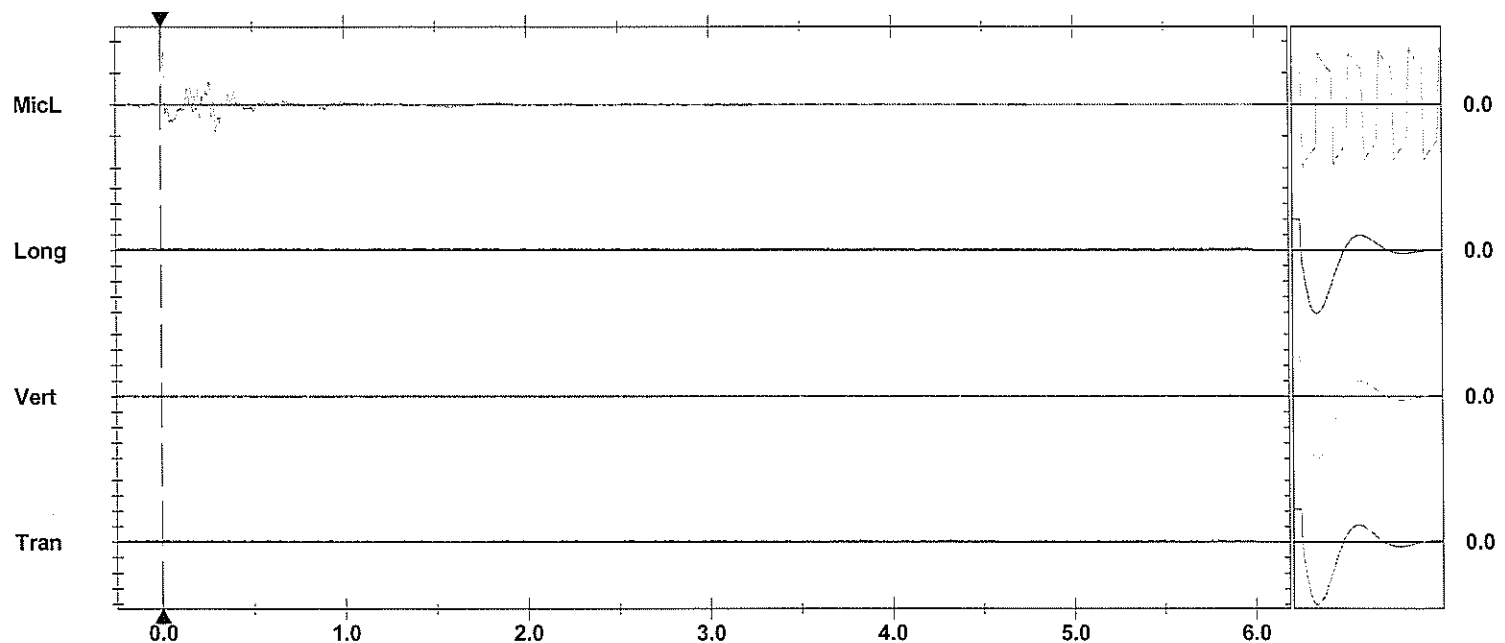
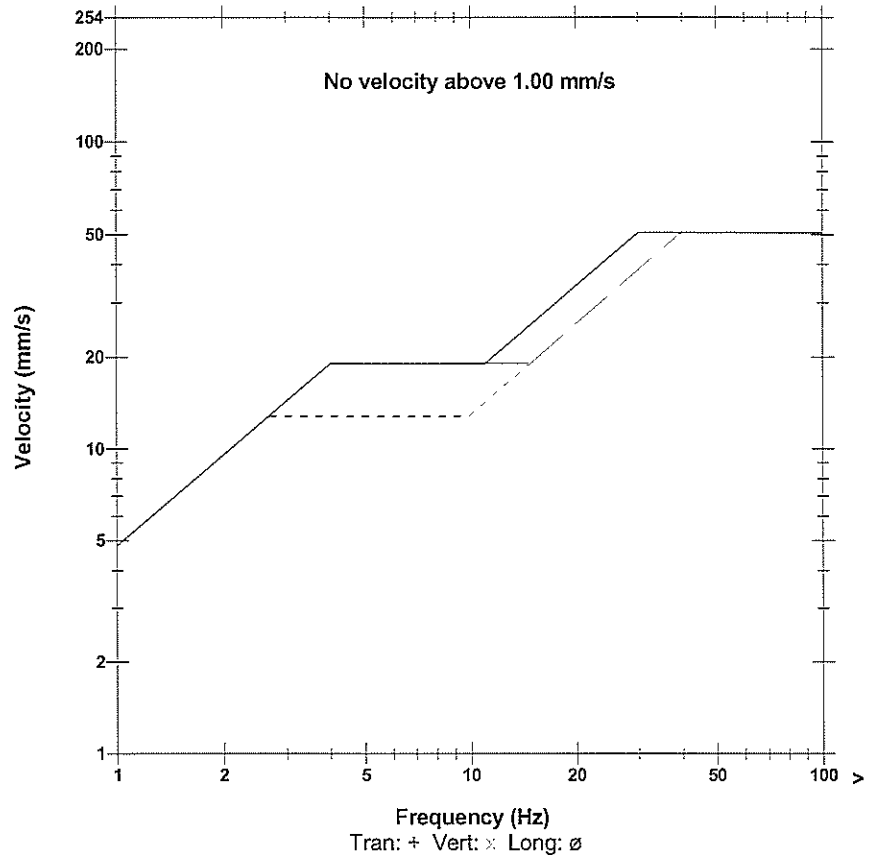
Extended Notes

Microphone Linear Weighting
PSPL 133.6 dB(L) at 0.010 sec
ZC Freq 18 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 710 mv)

	Tran	Vert	Long	
PPV	0.254	0.381	0.254	mm/s
ZC Freq	>100	>100	>100	Hz
Time (Rel. to Trig)	-0.192	0.005	-0.239	sec
Peak Acceleration	0.013	0.027	0.013	g
Peak Displacement	0.001	0.001	0.003	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.3	7.1	Hz
Overswing Ratio	3.7	4.1	4.3	

Peak Vector Sum 0.440 mm/s at 0.006 sec

USBM RI8507 And OSMRE



Time Scale: 0.50 sec/div **Amplitude Scale:** Geo: 2.000 mm/s/div Mic: 50.00 pa.(L)/div
Trigger = 

Sensor Check

Date/Time MicL at 15:13:27 December 8, 2016
Trigger Source Geo: 1.500 mm/s, Mic: 115.0 dB(L)
Range Geo: 254.0 mm/s
Record Time 10.0 sec at 1024 sps

Serial Number BE11783 V 10.72-1.1 Minimate Blaster
Battery Level 6.1 Volts
Unit Calibration January 8, 2016 by InstanTel
File Name M783GO16.AF0
Post Event Notes
 Set at 283197 Conc. Rd #10

Notes

Location:
Client:
User Name:
General: Blast Vibration Monitoring

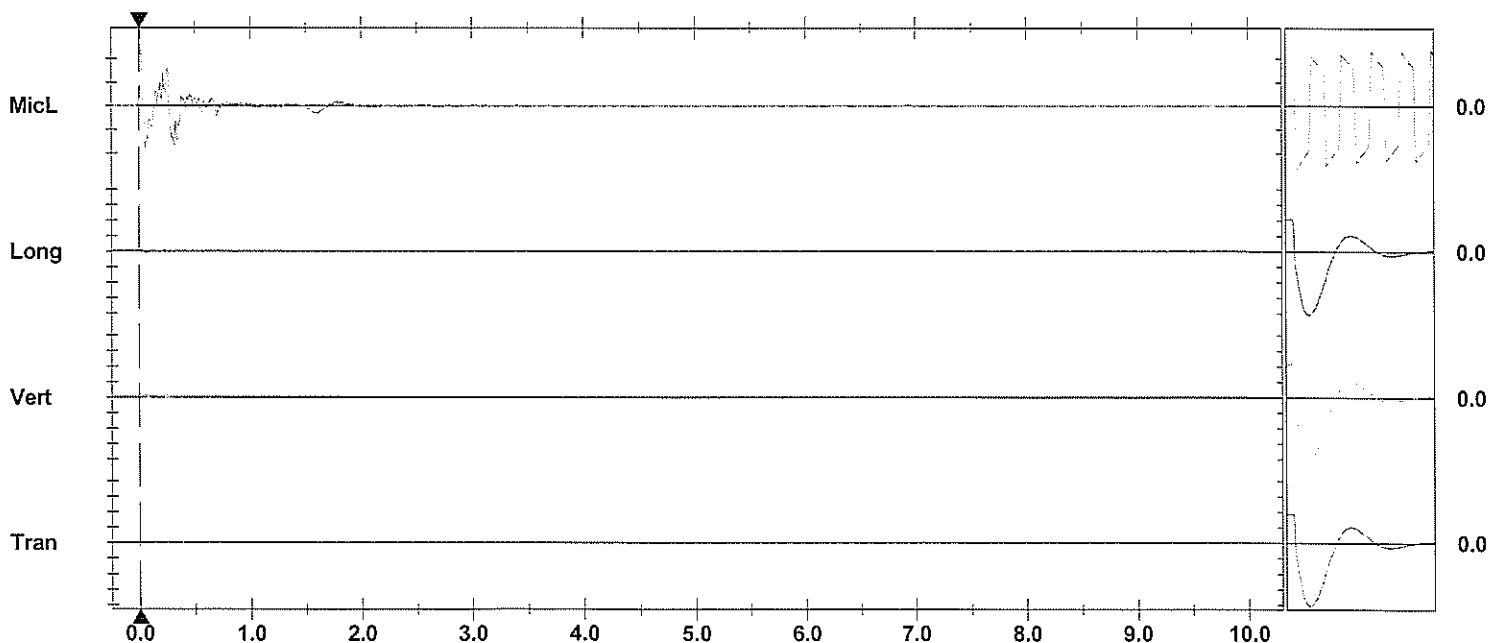
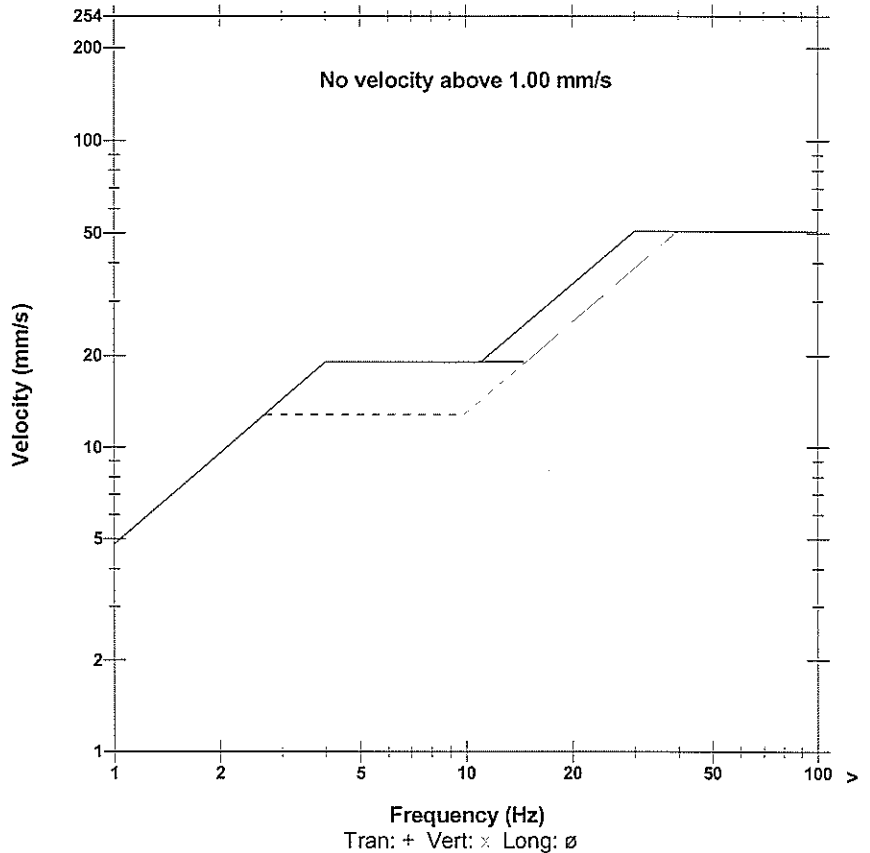
Extended Notes

Microphone Linear Weighting
PSPL 128.3 dB(L) at 0.007 sec
ZC Freq 10 Hz
Channel Test Passed (Freq = 20.1 Hz Amp = 735 mv)

	Tran	Vert	Long	
PPV	0.127	0.381	0.127	mm/s
ZC Freq	N/A	57	N/A	Hz
Time (Rel. to Trig)	-0.250	0.008	-0.250	sec
Peak Acceleration	0.013	0.027	0.013	g
Peak Displacement	0.000	0.002	0.000	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.5	7.4	Hz
Overswing Ratio	4.0	4.1	3.9	

Peak Vector Sum 0.421 mm/s at 0.043 sec
 N/A: Not Applicable

USBM RI8507 And OSMRE



Sensor Check



APPENDIX E2

ASSESSMENT REPORTS – NOISE AND VIBRATION



AUSTIN POWDER LTD.
TECHNICAL SERVICES

May 24, 2016

Dave Munro
Compliance Manager
323545 East Linton Side Rd W
Kemble, ON
N0H 1S0

Dear Mr. Munro,

On May 19, 2016 at approximately 3:59 pm Austin Powder fired a blast at Harold Sutherland Construction's Kepple Quarry. Although this blast fragmented the rock well, and produced compliant ground vibration levels, overpressure levels measured to the south of the blast exceeded those specified in the NPC 119 guideline. Upon review of the blast video, we believe that the probable cause for the elevated overpressure levels was insufficient charge confinement in the front row of blast holes.

For the next blast, we suggest increasing the designed burden of the front row of blast holes which will improve charge confinement and reduce overpressure levels at these receivers.

Best regards,

Alan Romphf
Division Technical Representative
Austin Powder Ltd.



AUSTIN POWDER LTD.
TECHNICAL SERVICES

December 9, 2016

Dave Munro
Compliance Manager
Harold Sutherland Construction
323545 East Linton Side Rd. W
Kemble, ON
N0H 1S0

Dear Mr. Munro,

On December 8, 2016 at approximately 3:13 pm, Austin Powder fired a blast at the Harold Sutherland Keppel Quarry. Although this blast fragmented the rock well, and produced compliant ground vibration levels, overpressure levels measured to the south of the blast exceeded those specified in the MOECC NPC 119 guideline.

It should be noted however, that procedures for the measurement of sound from blasting are outlined in Ontario Publication NPC 103. In the weather conditions section of this document regarding precipitation it states that "Measurements shall not be taken during precipitation." As there was precipitation occurring at the time of blast I do not believe that this is a reportable occurrence.

Best regards,

Alan Romphf
Division Technical Representative
Austin Powder Ltd.