APPENDICES

A – PRELIMINARY AND DETAILED SENSITIVITY ANALYSIS RESULTS
B – GLOBAL SENSITIVITY ANALYSIS RESULTS
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APPENDIX A - PRELIMINARY AND DETAILED SENSITIVITY ANALYSIS RESULTS

A.1 PRELIMINARY SENSITIVITY ANALYSIS

Tables A-1 and A-2 show the mix types and aggregate gradation details used in preliminary sensitivity analysis.

Table A-1 Binder types used in preliminary sensitivity analysis

Temperature (F)	Binder Type					
	mix 37		Mix 24		Mix 44	
	G*	δ	G*	δ	G*	δ
59	2707405.81	61.47	1669134	51.97	2859351	59.14
114.8	21936.16	77.11	38896.89	56.78	24187.65	75.12
168.8	452.98	87.85	2886.82	63.07	1969.35	83.8

Table A-2 Aggregate gradation used in preliminary sensitivity analysis

	Aggregate gradation		
	Gradation 1	Gradation 2	Gradation 3
% Retained 3/4 in sieve	0	11.62	30
% Retained 3/8 in sieve	1.16	35.3	47
% Retained #4 sieve	27.65	52.64	52.8
% Passing #200 sieve	11.12	7.28	8.38

A.2 DETAILED SENSITIVITY ANALYSIS

In this section, first the factorial matrix for each rehabilitation option is presented. Subsequently, the ANOVA table for each rehabilitation option is presented. The highlighted cells show the statistically significant main and interaction effects. Finally the significant interaction plots for each distress are shown.

A.2.1 HMA over HMA

The tables and figures for HMA overlay are presented below.

Table A-3 Factorial matrix of ANOVA for HMA overlay

Overlay Thickness	Overlay Effective Binder	Overlay PG	Overlay AV	Overlay Agg. Grad.	Existing Cond. Rating	Existing HMA Thickness	Existing Base Mod./Existing Subbase Mod./Subgrade Mod./Climate															
							15000								40000							
							15000				30000				15000				30000			
							2500		25000		2500		25000		2500		25000		2500		25000	
							Pelleston	Detroit	Pelleston	Detroit	Pelleston	Detroit	Pelleston	Detroit	Pelleston	Detroit	Pelleston	Detroit	Pelleston	Detroit	Pelleston	Detroit
2	7%	PG 58-22	5%	Fine	Very Poor	4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
						12	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
					Excellent	4	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
						12	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
				Coarse	Very Poor	4	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
						12	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
					Excellent	4	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112
						12	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128
			12%	Fine	Very Poor	4	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144
						12	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
					Excellent	4	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176
						12	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192
				Coarse	Very Poor	4	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208
						12	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224
					Excellent	4	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
						12	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256
		PG 76-28	5%	Fine	Very Poor	4	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272
						12	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288
					Excellent	4	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304
						12	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320
				Coarse	Very Poor	4	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336
						12	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352
					Excellent	4	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368
						12	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384
			12%	Fine	Very Poor	4	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400
						12	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416
					Excellent	4	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432
						12	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448
				Coarse	Very Poor	4	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464
						12	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480
					Excellent	4	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496
						12	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512
	14%	PG 58-22	5%	Fine	Very Poor	4	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528
						12	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544
					Excellent	4	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560
						12	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576
				Coarse	Very Poor	4	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592
						12	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608
					Excellent	4	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624
						12	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640
			12%	Fine	Very Poor	4	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656
						12	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672
					Excellent	4	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688
						12	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704
				Coarse	Very Poor	4	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720
						12	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736
					Excellent	4	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752
						12	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768
		PG 76-28	5%	Fine	Very Poor	4	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784
						12	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
					Excellent	4	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816
						12	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832
				Coarse	Very Poor	4	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848
						12	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864
					Excellent	4	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880
						12	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896
			12%	Fine	Very Poor	4	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912
						12	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928
					Excellent	4	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944
						12	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960
				Coarse	Very Poor	4	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976
						12	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992
					Excellent	4	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008
						12	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024

Table A-3 Factorial matrix of ANOVA for HMA overlay (continued)

8	7%	PG 58-22	5%	Fine	Very Poor	4	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040
						12	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056
					Excellent	4	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072
						12	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088
				Coarse	Very Poor	4	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104
						12	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120
					Excellent	4	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136
						12	1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152
			12%	Fine	Very Poor	4	1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168
						12	1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184
					Excellent	4	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200
						12	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216
				Coarse	Very Poor	4	1217	1218	1219	1220	1221	1222	1223	1224	1225	1226	1227	1228	1229	1230	1231	1232
						12	1233	1234	1235	1236	1237	1238	1239	1240	1241	1242	1243	1244	1245	1246	1247	1248
					Excellent	4	1249	1250	1251	1252	1253	1254	1255	1256	1257	1258	1259	1260	1261	1262	1263	1264
						12	1265	1266	1267	1268	1269	1270	1271	1272	1273	1274	1275	1276	1277	1278	1279	1280
		PG 76-28	5%	Fine	Very Poor	4	1281	1282	1283	1284	1285	1286	1287	1288	1289	1290	1291	1292	1293	1294	1295	1296
						12	1297	1298	1299	1300	1301	1302	1303	1304	1305	1306	1307	1308	1309	1310	1311	1312
					Excellent	4	1313	1314	1315	1316	1317	1318	1319	1320	1321	1322	1323	1324	1325	1326	1327	1328
						12	1329	1330	1331	1332	1333	1334	1335	1336	1337	1338	1339	1340	1341	1342	1343	1344
				Coarse	Very Poor	4	1345	1346	1347	1348	1349	1350	1351	1352	1353	1354	1355	1356	1357	1358	1359	1360
						12	1361	1362	1363	1364	1365	1366	1367	1368	1369	1370	1371	1372	1373	1374	1375	1376
					Excellent	4	1377	1378	1379	1380	1381	1382	1383	1384	1385	1386	1387	1388	1389	1390	1391	1392
						12	1393	1394	1395	1396	1397	1398	1399	1400	1401	1402	1403	1404	1405	1406	1407	1408
			12%	Fine	Very Poor	4	1409	1410	1411	1412	1413	1414	1415	1416	1417	1418	1419	1420	1421	1422	1423	1424
						12	1425	1426	1427	1428	1429	1430	1431	1432	1433	1434	1435	1436	1437	1438	1439	1440
					Excellent	4	1441	1442	1443	1444	1445	1446	1447	1448	1449	1450	1451	1452	1453	1454	1455	1456
						12	1457	1458	1459	1460	1461	1462	1463	1464	1465	1466	1467	1468	1469	1470	1471	1472
				Coarse	Very Poor	4	1473	1474	1475	1476	1477	1478	1479	1480	1481	1482	1483	1484	1485	1486	1487	1488
						12	1489	1490	1491	1492	1493	1494	1495	1496	1497	1498	1499	1500	1501	1502	1503	1504
					Excellent	4	1505	1506	1507	1508	1509	1510	1511	1512	1513	1514	1515	1516	1517	1518	1519	1520
						12	1521	1522	1523	1524	1525	1526	1527	1528	1529	1530	1531	1532	1533	1534	1535	1536
	14%	PG 58-22	5%	Fine	Very Poor	4	1537	1538	1539	1540	1541	1542	1543	1544	1545	1546	1547	1548	1549	1550	1551	1552
						12	1553	1554	1555	1556	1557	1558	1559	1560	1561	1562	1563	1564	1565	1566	1567	1568
					Excellent	4	1569	1570	1571	1572	1573	1574	1575	1576	1577	1578	1579	1580	1581	1582	1583	1584
						12	1585	1586	1587	1588	1589	1590	1591	1592	1593	1594	1595	1596	1597	1598	1599	1600
				Coarse	Very Poor	4	1601	1602	1603	1604	1605	1606	1607	1608	1609	1610	1611	1612	1613	1614	1615	1616
						12	1617	1618	1619	1620	1621	1622	1623	1624	1625	1626	1627	1628	1629	1630	1631	1632
					Excellent	4	1633	1634	1635	1636	1637	1638	1639	1640	1641	1642	1643	1644	1645	1646	1647	1648
						12	1649	1650	1651	1652	1653	1654	1655	1656	1657	1658	1659	1660	1661	1662	1663	1664
			12%	Fine	Very Poor	4	1665	1666	1667	1668	1669	1670	1671	1672	1673	1674	1675	1676	1677	1678	1679	1680
						12	1681	1682	1683	1684	1685	1686	1687	1688	1689	1690	1691	1692	1693	1694	1695	1696
					Excellent	4	1697	1698	1699	1700	1701	1702	1703	1704	1705	1706	1707	1708	1709	1710	1711	1712
						12	1713	1714	1715	1716	1717	1718	1719	1720	1721	1722	1723	1724	1725	1726	1727	1728
				Coarse	Very Poor	4	1729	1730	1731	1732	1733	1734	1735	1736	1737	1738	1739	1740	1741	1742	1743	1744
						12	1745	1746	1747	1748	1749	1750	1751	1752	1753	1754	1755	1756	1757	1758	1759	1760
					Excellent	4	1761	1762	1763	1764	1765	1766	1767	1768	1769	1770	1771	1772	1773	1774	1775	1776
						12	1777	1778	1779	1780	1781	1782	1783	1784	1785	1786	1787	1788	1789	1790	1791	1792
		PG 76-28	5%	Fine	Very Poor	4	1793	1794	1795	1796	1797	1798	1799	1800	1801	1802	1803	1804	1805	1806	1807	1808
						12	1809	1810	1811	1812	1813	1814	1815	1816	1817	1818	1819	1820	1821	1822	1823	1824
					Excellent	4	1825	1826	1827	1828	1829	1830	1831	1832	1833	1834	1835	1836	1837	1838	1839	1840
						12	1841	1842	1843	1844	1845	1846	1847	1848	1849	1850	1851	1852	1853	1854	1855	1856
				Coarse	Very Poor	4	1857	1858	1859	1860	1861	1862	1863	1864	1865	1866	1867	1868	1869	1870	1871	1872
						12	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888
					Excellent	4	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904
						12	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
			12%	Fine	Very Poor	4	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936
						12	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952
					Excellent	4	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
						12	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
				Coarse	Very Poor	4	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
						12	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
					Excellent	4	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
						12	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048

A.2.1.1. Longitudinal cracking

Table A-4 ANOVA table for HMA overlay factorial matrix for longitudinal cracking

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3.34E+10	56	5.96E+08	221.48	0
Intercept	2.31E+10	1	2.31E+10	8581.25	0
OLTH	1.53E+10	1	1.53E+10	5698.01	0
OLEB	3.69E+08	1	3.69E+08	137.105	0
OLPG	3252647.869	1	3252647.869	1.209	0.27
OLAV	1.98E+09	1	1.98E+09	737.18	0
OLAG	2479152.113	1	2479152.113	0.921	0.34
EXCON	4.48E+09	1	4.48E+09	1663.99	0
EXTH	3.49E+09	1	3.49E+09	1296.21	0
BMOD	1.34E+08	1	1.34E+08	49.735	0
SBMOD	236874.143	1	236874.143	0.088	0.77
SGMOD	8.78E+08	1	8.78E+08	326.336	0
Climate	2752504.654	1	2752504.654	1.023	0.31
EXCON * BMOD	60543223.97	1	60543223.97	22.499	0
EXTH * BMOD	2.73E+08	1	2.73E+08	101.306	0
OLAG * BMOD	474.686	1	474.686	0	0.99
OLAV * BMOD	1224265.29	1	1224265.29	0.455	0.5
OLEB * BMOD	2806218.2	1	2806218.2	1.043	0.31
OLPG * BMOD	425157.258	1	425157.258	0.158	0.69
OLTH * BMOD	20966345.57	1	20966345.57	7.792	0.01
BMOD * SBMOD	87689.129	1	87689.129	0.033	0.86
BMOD * SGMOD	1023030.126	1	1023030.126	0.38	0.54
EXCON * EXTH	5.36E+08	1	5.36E+08	199.073	0
OLAG * EXCON	107406.276	1	107406.276	0.04	0.84
OLAV * EXCON	1.01E+08	1	1.01E+08	37.488	0
OLEB * EXCON	10145350.22	1	10145350.22	3.77	0.05
OLPG * EXCON	80696.258	1	80696.258	0.03	0.86
OLTH * EXCON	2.80E+09	1	2.80E+09	1039.32	0
EXCON * SBMOD	9590125.087	1	9590125.087	3.564	0.06
EXCON * SGMOD	389200.176	1	389200.176	0.145	0.7
OLAG * EXTH	345354.255	1	345354.255	0.128	0.72
OLAV * EXTH	3.24E+08	1	3.24E+08	120.397	0
OLEB * EXTH	21408876.07	1	21408876.07	7.956	0.01
OLPG * EXTH	20016069.52	1	20016069.52	7.438	0.01
OLTH * EXTH	9.62E+08	1	9.62E+08	357.533	0
EXTH * SBMOD	4405402.445	1	4405402.445	1.637	0.2
EXTH * SGMOD	5.03E+08	1	5.03E+08	186.907	0
OLAV * OLAG	32218.166	1	32218.166	0.012	0.91
OLEB * OLAG	1766.817	1	1766.817	0.001	0.98
OLPG * OLAG	26521.348	1	26521.348	0.01	0.92
OLTH * OLAG	231816.235	1	231816.235	0.086	0.77
OLAG * SBMOD	14.841	1	14.841	0	1
OLAG * SGMOD	6690.281	1	6690.281	0.002	0.96
OLEB * OLAV	1.40E+08	1	1.40E+08	52.191	0
OLPG * OLAV	48273651.83	1	48273651.83	17.94	0
OLTH * OLAV	4.20E+08	1	4.20E+08	156.179	0
OLAV * SBMOD	1166039.157	1	1166039.157	0.433	0.51
OLAV * SGMOD	3038505.372	1	3038505.372	1.129	0.29
OLEB * OLPG	36442959.08	1	36442959.08	13.543	0
OLTH * OLEB	3.02E+08	1	3.02E+08	112.356	0
OLEB * SBMOD	1017.653	1	1017.653	0	0.98
OLEB * SGMOD	4593425.563	1	4593425.563	1.707	0.19
OLTH * OLPG	48360207.19	1	48360207.19	17.972	0
OLPG * SBMOD	22047.638	1	22047.638	0.008	0.93
OLPG * SGMOD	15622114.52	1	15622114.52	5.806	0.02
OLTH * SBMOD	73283.472	1	73283.472	0.027	0.87
OLTH * SGMOD	33878122.17	1	33878122.17	12.59	0
SBMOD * SGMOD	16450.146	1	16450.146	0.006	0.94
a. R Squared = .862 (Adjusted R Squared = .858)					

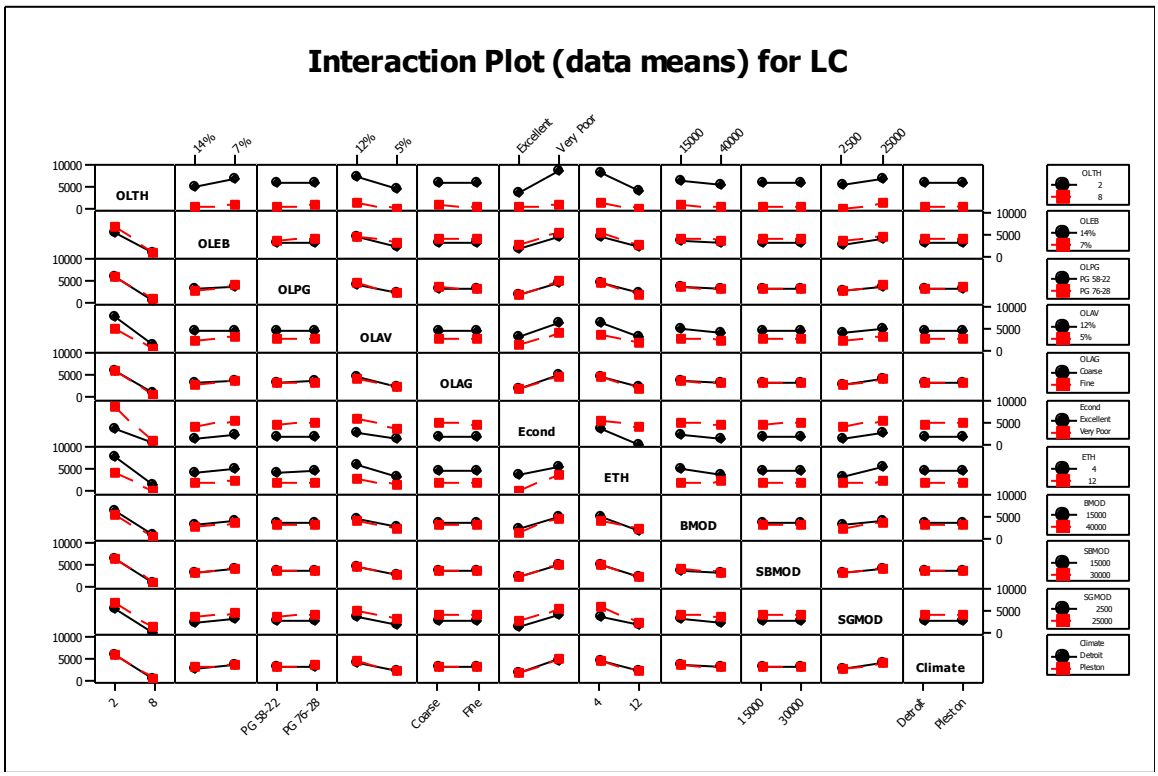

Figure A-1 Summary of interactions

BMOD	OLAV	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
15000	.05	2604.846	72.496	2462.670	2747.022
	.12	4622.088	72.496	4479.912	4764.264
40000	.05	2142.481	72.496	2000.305	2284.657
	.12	4061.925	72.496	3919.749	4204.101

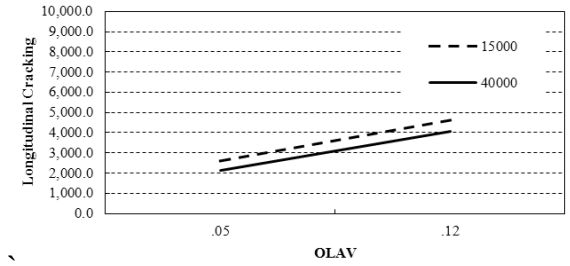

Figure A-2 Overlay air voids vs. base modulus

BMOD	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
15000	2	6450.834	72.496	6308.658	6593.010
	8	776.100	72.496	633.924	918.276
40000	2	5737.209	72.496	55 5.033	5879.385
	8	467.197	72.496	325.021	609.373

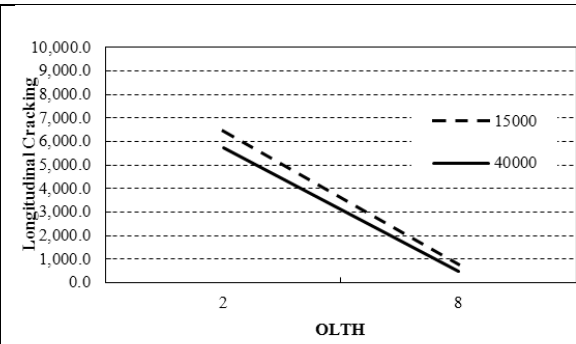

Figure A-3 Overlay thickness vs. base modulus

OLAV	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
.05	1116.971	72.496	974.795	125 .147
.12	2641.441	72.496	2499.265	2783.617
.05	3630.356	72.496	3488.180	3772.532
.12	6042.572	72.496	5900.395	6184.748

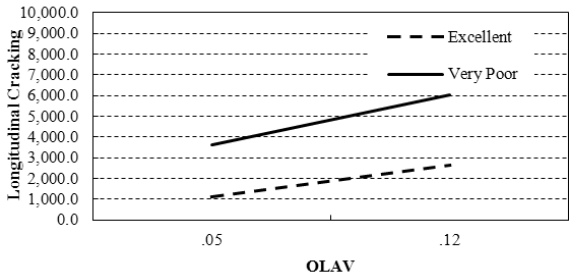

Figure A-4 Overlay air voids vs. existing pavement condition

OLTH	Mean	Std. Er or	95% Confidence Interval	
			Lower Bound	Upper Bound
2	3446.813	72.496	3304.637	3588.989
8	311.599	72.496	169.423	453.775
2	8741.230	72.496	8599.054	8883.406
8	931.697	72.496	789.521	1073.874

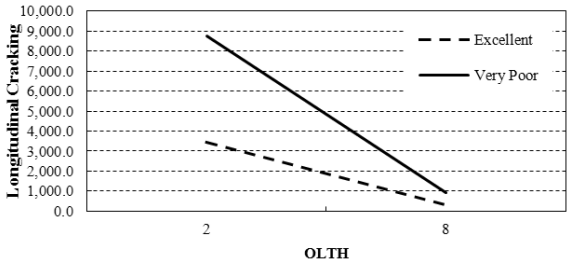

Figure A-5 Overlay thickness vs. existing pavement condition

OLEB	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
.07	5189.545	72.496	5047.369	5331.721
.14	4136.190	72.496	3994.014	4278.366
.07	2374.995	72.496	2232.819	2517.171
.14	1730.611	72.496	1588.435	1872.787

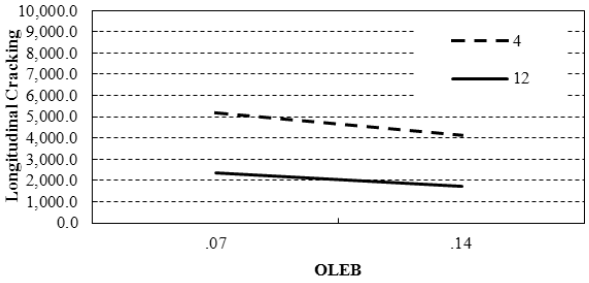

Figure A-6 Overlay effective binder vs. existing pavement thickness

OLPG	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
PG 58-22	4524.154	72.496	4381.978	4666.330
PG 76-28	4801.580	72.496	4659.404	4943.756
PG 58-22	2111.811	72.496	1969.635	2253.987
PG 76-28	1993.794	72.496	1851.618	2135.970

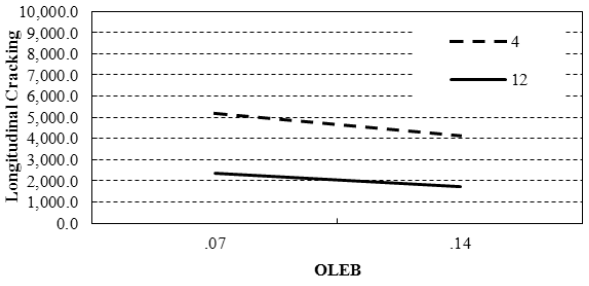

Figure A-7 Overlay effective vs. existing pavement thickness

OLTH	Mean	Std. Error	95% Confidence Interval	
			Low r Bound	Upper Bound
2	8084.451	72.496	7942.275	8226.627
8	1241.283	72.496	1099.107	1383.459
2	4103.592	72.496	3961.416	4245.768
8	2.014	72.496	-140.162	144.190

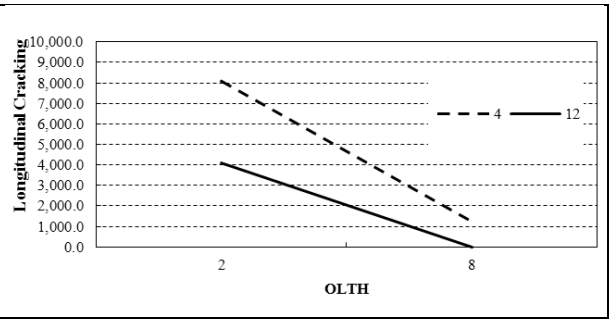

Figure A-8 Overlay Thickness vs. Existing pavement thickness

OLPG	SGMOD	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
PG 58-22	2500	2750.509	72.496	2608.333	2892.685
	25000	3885.457	72.496	3743.281	4027.633
PG 76-28	2500	2655.537	72.496	2513.361	2797.713
	25000	4139.838	72.496	3997.662	4282.014

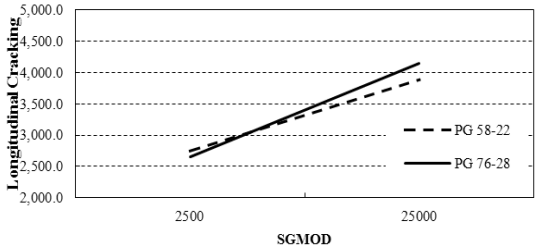

Figure A-9 Overlay PG vs. Subgrade modulus

OLTH	SGMOD	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
2 in	2500 psi	5310.594	72.496	5168.418	5452.770
	25000 psi	6877.450	72.496	6735.274	7019.626
8 in	2500	95.452	72.496	-46.724	237.628
	25000	1147.845	72.496	1005.669	1290.021

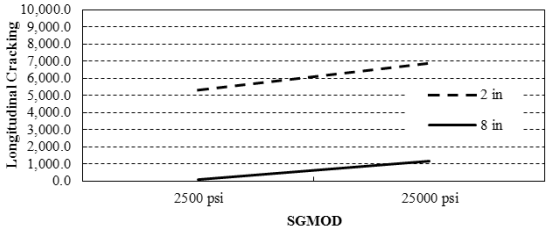

Figure A-10 Overlay Thickness vs. Subgrade modulus

A.2.1.2. Alligator cracking

Table A-5 ANOVA table for HMA overlay factorial matrix for alligator cracking

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1074358.925[a]	56	19184.981	365.388	0
Intercept	295690.043	1	295690.04	5631.572	0
OLTH	225836.768	1	225836.77	4301.18	0
OLEB	59573.664	1	59573.664	1134.612	0
OLPG	1058.405	1	1058.405	20.158	0
OLAV	53618.69	1	53618.69	1021.196	0
OLAG	34.018	1	34.018	0.648	0.421
EXCON	286507.442	1	286507.44	5456.684	0
EXTH	9951.749	1	9951.749	189.536	0
BMOD	1612.359	1	1612.359	30.708	0
SBMOD	20.999	1	20.999	0.4	0.527
SGMOD	545.795	1	545.795	10.395	0.001
Climate	527.895	1	527.895	10.054	0.002
EXCON * BMOD	1509.383	1	1509.383	28.747	0
EXTH * BMOD	1316.232	1	1316.232	25.068	0
OLAG * BMOD	0.017	1	0.017	0	0.986
OLAV * BMOD	0.567	1	0.567	0.011	0.917
OLEB * BMOD	9.319	1	9.319	0.177	0.674
OLPG * BMOD	16.659	1	16.659	0.317	0.573
OLTH * BMOD	769.58	1	769.58	14.657	0
BMOD * SBMOD	1.194	1	1.194	0.023	0.88
BMOD * SGMOD	22.673	1	22.673	0.432	0.511
EXCON * EXTH	8992.896	1	8992.896	171.274	0
OLAG * EXCON	25.637	1	25.637	0.488	0.485
OLAV * EXCON	51828.737	1	51828.737	987.105	0
OLEB * EXCON	56240.42	1	56240.42	1071.128	0
OLPG * EXCON	806.104	1	806.104	15.353	0
OLTH * EXCON	227211.141	1	227211.14	4327.355	0
EXCON * SBMOD	17.164	1	17.164	0.327	0.568
EXCON * SGMOD	481.075	1	481.075	9.162	0.003
OLAG * EXTH	1.642	1	1.642	0.031	0.86
OLAV * EXTH	46.18	1	46.18	0.88	0.348
OLEB * EXTH	296.996	1	296.996	5.656	0.017
OLPG * EXTH	64.136	1	64.136	1.222	0.269
OLTH * EXTH	5804.393	1	5804.393	110.548	0
EXTH * SBMOD	18.14	1	18.14	0.345	0.557
EXTH * SGMOD	9.045	1	9.045	0.172	0.678
OLAV * OLAG	3.634	1	3.634	0.069	0.793
OLEB * OLAG	2.358	1	2.358	0.045	0.832
OLPG * OLAG	0.766	1	0.766	0.015	0.904
OLTH * OLAG	52.573	1	52.573	1.001	0.317
OLAG * SBMOD	0.036	1	0.036	0.001	0.979
OLAG * SGMOD	0.145	1	0.145	0.003	0.958
OLEB * OLAV	2542.819	1	2542.819	48.429	0
OLPG * OLAV	662.525	1	662.525	12.618	0
OLTH * OLAV	31206.155	1	31206.155	594.338	0
OLAV * SBMOD	0.096	1	0.096	0.002	0.966
OLAV * SGMOD	5.869	1	5.869	0.112	0.738
OLEB * OLPG	257.973	1	257.973	4.913	0.027
OLTH * OLEB	44650.883	1	44650.883	850.399	0
OLEB * SBMOD	3.311	1	3.311	0.063	0.802
OLEB * SGMOD	34.933	1	34.933	0.665	0.415
OLTH * OLPG	22.883	1	22.883	0.436	0.509
OLPG * SBMOD	2.41	1	2.41	0.046	0.83
OLPG * SGMOD	12.782	1	12.782	0.243	0.622
OLTH * SBMOD	0.285	1	0.285	0.005	0.941
OLTH * SGMOD	114.043	1	114.043	2.172	0.141
SBMOD * SGMOD	5.331	1	5.331	0.102	0.75

a. R Squared = .911 (Adjusted R Squared = .909)

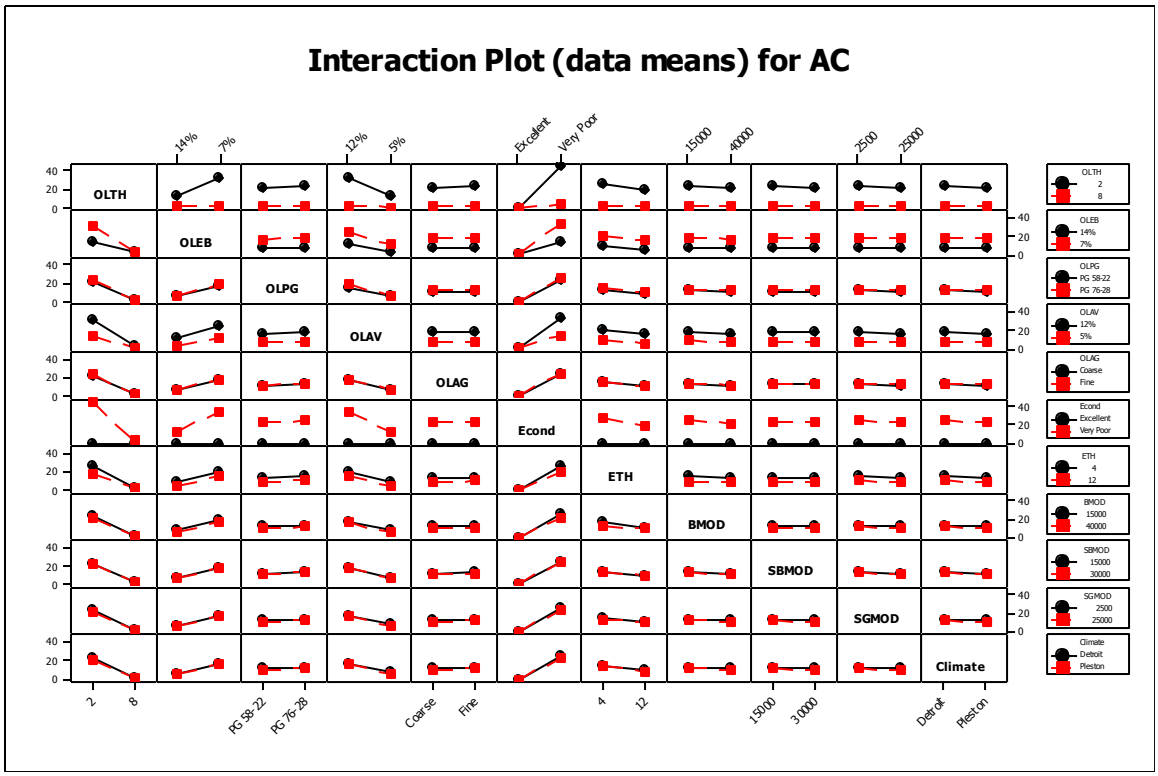

Figure A-11 Summary of interactions

BMOD	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
15000	2	24.017	.320	23.389	24.645
	8	1.789	.320	1.161	2.417
40000	2	21.017	.320	20.389	21.645
	8	1.240	.320	.612	1.869

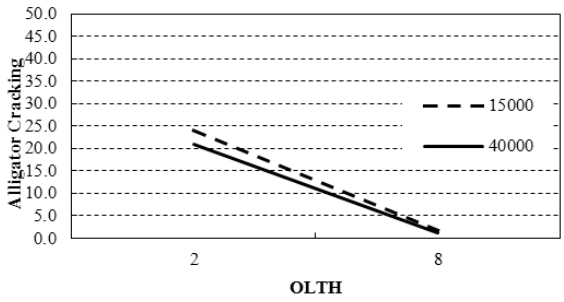

Figure A-12 Overlay thickness vs. base modulus

EXCON	OLAV	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Excellent	.05	.102	.320	-.526	.730
	.12	.274	.320	-.354	.902
Very Poor	.05	13.696	.320	13.068	14.324
	.12	33.991	.320	33.363	34.619

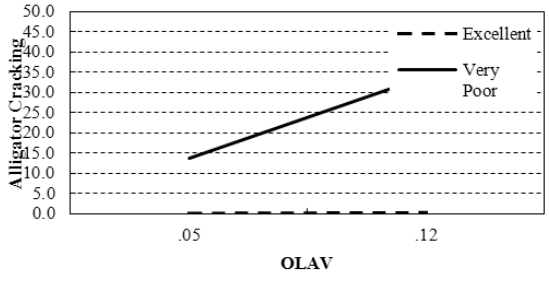

Figure A-13 Overlay air voids vs. existing pavement condition

EXCON	OLEB	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Excellent	.07	.341	.320	-.287	.969
	.14	.035	.320	-.593	.663
Very Poor	.07	34.477	. 20	33.849	35.105
	.14	13.210	.320	12.582	13.838

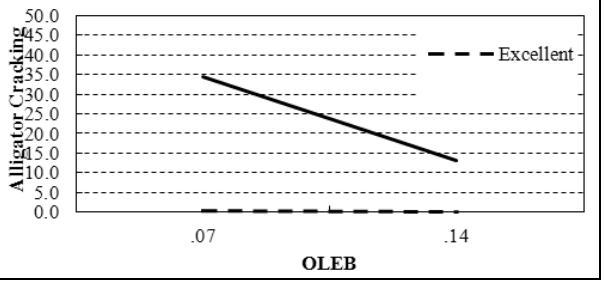

Figure A-14 Overlay effective binder vs. existing pavement condition

EXCON	OLPG	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
xcellent	PG 58-22	.097	.320	-.531	.725
	PG 76-28	.280	.320	-.348	.908
Very Poor	PG 58-22	22.497	.320	21.869	23.125
	PG 76-28	25.190	.320	24.562	25.818

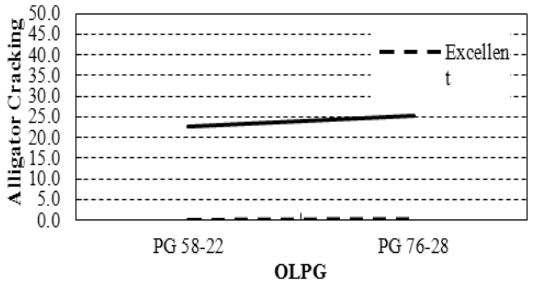

Figure A-15 Overlay PG vs. existing pavement condition

EXCON	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Excellent	2	.156	.320	-.472	.784
	8	.220	.320	-.408	.848
Very Poor	2	44.878	.320	44.250	45.506
	8	2.810	.320	2.182	3.438

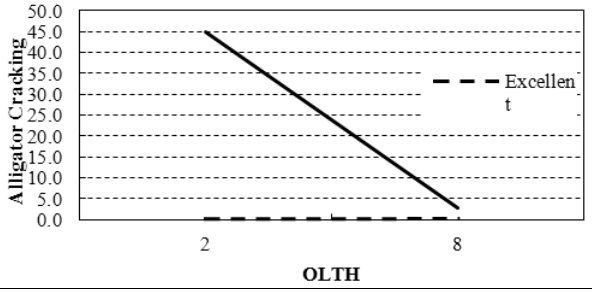

Figure A-16 Overlay thickness vs. existing pavement condition

EXTH	OLEB	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
4	.07	19.994	.320	19.366	20.622
	.14	8.446	.320	7.818	9.074
12	.07	14.824	.320	14.196	15.452
	.14	4.799	.320	4.171	5.427

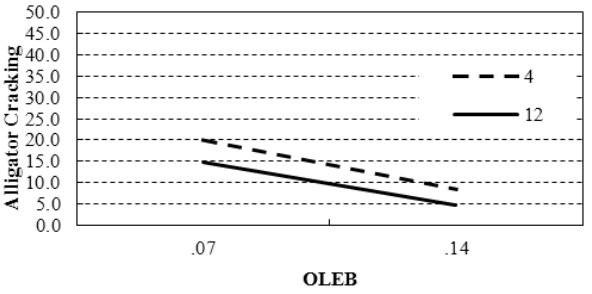

Figure A-17 Overlay effective binder vs. existing pavement thickness

EXTH	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
4	2	26.405	.320	25.777	27.033
	8	2.036	.320	1.408	2.664
12	2	18.629	.320	18.0 1	19.257
	8	.994	.320	.366	1.622

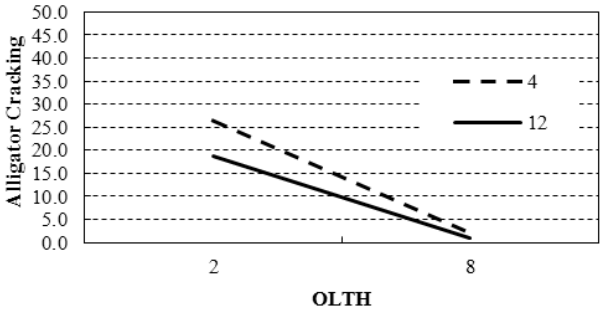

Figure A-18 Overlay thickness vs. existing pavement thickness

A.2.1.3. Rutting

Table A-6 ANOVA table for HMA overlay factorial matrix for rutting

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	684.888[a]	56	12.23	879.94	0
Intercept	628.29	1	628.29	45204.5	0
OLTH	237.78	1	237.78	17107.91	0
OLEB	2.963	1	2.963	213.195	0
OLPG	1.312	1	1.312	94.371	0
OLAV	4.941	1	4.941	355.461	0
OLAG	0.1	1	0.1	7.181	0.01
EXCON	100.138	1	100.138	7204.788	0
EXTH	128.33	1	128.33	9233.122	0
BMOD	1.565	1	1.565	112.58	0
SBMOD	0.744	1	0.744	53.558	0
SGMOD	0.744	1	0.744	53.519	0
Climate	0.016	1	0.016	1.154	0.28
EXCON * BMOD	0.278	1	0.278	19.995	0
EXTH * BMOD	0.508	1	0.508	36.568	0
OLAG * BMOD	0	1	0	0.007	0.93
OLAV * BMOD	0.003	1	0.003	0.218	0.64
OLEB * BMOD	0.001	1	0.001	0.07	0.79
OLPG * BMOD	0.001	1	0.001	0.082	0.77
OLTH * BMOD	0.717	1	0.717	51.574	0
BMOD * SBMOD	0.006	1	0.006	0.402	0.53
BMOD * SGMOD	0.001	1	0.001	0.081	0.78
EXCON * EXTH	24.594	1	24.594	1769.527	0
OLAG * EXCON	0.004	1	0.004	0.288	0.59
OLAV * EXCON	0.269	1	0.269	19.337	0
OLEB * EXCON	0.073	1	0.073	5.226	0.02
OLPG * EXCON	0.049	1	0.049	3.517	0.06
OLTH * EXCON	96.839	1	96.839	6967.434	0
EXCON * SBMOD	0.028	1	0.028	2.019	0.16
EXCON * SGMOD	0.258	1	0.258	18.538	0
OLAG * EXTH	0.008	1	0.008	0.566	0.45
OLAV * EXTH	0.459	1	0.459	33.014	0
OLEB * EXTH	0.231	1	0.231	16.633	0
OLPG * EXTH	0.13	1	0.13	9.356	0
OLTH * EXTH	80.141	1	80.141	5766.045	0
EXTH * SBMOD	0.086	1	0.086	6.198	0.01
EXTH * SGMOD	0.069	1	0.069	4.939	0.03
OLAV * OLAG	0.004	1	0.004	0.311	0.58
OLEB * OLAG	0.003	1	0.003	0.207	0.65
OLPG * OLAG	0.001	1	0.001	0.068	0.79
OLTH * OLAG	5.55E-05	1	5.55E-05	0.004	0.95
OLAG * SBMOD	1.59E-06	1	1.59E-06	0	0.99
OLAG * SGMOD	0	1	0	0.008	0.93
OLEB * OLAV	0.472	1	0.472	33.973	0
OLPG * OLAV	4.02E-05	1	4.02E-05	0.003	0.96
OLTH * OLAV	0.019	1	0.019	1.399	0.24
OLAV * SBMOD	0	1	0	0.02	0.89
OLAV * SGMOD	0.005	1	0.005	0.341	0.56
OLEB * OLPG	0.251	1	0.251	18.053	0
OLTH * OLEB	0.193	1	0.193	13.919	0
OLEB * SBMOD	8.25E-08	1	8.25E-08	0	1
OLEB * SGMOD	0.001	1	0.001	0.061	0.8
OLTH * OLPG	0.036	1	0.036	2.566	0.11
OLPG * SBMOD	0	1	0	0.024	0.88
OLPG * SGMOD	0.002	1	0.002	0.141	0.71
OLTH * SBMOD	0.107	1	0.107	7.673	0.01
OLTH * SGMOD	0.405	1	0.405	29.117	0
SBMOD * SGMOD	0.004	1	0.004	0.256	0.61

a. R Squared = .961 (Adjusted R Squared = .960)

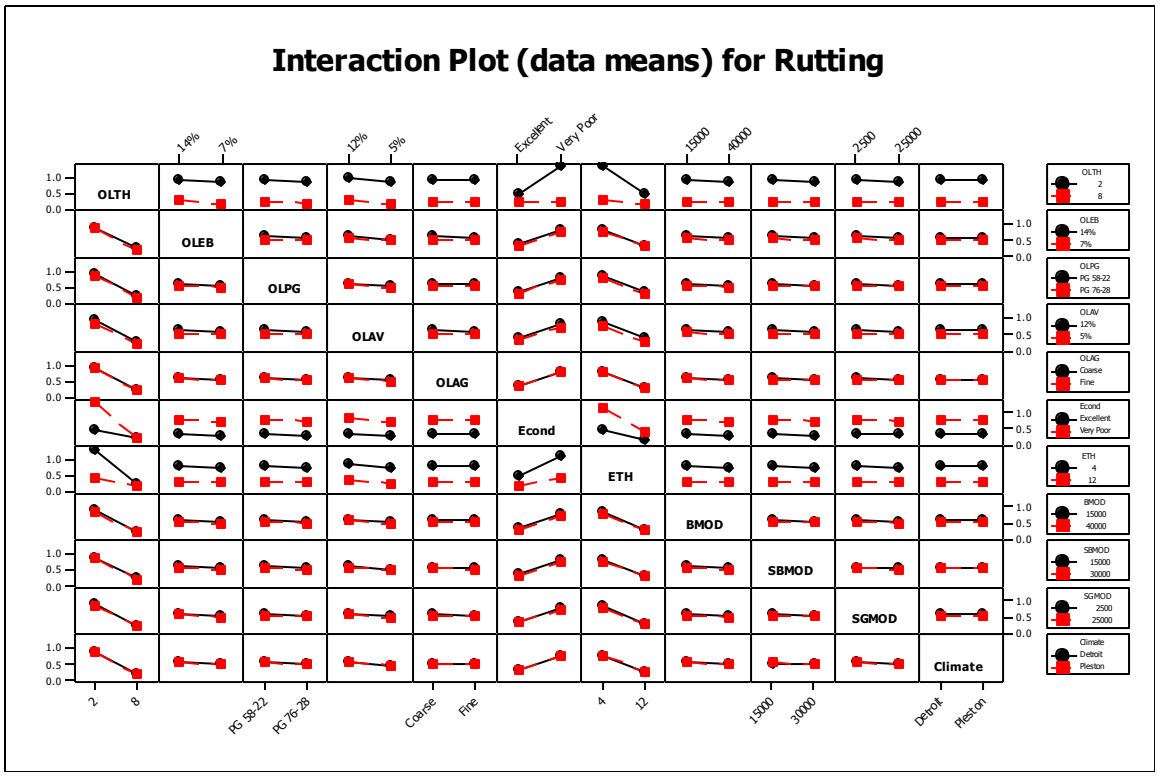

Figure A-19 Summary of interactions

BMOD	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
15000	2	.941	.005	.931	.951
	8	.222	.005	.212	.232
40000	2	.848	.005	.838	.858
	8	.204	.005	.194	.214

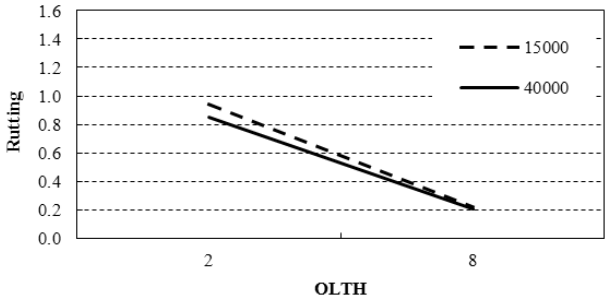

Figure A-20 Overlay thickness vs. overlay thickness vs. Base modulus

EXCON	OLAV	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Excellent	.05	.295	.005	.285	.305
	.12	.370	.005	.360	.381
Very Poor	.05	.714	.005	.704	.725
	.12	.836	.005	.825	.846

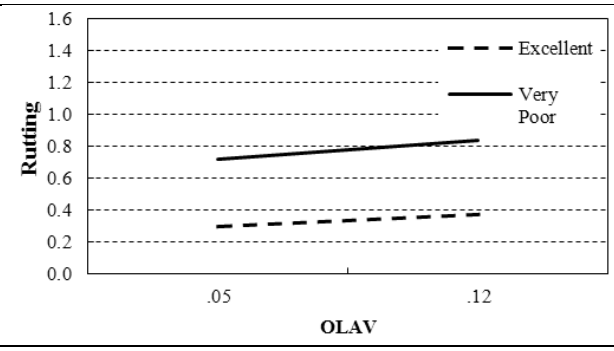

Figure A-21 Overlay air voids vs. existing pavement condition

EXCON	OLEB	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Excellent	.07	.301	.005	.290	.311
	.14	.365	.005	.355	.375
Very Poor	.07	.731	.005	.721	.741
	.14	.819	.005	.809	.829

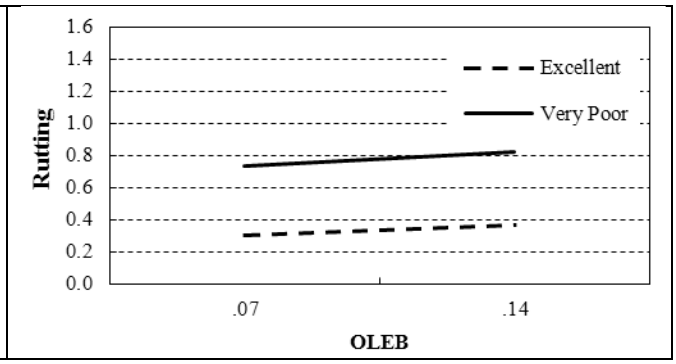

Figure A-22 Overlay effective binder vs. existing pavement condition

EXCON	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Excellent	2	.456	.005	.446	.466
	8	.209	.005	.199	.220
Very Poor	2	1.333	.005	1.323	1.343
	8	.217	.005	.207	.227

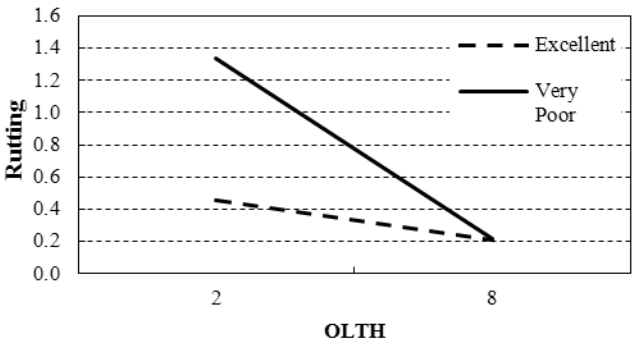

Figure A-23 Overlay thickness vs. existing pavement condition

EXTH	OLAV	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
4	.05	.740	.005	.730	.750
	.12	.868	.005	.858	.879
12	.05	.269	.005	.259	.280
	.12	.338	.005	.327	.348

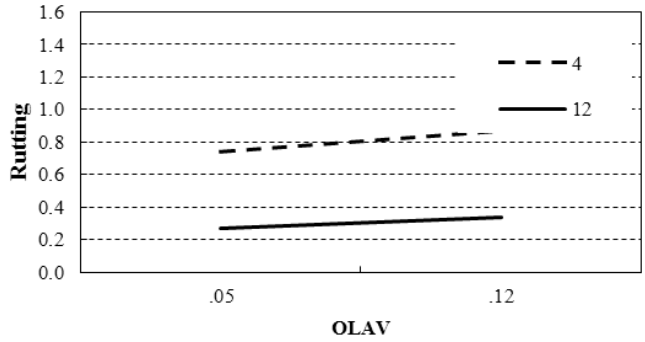

Figure A-24 Overlay air voids vs. existing thickness

EXTH	OLEB	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
4	.07	.756	.005	.745	.766
	.14	.853	.005	.843	.863
12	.07	.276	.005	.266	.286
	.14	.331	.005	.321	.341

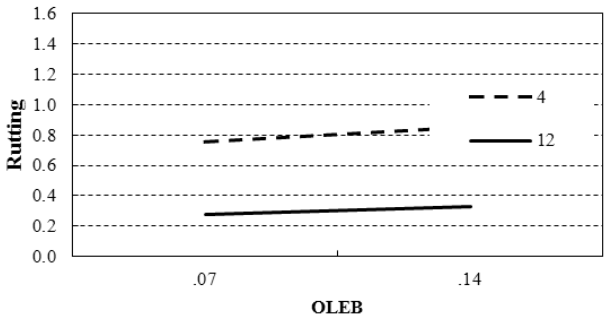

Figure A-25 Overlay effective binder vs. existing pavement thickness

EXTH	OLPG	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
4	PG 58-22	.837	.005	.827	.848
	PG 76-28	.771	.005	.761	.781
12	PG 58-22	.321	.005	.311	.331
	PG 76-28	.286	.005	.276	.296

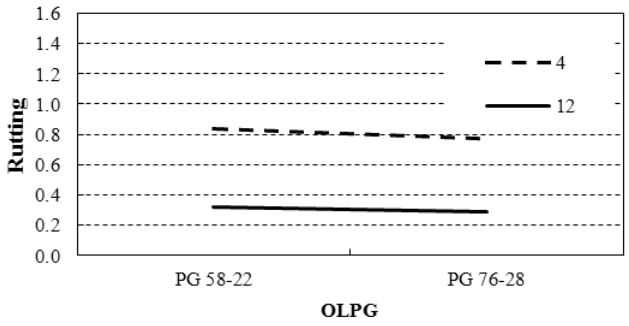

Figure A-26 Overlay PG vs. existing pavement thickness

EXTH	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
4	2	1.343	.005	1.333	1.353
	8	.266	.005	.255	.276
12	2	.446	.005	.436	.457
	8	.161	.005	.150	.171

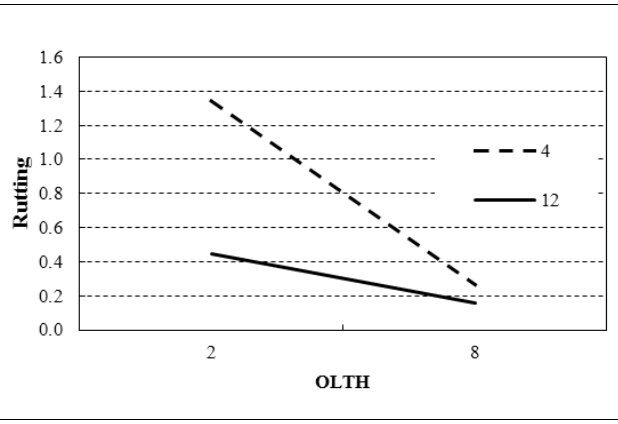

Figure A-27 Overlay thickness vs. existing pavement thickness

OLTH	SBMOD	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
2	15000	.921	.005	.911	.931
	30000	.868	.005	.858	.879
8	15000	.225	.005	.215	.235
	30000	.201	.005	.191	.212

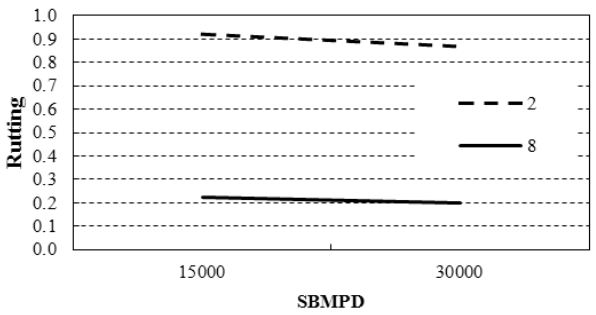

Figure A-28 Overlay thickness vs. subbase modulus

OLTH	SGMOD	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
2	2500	.928	.005	.918	.938
	25000	.862	.005	.851	.872
8	2500	.218	.005	.208	.228
	25000	.208	.005	.198	.218

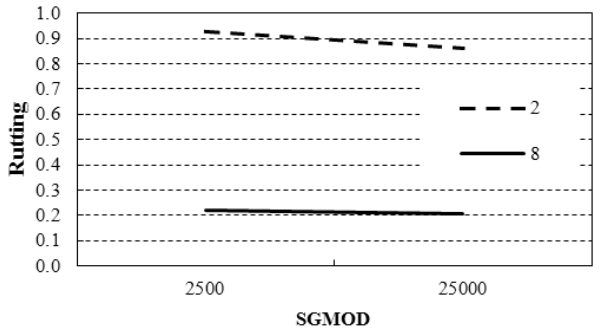

Figure A-29 Overlay thickness vs. subgrade modulus

A.2.1.4. IRI

Table A-7 ANOVA table for HMA overlay factorial matrix for IRI

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	12658760.342[a]	56	226049.292	97.999	0
Intercept	40029353.5	1	40029353.5	17353.94	0
OLTH	2505182.31	1	2505182.31	1086.073	0
OLEB	525725.784	1	525725.784	227.918	0
OLPG	1370.752	1	1370.752	0.594	0.441
OLAV	726362.745	1	726362.745	314.9	0
OLAG	462.935	1	462.935	0.201	0.654
EXCON	1950491.49	1	1950491.49	845.597	0
EXTH	768300.206	1	768300.206	333.081	0
BMOD	70745.587	1	70745.587	30.67	0
SBMOD	2733.146	1	2733.146	1.185	0.276
SGMOD	15247.491	1	15247.491	6.61	0.01
Climate	6231.117	1	6231.117	2.701	0.1
EXCON * BMOD	55916.905	1	55916.905	24.242	0
EXTH * BMOD	56855.081	1	56855.081	24.648	0
OLAG * BMOD	106.443	1	106.443	0.046	0.83
OLAV * BMOD	24695.448	1	24695.448	10.706	0.001
OLEB * BMOD	31185.19	1	31185.19	13.52	0
OLPG * BMOD	625.143	1	625.143	0.271	0.603
OLTH * BMOD	59046.587	1	59046.587	25.598	0
BMOD * SBMOD	154.385	1	154.385	0.067	0.796
BMOD * SGMOD	1048.391	1	1048.391	0.455	0.5
EXCON * EXTH	382951.966	1	382951.966	166.021	0
OLAG * EXCON	975.853	1	975.853	0.423	0.515
OLAV * EXCON	611704.409	1	611704.409	265.192	0
OLEB * EXCON	607040.155	1	607040.155	263.17	0
OLPG * EXCON	5159.693	1	5159.693	2.237	0.135
OLTH * EXCON	1849319.07	1	1849319.07	801.736	0
EXCON * SBMOD	583.859	1	583.859	0.253	0.615
EXCON * SGMOD	11758.59	1	11758.59	5.098	0.024
OLAG * EXTH	218.34	1	218.34	0.095	0.758
OLAV * EXTH	116945.059	1	116945.059	50.699	0
OLEB * EXTH	103972.275	1	103972.275	45.075	0
OLPG * EXTH	590.928	1	590.928	0.256	0.613
OLTH * EXTH	590529.762	1	590529.762	256.013	0
EXTH * SBMOD	996.951	1	996.951	0.432	0.511
EXTH * SGMOD	2140.011	1	2140.011	0.928	0.336
OLAV * OLAG	709.821	1	709.821	0.308	0.579
OLEB * OLAG	765.505	1	765.505	0.332	0.565
OLPG * OLAG	1.187	1	1.187	0.001	0.982
OLTH * OLAG	1241.732	1	1241.732	0.538	0.463
OLAG * SBMOD	1.235	1	1.235	0.001	0.982
OLAG * SGMOD	22.887	1	22.887	0.01	0.921
OLEB * OLAV	351512.302	1	351512.302	152.391	0
OLPG * OLAV	5613.695	1	5613.695	2.434	0.119
OLTH * OLAV	548664.133	1	548664.133	237.863	0
OLAV * SBMOD	122.217	1	122.217	0.053	0.818
OLAV * SGMOD	3827.305	1	3827.305	1.659	0.198
OLEB * OLPG	7074.18	1	7074.18	3.067	0.08
OLTH * OLEB	630504.842	1	630504.842	273.343	0
OLEB * SBMOD	226.778	1	226.778	0.098	0.754
OLEB * SGMOD	5447.396	1	5447.396	2.362	0.125
OLTH * OLPG	3114.824	1	3114.824	1.35	0.245
OLPG * SBMOD	19.317	1	19.317	0.008	0.927
OLPG * SGMOD	76.068	1	76.068	0.033	0.856
OLTH * SBMOD	777.289	1	777.289	0.337	0.562
OLTH * SGMOD	11547.725	1	11547.725	5.006	0.025
SBMOD * SGMOD	115.853	1	115.853	0.05	0.823
a. R Squared = .734 (Adjusted R Squared = .726)					

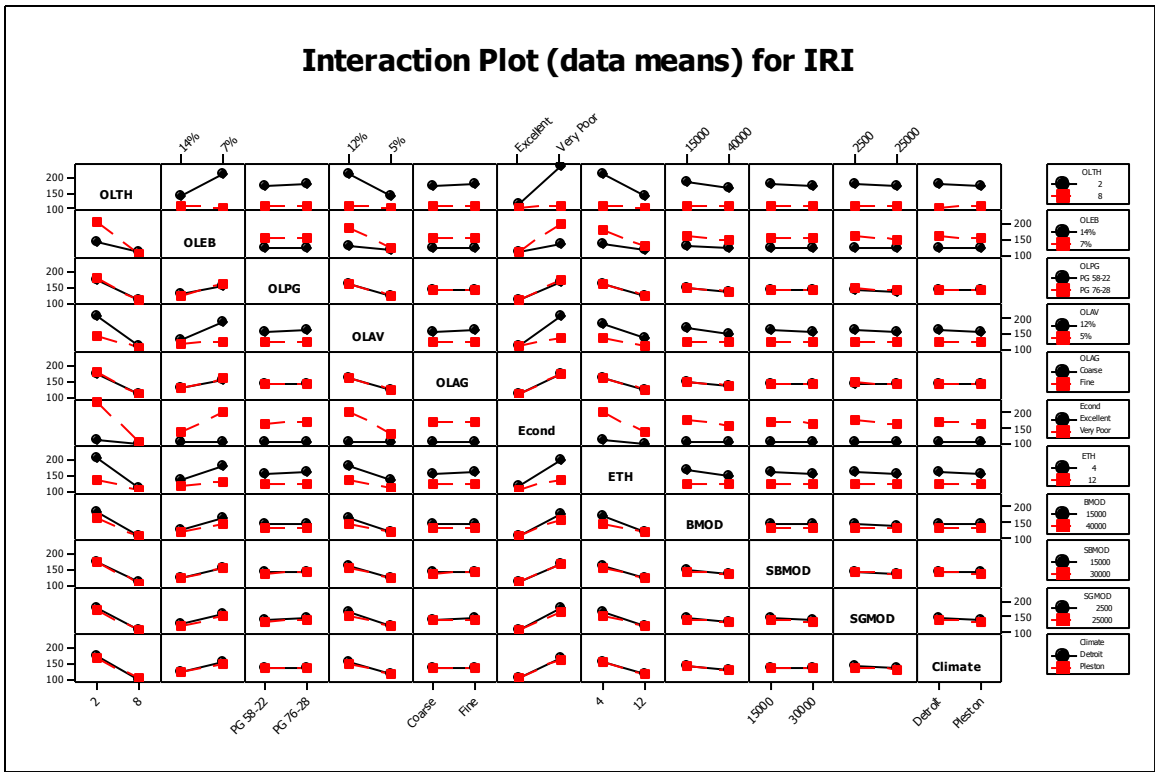

Figure A-30 Summary of interactions

BMOD	OLAV	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
15000	.05	123.378	2.123	119.215	127.540
	.12	167.988	2.123	163.825	172.151
40000	.05	118.568	2.123	114.405	122.731
	.12	149.288	2.123	145.126	153.451

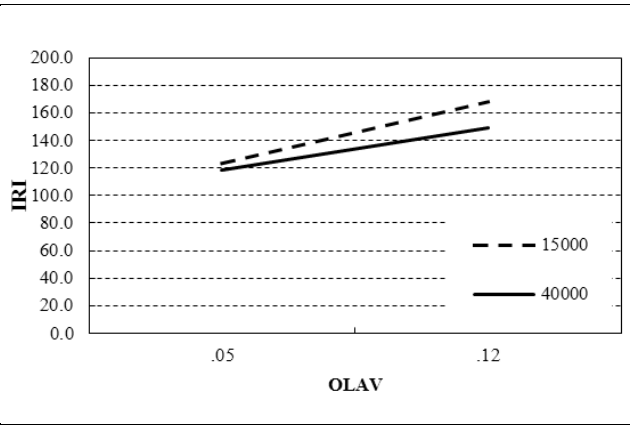

Figure A-31 Overlay air voids vs. base modulus

BMOD	OLEB	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
15000	.07	165.607	2.123	161.444	169.770
	.14	125.759	2.123	121.596	129.921
40000	.07	146.048	2.123	141.885	150.210
	.14	121.808	2.123	117.646	125.971

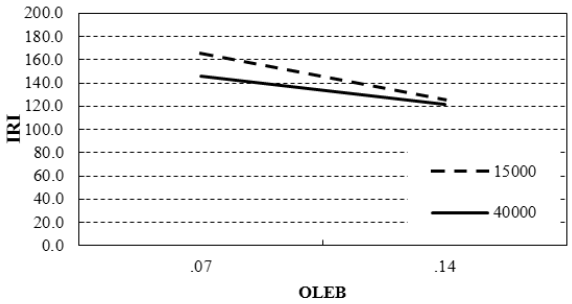

Figure A-32 Overlay Effective binder vs. base modulus

BMOD	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
15000	2	186.027	2.123	181.865	190.190
	8	105.339	2.123	101.176	109.501
40000	2	163.533	2.123	59.371	167.696
	8	104.323	2.123	100.160	108.485

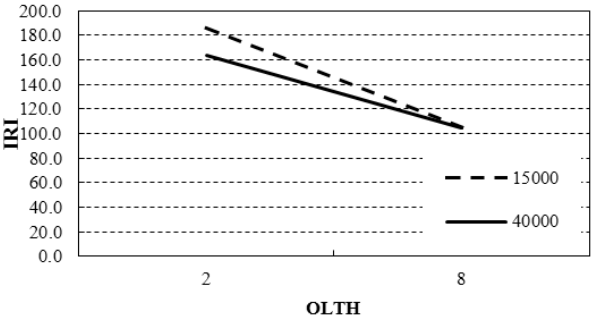

Figure A-33 Overlay thickness vs. base modulus

EXCON	OLAV	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Excellent	.05	107.395	2.123	103.232	111.557
	.12	110.495	2.123	106.332	114.658
Very Poor	.05	134.551	2.123	130.389	138.714
	.12	206.781	2.123	202.619	210.944

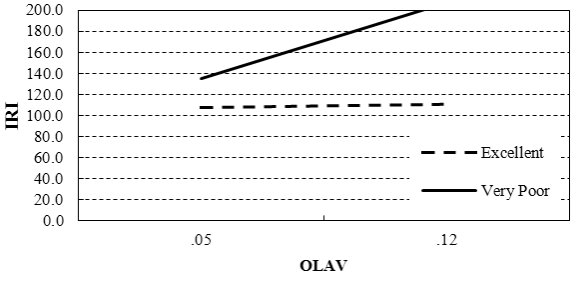

Figure A-34 Overlay air voids vs. existing condition

EXCON	OLB	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Excellent	.07	107.750	2.123	103.588	111.913
	.14	110.139	2.123	105.977	114.302
Very Poor	.07	203.905	2.123	199.742	208.067
	.14	137.428	2.123	133.265	141.591

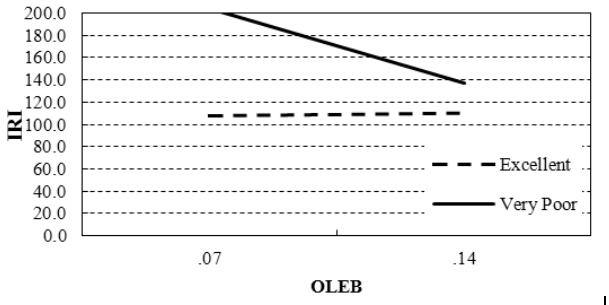

Figure A-35 Overlay effective binder vs. existing condition

EXCON	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Excellent	2	113.870	2.123	109.707	118.032
	8	104.020	2.123	99.857	108.182
Very Poor	2	235.691	2.123	231.528	239.853
	8	105.642	2.123	101.479	109.804

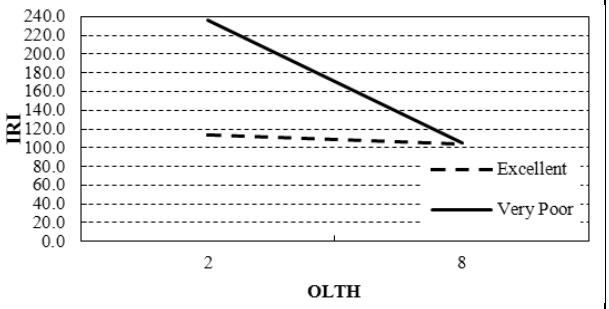

Figure A-36 Overlay thickness vs. Existing condition

EXTH	OLAV	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
4	.05	132.785	2.123	128.622	136.948
	.12	185.563	2.123	181.401	189.726
12	.05	109.161	2.123	104.998	113.323
	.12	131.713	2.123	127.550	135.876

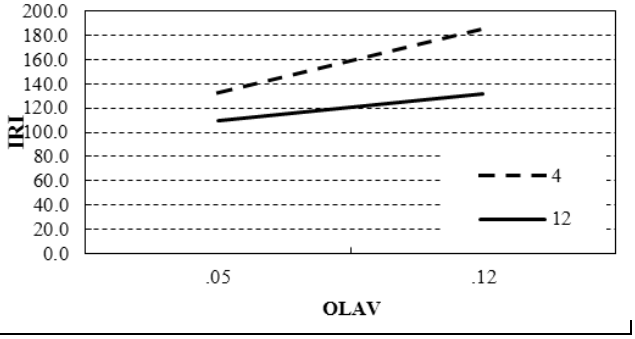

Figure A-37 Overlay air voids vs. existing thickness

EXTH	OLEB	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
4	.07	182.321	2.123	178.159	186.484
	.14	136.027	2.123	131.865	140.190
12	.07	129.334	2.123	125.171	133.496
	.14	111.540	2.123	107.377	115.703

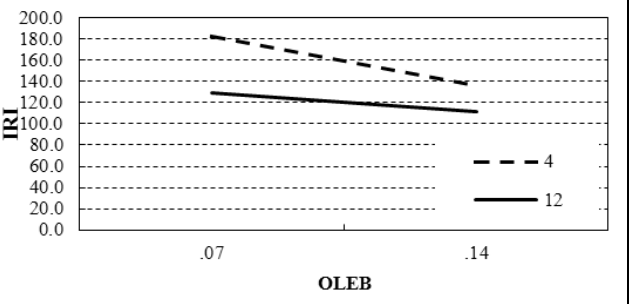

Figure A-38 Overlay Effective binder vs. existing thickness

EXTH	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
4	2	211.130	2.123	206.967	215.292
	8	107.219	2.123	103.056	111.381
12	2	138.431	2.123	134.268	142.593
	8	102.443	2.123	98.280	106.605

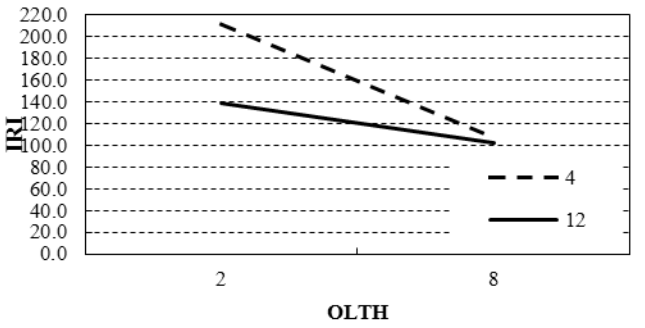

Figure A-39 Overlay thickness vs. existing thickness

OLTH	SGMOD	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
2	2500	179.883	2.123	175.721	184.046
	25000	169.677	2.123	165.515	173.840
8	2500	105.185	2.123	101.022	109.347
	25000	104.477	2.123	100.314	108.639

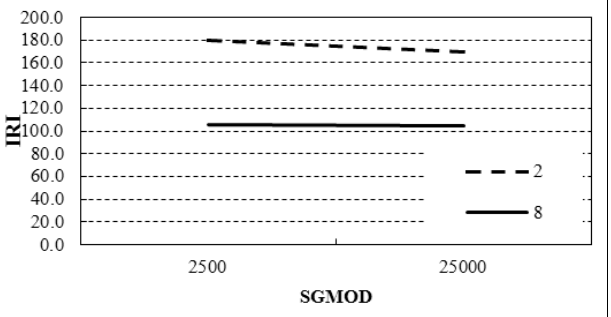

Figure A-40 Overlay thickness vs. subgrade modulus

A.2.2 Composite Overlays

Table A-8 Factorial matrix of ANOVA for composite

OLTH (in)	OLPG	OLGRAD	OLEB (%)	OLAV (%)	EPCCE (psi)/EPCCTH (in)/EK(psi/in)/Climate															
					500000								3000000							
					7				11				7				11			
					50		300		50		300		50		300		50		300	
					Pellston	Detroit	Pellston	Detroit	Pellston	Detroit	Pellston	Detroit	Pellston	Detroit	Pellston	Detroit	Pellston	Detroit	Pellston	Detroit
2	PG 58-22	Coarse	7	5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
				12	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
			14	5	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
				12	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
		Fine	7	5	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
				12	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
			14	5	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112
				12	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128
	PG 76-28	Coarse	7	5	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144
				12	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
			14	5	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176
				12	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192
		Fine	7	5	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208
				12	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224
			14	5	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
				12	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256
8	PG 58-22	Coarse	7	5	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272
				12	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288
			14	5	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304
				12	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320
		Fine	7	5	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336
				12	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352
			14	5	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368
				12	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384
	PG 76-28	Coarse	7	5	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400
				12	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416
			14	5	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432
				12	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448
		Fine	7	5	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464
				12	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480
			14	5	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496
				12	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512

A.2.2.1. Longitudinal cracking

Table A-9 ANOVA table for composite factorial matrix for longitudinal cracking

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	7.56E+09	45	1.68E+08	290.86	0
Intercept	2.59E+09	1	2.59E+09	4478.054	0
OLTH	2.57E+09	1	2.57E+09	4453.662	0
OLPG	72471800.4	1	72471800.4	125.487	0
OLGRAD	5270230.13	1	5270230.13	9.126	0.003
OLEB	1989703.29	1	1989703.29	3.445	0.064
OLAV	2.24E+09	1	2.24E+09	3883.855	0
EMOD	15118277	1	15118277	26.178	0
EPCCTH	99276343.9	1	99276343.9	171.899	0
EK	2859.57	1	2859.57	0.005	0.944
Climate	7706531.89	1	7706531.89	13.344	0
EK * Climate	2859.57	1	2859.57	0.005	0.944
EMOD * Climate	19044.689	1	19044.689	0.033	0.856
EPCCTH * Climate	1567547.59	1	1567547.59	2.714	0.1
OLAV * Climate	3413466.43	1	3413466.43	5.91	0.015
OLEB * Climate	36122.016	1	36122.016	0.063	0.803
OLGRAD * Climate	1385.748	1	1385.748	0.002	0.961
OLTH * Climate	7328170.15	1	7328170.15	12.689	0
OLPG * Climate	1062007.38	1	1062007.38	1.839	0.176
EMOD * EK	2859.57	1	2859.57	0.005	0.944
EPCCTH * EK	2859.57	1	2859.57	0.005	0.944
OLAV * EK	2859.57	1	2859.57	0.005	0.944
OLEB * EK	2859.57	1	2859.57	0.005	0.944
OLGRAD * EK	2859.57	1	2859.57	0.005	0.944
OLTH * EK	2859.57	1	2859.57	0.005	0.944
OLPG * EK	2859.57	1	2859.57	0.005	0.944
EMOD * EPCCTH	2476959.27	1	2476959.27	4.289	0.039
OLAV * EMOD	5725355.77	1	5725355.77	9.914	0.002
OLEB * EMOD	41843.629	1	41843.629	0.072	0.788
OLGRAD * EMOD	31022.914	1	31022.914	0.054	0.817
OLTH * EMOD	14578920	1	14578920	25.244	0
OLPG * EMOD	1119314.7	1	1119314.7	1.938	0.165
OLAV * EPCCTH	45218576	1	45218576	78.297	0
OLEB * EPCCTH	161637.344	1	161637.344	0.28	0.597
OLGRAD * EPCCTH	823339.616	1	823339.616	1.426	0.233
OLTH * EPCCTH	97215127.8	1	97215127.8	168.33	0
OLPG * EPCCTH	17200520.1	1	17200520.1	29.783	0
OLEB * OLAV	220512.745	1	220512.745	0.382	0.537
OLGRAD * OLAV	2160579.99	1	2160579.99	3.741	0.054
OLTH * OLAV	2.23E+09	1	2.23E+09	3861.16	0
OLPG * OLAV	33511847.1	1	33511847.1	58.027	0
OLGRAD * OLEB	194.686	1	194.686	0	0.985
OLTH * OLEB	1852124.38	1	1852124.38	3.207	0.074
OLPG * OLEB	54131.193	1	54131.193	0.094	0.76
OLTH * OLGRAD	5103964.58	1	5103964.58	8.838	0.003
OLPG * OLGRAD	304730.631	1	304730.631	0.528	0.468
OLTH * OLPG	70916666	1	70916666	122.794	0
Error	2.69E+08	466	577526.025		
Total	1.04E+10	512			
Corrected Total	7.83E+09	511			
a. R Squared = .966 (Adjusted R Squared = .962)					

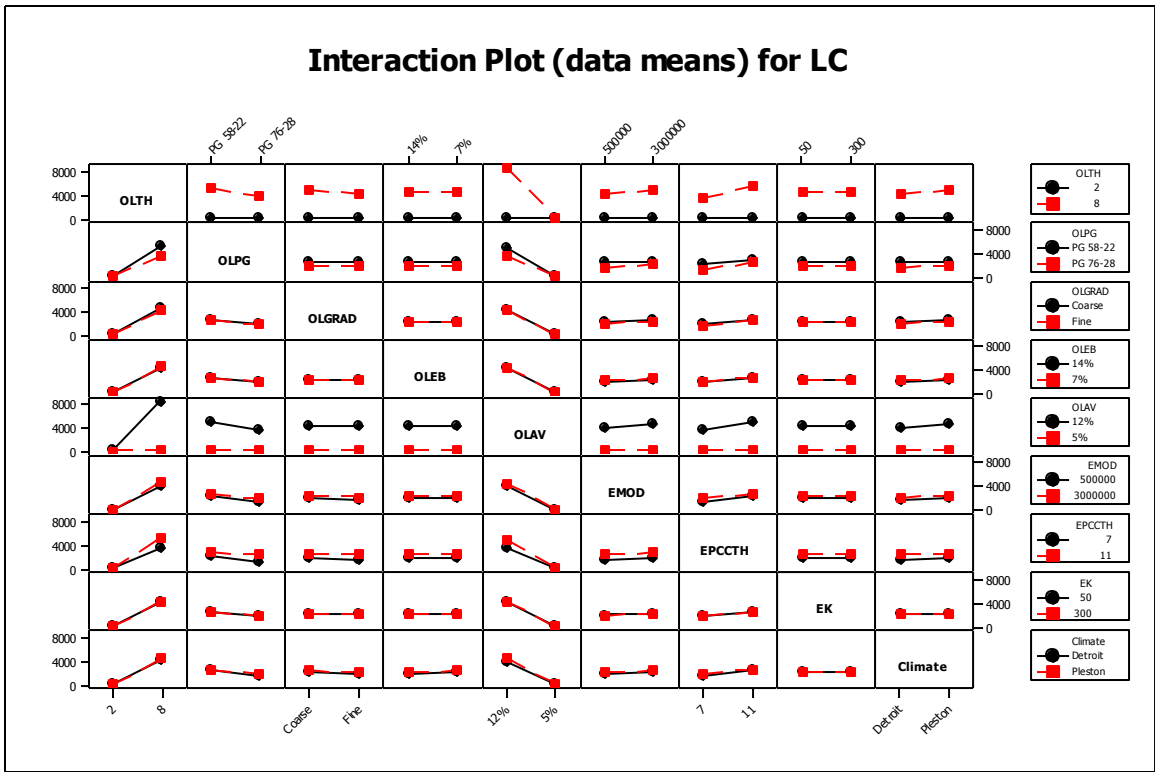

Figure A-41 Summary of interactions

EMOD	OLAV	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
500000	5.00%	88.325	67.171	-43.670	220.320
	12.00%	4062.957	67.171	3930.962	4194.953
3000000	5.00%	220.505	67.171	88.510	352.501
	12.00%	4618.124	67.171	4486.129	4750.119

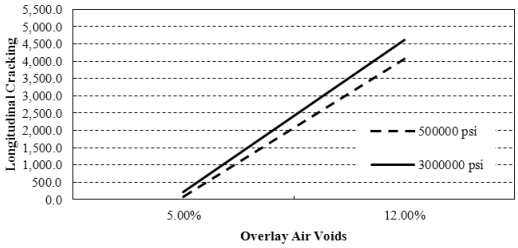

Figure A-42 Overlay air voids vs. existing modulus

EMOD	OLPG	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
500000 psi	PG 58-22	2498.624	67.171	2366.629	2630.619
	PG 76-28	1652.658	67.171	1520.663	1784.653
3000000 psi	PG 58-22	2748.785	67.171	2616.790	2880.780
	PG 76-28	2089.845	67.171	1957.849	2221.840

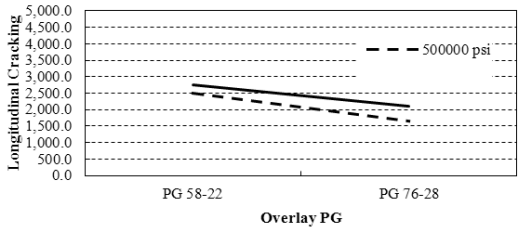

Figure A-43 Overlay PG vs. existing modulus

OLTH	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
2	3.036	67.171	-128.959	135.032
8	4148.246	67.171	4016.251	4280.241
2	9.222	67.171	-122.773	141.218
8	4829.407	67.171	4697.412	4961.402

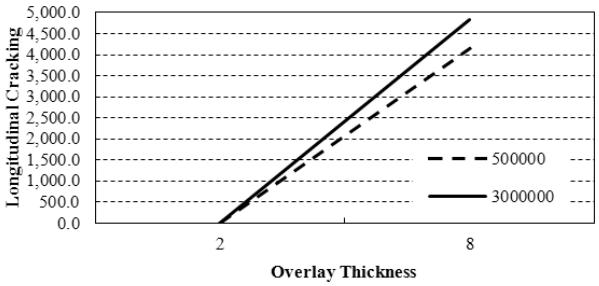

Figure A-44 Overlay thickness vs. existing modulus

OLAV	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
5.00%	11.258	67.171	-120.737	143.253
12.00%	3603.018	67.171	3471.023	3735.014
5.00%	297.572	67.171	165.577	429.567
12.00%	5078.063	67.171	4946.068	5210.059

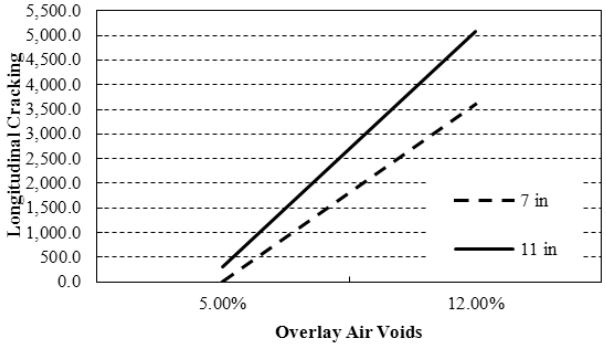

Figure A-45 Overlay air voids vs. existing thickness

OLPG	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
PG 58-22	2366.654	67.171	2234.658	2498.649
PG 76-28	1247.623	67.171	1115.628	1379.618
PG 58-22	2880.756	67.171	2748.760	3012.751
PG 76-28	2494.880	67.171	2362.885	2626.875

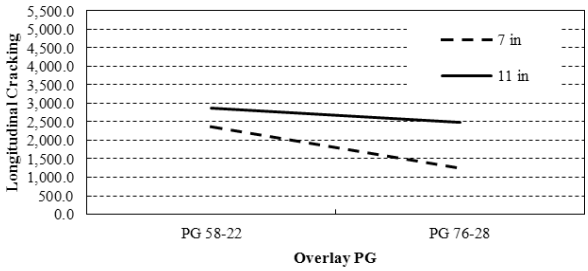

Figure A-46 Overlay PG vs. existing thickness

OLTH	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
2	1.534	67.171	-130.461	133.529
8	3612.742	67.171	3480.747	3744.738
2	10.725	67.171	-121.271	142.720
8	5364.911	67.171	5232.916	5496.906

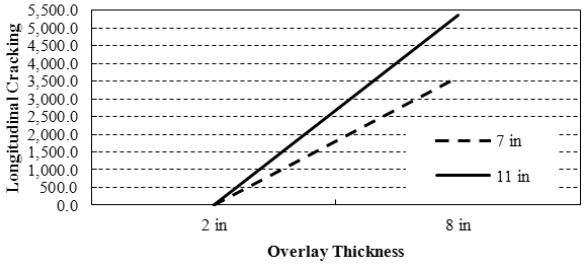

Figure A-47 Overlay thickness vs. existing thickness

A.2.2.2. Alligator cracking

Table A-10 ANOVA table for composite factorial matrix for alligator cracking

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2.500E-7[a]	45	5.56E-09	12.328	0
Intercept	2.00E-08	1	2.00E-08	44.381	0
OLTH	2.00E-08	1	2.00E-08	44.381	0
OLPG	0	1	0	0	1
OLGRAD	5.00E-09	1	5.00E-09	11.095	0.001
OLEB	2.00E-08	1	2.00E-08	44.381	0
OLAV	5.00E-09	1	5.00E-09	11.095	0.001
EMOD	2.00E-08	1	2.00E-08	44.381	0
EPCCTH	2.00E-08	1	2.00E-08	44.381	0
EK	0	1	0	0	1
Climate	0	1	0	0	1
EK * Climate	0	1	0	0	1
EMOD * Climate	0	1	0	0	1
EPCCTH * Climate	0	1	0	0	1
OLAV * Climate	0	1	0	0	1
OLEB * Climate	0	1	0	0	1
OLGRAD * Climate	0	1	0	0	1
OLTH * Climate	0	1	0	0	1
OLPG * Climate	0	1	0	0	1
EMOD * EK	0	1	0	0	1
EPCCTH * EK	0	1	0	0	1
OLAV * EK	0	1	0	0	1
OLEB * EK	0	1	0	0	1
OLGRAD * EK	0	1	0	0	1
OLTH * EK	0	1	0	0	1
OLPG * EK	0	1	0	0	1
EMOD * EPCCTH	2.00E-08	1	2.00E-08	44.381	0
OLAV * EMOD	5.00E-09	1	5.00E-09	11.095	0.001
OLEB * EMOD	2.00E-08	1	2.00E-08	44.381	0
OLGRAD * EMOD	5.00E-09	1	5.00E-09	11.095	0.001
OLTH * EMOD	2.00E-08	1	2.00E-08	44.381	0
OLPG * EMOD	0	1	0	0	1
OLAV * EPCCTH	5.00E-09	1	5.00E-09	11.095	0.001
OLEB * EPCCTH	2.00E-08	1	2.00E-08	44.381	0
OLGRAD * EPCCTH	5.00E-09	1	5.00E-09	11.095	0.001
OLTH * EPCCTH	2.00E-08	1	2.00E-08	44.381	0
OLPG * EPCCTH	0	1	0	0	1
OLEB * OLAV	5.00E-09	1	5.00E-09	11.095	0.001
OLGRAD * OLAV	0	1	0	0	1
OLTH * OLAV	5.00E-09	1	5.00E-09	11.095	0.001
OLPG * OLAV	0	1	0	0	1
OLGRAD * OLEB	5.00E-09	1	5.00E-09	11.095	0.001
OLTH * OLEB	2.00E-08	1	2.00E-08	44.381	0
OLPG * OLEB	0	1	0	0	1
OLTH * OLGRAD	5.00E-09	1	5.00E-09	11.095	0.001
OLPG * OLGRAD	0	1	0	0	1
OLTH * OLPG	0	1	0	0	1
Error	2.10E-07	466	4.51E-10		
Total	4.80E-07	512			
Corrected Total	4.60E-07	511			
a. R Squared = .543 (Adjusted R Squared = .499)					

A.2.2.3. Rutting

Table A-11 ANOVA table for composite factorial matrix for rutting

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	28.040[a]	45	0.623	6612.061	0
Intercept	123.901	1	123.901	1314764.05	0
OLTH	6.347	1	6.347	67346.107	0
OLPG	4.027	1	4.027	42733.315	0
OLGRAD	0.247	1	0.247	2620.255	0
OLEB	3.593	1	3.593	38121.802	0
OLAV	11.727	1	11.727	124443.076	0
EMOD	0.092	1	0.092	981.022	0
EPCCTH	0.367	1	0.367	3896.758	0
EK	5.28E-06	1	5.28E-06	0.056	0.813
Climate	0.148	1	0.148	1567.259	0
EK * Climate	5.28E-06	1	5.28E-06	0.056	0.813
EMOD * Climate	3.40E-05	1	3.40E-05	0.361	0.548
EPCCTH * Climate	3.13E-08	1	3.13E-08	0	0.985
OLAV * Climate	0.011	1	0.011	112.709	0
OLEB * Climate	0.003	1	0.003	31.253	0
OLGRAD * Climate	0	1	0	2.122	0.146
OLTH * Climate	4.51E-05	1	4.51E-05	0.479	0.489
OLPG * Climate	0.002	1	0.002	20.56	0
EMOD * EK	5.28E-06	1	5.28E-06	0.056	0.813
EPCCTH * EK	5.28E-06	1	5.28E-06	0.056	0.813
OLAV * EK	5.28E-06	1	5.28E-06	0.056	0.813
OLEB * EK	5.28E-06	1	5.28E-06	0.056	0.813
OLGRAD * EK	5.28E-06	1	5.28E-06	0.056	0.813
OLTH * EK	5.28E-06	1	5.28E-06	0.056	0.813
OLPG * EK	5.28E-06	1	5.28E-06	0.056	0.813
EMOD * EPCCTH	0.001	1	0.001	7.362	0.007
OLAV * EMOD	0.003	1	0.003	28.468	0
OLEB * EMOD	0.001	1	0.001	8.596	0.004
OLGRAD * EMOD	1.80E-05	1	1.80E-05	0.191	0.662
OLTH * EMOD	0.002	1	0.002	24.896	0
OLPG * EMOD	0.001	1	0.001	5.691	0.017
OLAV * EPCCTH	0.006	1	0.006	68.651	0
OLEB * EPCCTH	0.002	1	0.002	20.891	0
OLGRAD * EPCCTH	6.61E-05	1	6.61E-05	0.702	0.403
OLTH * EPCCTH	0.003	1	0.003	29.054	0
OLPG * EPCCTH	0.001	1	0.001	5.691	0.017
OLEB * OLAV	0.393	1	0.393	4171.999	0
OLGRAD * OLAV	0.021	1	0.021	220.802	0
OLTH * OLAV	0.404	1	0.404	4288.063	0
OLPG * OLAV	0.279	1	0.279	2962.604	0
OLGRAD * OLEB	0.006	1	0.006	67.15	0
OLTH * OLEB	0.125	1	0.125	1323.771	0
OLPG * OLEB	0.085	1	0.085	899.516	0
OLTH * OLGRAD	0.009	1	0.009	94.205	0
OLPG * OLGRAD	0.005	1	0.005	56.836	0
OLTH * OLPG	0.13	1	0.13	1380.01	0
Error	0.044	466	9.42E-05		
Total	151.985	512			
Corrected Total	28.084	511			
a. R Squared = .998 (Adjusted R Squared = .998)					

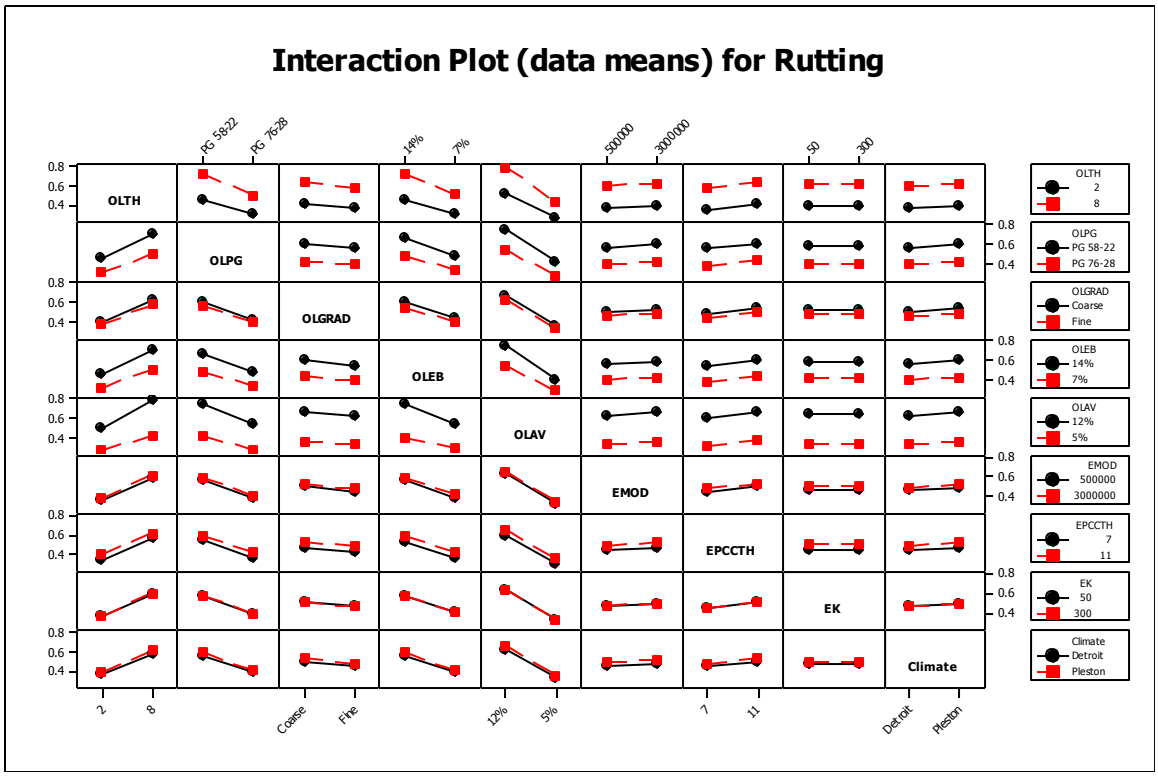

Figure A-48 Summary of interactions

EMOD	OLAV	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
500000	5.00%	.329	.001	.328	.331
	12.00%	.628	.001	.626	.629
3000000	5.00%	.352	.001	.350	.353
	12.00%	.659	.001	.657	.661

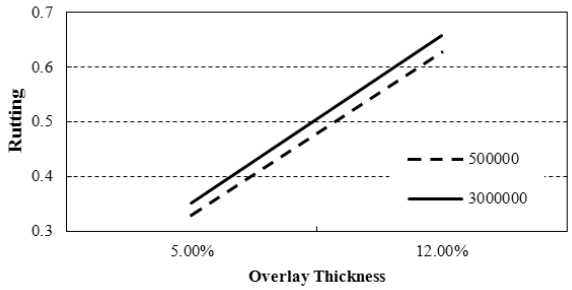

Figure A-49 Overlay air voids vs. existing modulus

EMOD	OLEB	M an	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
500000	7.00%	.396	.001	.394	.398
	14.00 %	.561	.001	.559	.563
3000000	7.00%	.420	.001	.419	.422
	14.00 %	.590	.001	.589	.592

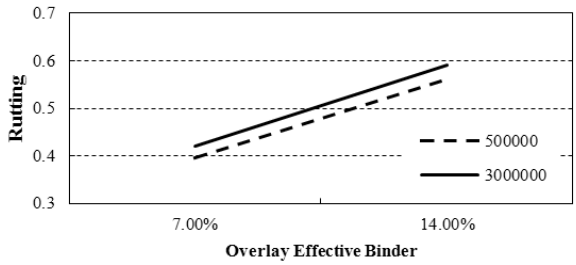

Figure A-50 Overlay effective binder vs. existing modulus

EMOD	OLPG	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
500000	PG 58-22	.566	.001	.564	.568
	PG 76-28	.391	.001	.389	.393
3000000	PG 58-22	.595	.001	.593	.597
	PG 76-28	.416	.001	.414	.417

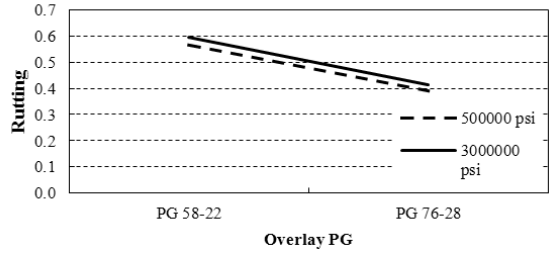

Figure A-51 Overlay PG vs. existing modulus

EMOD	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
500000	2	.365	.001	.363	.367
	8	.592	.001	.590	.594
3000000	2	.396	.001	.394	.398
	8	.615	.001	.613	.616

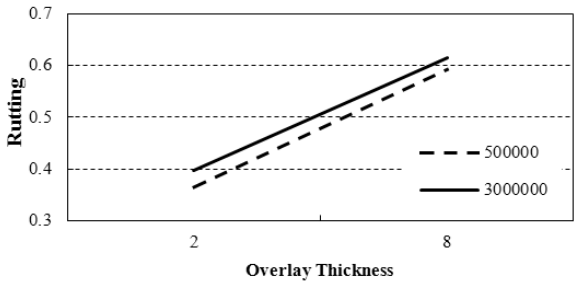

Figure A-52 Overlay thickness vs. existing modulus

EMOD	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
500000	2	.365	.001	.363	.367
	8	.592	.001	.590	.594
3000000	2	.396	.001	.394	.398
	8	.615	.001	.613	.616

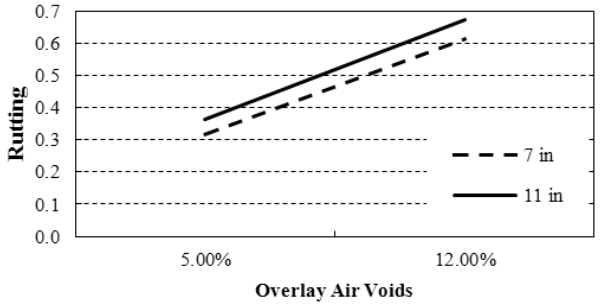

Figure A-53 Overlay air voids vs. existing thickness

ETH	OLEB	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
7	7.00%	.383	.001	.382	.385
	14.00%	.547	.001	.545	.549
11	7.00%	.433	.001	.431	.435
	14.00%	.604	.001	.603	.606

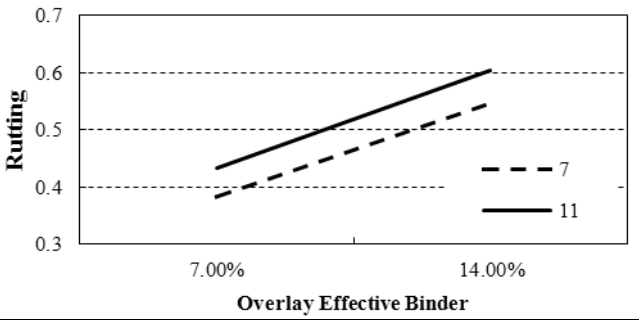

Figure A-54 Overlay effective binder vs. existing thickness

ETH	OLPG	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
7	PG 58-22	.553	.001	.551	.554
	PG 76-28	.377	.001	.376	.379
11	PG 58-22	.608	.001	.607	.610
	PG 76-28	.429	.001	.427	.431

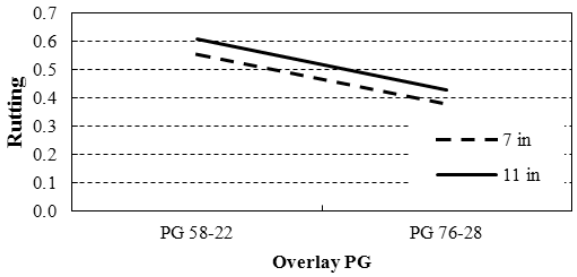

Figure A-55 Overlay PG vs. existing thickness

ETH	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
7	2	.356	.001	.354	.358
	8	.574	.001	.572	.576
11	2	.405	.001	.403	.407
	8	.632	.001	.631	.634

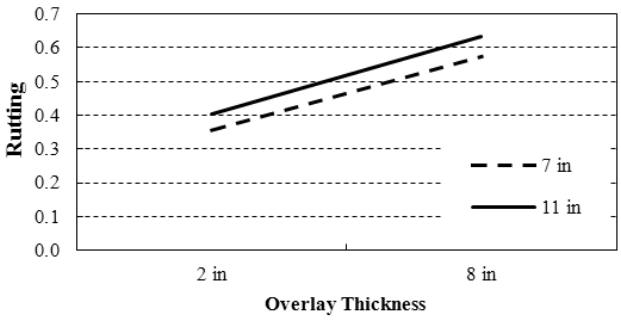

Figure A-56 Overlay thickness vs. existing thickness

A.2.2.4. IRI

Table A-12 ANOVA table for composite factorial matrix for IRI

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	28.040[a]	45	0.623	6612.061	0
Intercept	123.901	1	123.901	1314764.05	0
OLTH	6.347	1	6.347	67346.107	0
OLPG	4.027	1	4.027	42733.315	0
OLGRAD	0.247	1	0.247	2620.255	0
OLEB	3.593	1	3.593	38121.802	0
OLAV	11.727	1	11.727	124443.076	0
EMOD	0.092	1	0.092	981.022	0
EPCCTH	0.367	1	0.367	3896.758	0
EK	5.28E-06	1	5.28E-06	0.056	0.813
Climate	0.148	1	0.148	1567.259	0
EK * Climate	5.28E-06	1	5.28E-06	0.056	0.813
EMOD * Climate	3.40E-05	1	3.40E-05	0.361	0.548
EPCCTH * Climate	3.13E-08	1	3.13E-08	0	0.985
OLAV * Climate	0.011	1	0.011	112.709	0
OLEB * Climate	0.003	1	0.003	31.253	0
OLGRAD * Climate	0	1	0	2.122	0.146
OLTH * Climate	4.51E-05	1	4.51E-05	0.479	0.489
OLPG * Climate	0.002	1	0.002	20.56	0
EMOD * EK	5.28E-06	1	5.28E-06	0.056	0.813
EPCCTH * EK	5.28E-06	1	5.28E-06	0.056	0.813
OLAV * EK	5.28E-06	1	5.28E-06	0.056	0.813
OLEB * EK	5.28E-06	1	5.28E-06	0.056	0.813
OLGRAD * EK	5.28E-06	1	5.28E-06	0.056	0.813
OLTH * EK	5.28E-06	1	5.28E-06	0.056	0.813
OLPG * EK	5.28E-06	1	5.28E-06	0.056	0.813
EMOD * EPCCTH	0.001	1	0.001	7.362	0.007
OLAV * EMOD	0.003	1	0.003	28.468	0
OLEB * EMOD	0.001	1	0.001	8.596	0.004
OLGRAD * EMOD	1.80E-05	1	1.80E-05	0.191	0.662
OLTH * EMOD	0.002	1	0.002	24.896	0
OLPG * EMOD	0.001	1	0.001	5.691	0.017
OLAV * EPCCTH	0.006	1	0.006	68.651	0
OLEB * EPCCTH	0.002	1	0.002	20.891	0
OLGRAD * EPCCTH	6.61E-05	1	6.61E-05	0.702	0.403
OLTH * EPCCTH	0.003	1	0.003	29.054	0
OLPG * EPCCTH	0.001	1	0.001	5.691	0.017
OLEB * OLAV	0.393	1	0.393	4171.999	0
OLGRAD * OLAV	0.021	1	0.021	220.802	0
OLTH * OLAV	0.404	1	0.404	4288.063	0
OLPG * OLAV	0.279	1	0.279	2962.604	0
OLGRAD * OLEB	0.006	1	0.006	67.15	0
OLTH * OLEB	0.125	1	0.125	1323.771	0
OLPG * OLEB	0.085	1	0.085	899.516	0
OLTH * OLGRAD	0.009	1	0.009	94.205	0
OLPG * OLGRAD	0.005	1	0.005	56.836	0
OLTH * OLPG	0.13	1	0.13	1380.01	0
Error	0.044	466	9.42E-05		
Total	151.985	512			
Corrected Total	28.084	511			
a. R Squared = .998 (Adjusted R Squared = .998)					

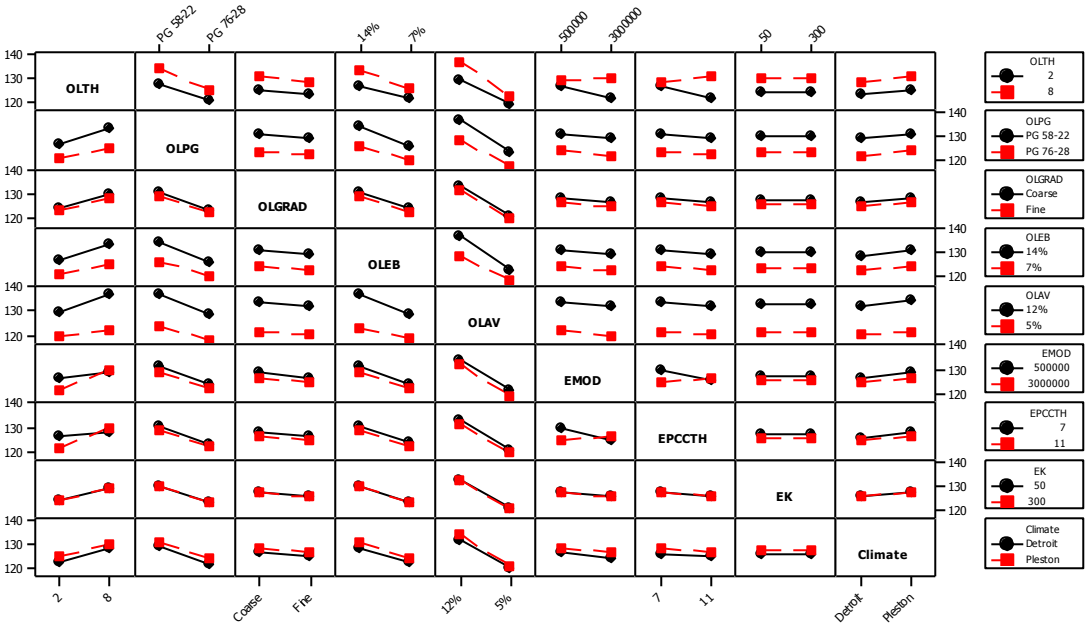

Figure A-57 Summary of interactions

EMOD	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
500000	2	126.40	.153	126.10	126.70
	8	128.77	.153	128.47	129.07
3000000	2	121.31	.153	121.01	121.61
	8	129.78	.153	129.48	130.08

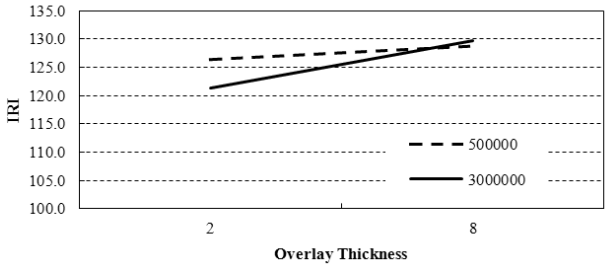

Figure A-58 Overlay thickness vs. existing modulus

ETH	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
7	2	126.510	.153	126.210	126.810
	8	128.082	.153	127.782	128.382
11	2	121.209	.153	120.909	121.510
	8	130.484	.153	130.184	130.785

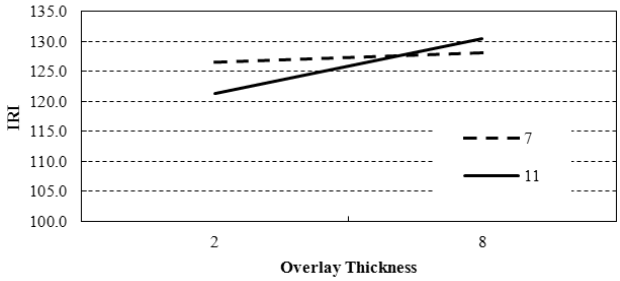

Figure A-59 Overlay thickness vs. existing modulus

A.2.3 Rubblized Overlays

Table A-13 Factorial matrix of ANOVA for rubblized

OLTH (in)	OLPG	OLGRAD	OLEB (%)	OLAV (%)	EPCCE (psi) /EPCCTH (in) /Climate							
					35000				1500000			
					7		11		7		11	
					Pellston	Detroit	Pellston	Detroit	Pellston	Detroit	Pellston	Detroit
2	PG 58-22	Coarse	7	5	1	2	3	4	5	6	7	8
				12	9	10	11	12	13	14	15	16
			14	5	17	18	19	20	21	22	23	24
				12	25	26	27	28	29	30	31	32
		Fine	7	5	33	34	35	36	37	38	39	40
				12	41	42	43	44	45	46	47	48
			14	5	49	50	51	52	53	54	55	56
				12	57	58	59	60	61	62	63	64
	PG 76-28	Coarse	7	5	65	66	67	68	69	70	71	72
				12	73	74	75	76	77	78	79	80
			14	5	81	82	83	84	85	86	87	88
				12	89	90	91	92	93	94	95	96
		Fine	7	5	97	98	99	100	101	102	103	104
				12	105	106	107	108	109	110	111	112
			14	5	113	114	115	116	117	118	119	120
				12	121	122	123	124	125	126	127	128
8	PG 58-22	Coarse	7	5	129	130	131	132	133	134	135	136
				12	137	138	139	140	141	142	143	144
			14	5	145	146	147	148	149	150	151	152
				12	153	154	155	156	157	158	159	160
		Fine	7	5	161	162	163	164	165	166	167	168
				12	169	170	171	172	173	174	175	176
			14	5	177	178	179	180	181	182	183	184
				12	185	186	187	188	189	190	191	192
	PG 76-28	Coarse	7	5	193	194	195	196	197	198	199	200
				12	201	202	203	204	205	206	207	208
			14	5	209	210	211	212	213	214	215	216
				12	217	218	219	220	221	222	223	224
		Fine	7	5	225	226	227	228	229	230	231	232
				12	233	234	235	236	237	238	239	240
			14	5	241	242	243	244	245	246	247	248
				12	249	250	251	252	253	254	255	256

A.2.3.1. Longitudinal cracking

Table A-14 ANOVA table for rubblized factorial matrix for longitudinal cracking

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3969060054.148	36	110251668.171	36.716	.000
Intercept	3218734132.697	1	3218734132.697	1071.899	.000
OLTH	160276391.251	1	160276391.251	53.375	.000
OLPG	39788482.766	1	39788482.766	13.250	.000
OLAG	3535767.832	1	3535767.832	1.177	.279
OLEB	38336854.785	1	38336854.785	12.767	.000
OLAV	1966771158.536	1	1966771158.536	654.972	.000
EPCCE	1007816373.150	1	1007816373.150	335.622	.000
EPCCTH	9408068.571	1	9408068.571	3.133	.078
Climate	1827400.415	1	1827400.415	.609	.436
EPCCE * Climate	1625564.438	1	1625564.438	.541	.463
EPCCTH * Climate	24177.918	1	24177.918	.008	.929
OLAG * Climate	57.173	1	57.173	.000	.997
OLAV * Climate	1294108.164	1	1294108.164	.431	.512
OLEB * Climate	16168.076	1	16168.076	.005	.942
OLPG * Climate	249.996	1	249.996	.000	.993
OLTH * Climate	1834084.476	1	1834084.476	.611	.435
EPCCE * EPCCTH	27183136.925	1	27183136.925	9.052	.003
OLAG * EPCCE	7641637.833	1	7641637.833	2.545	.112
OLAV * EPCCE	381702916.485	1	381702916.485	127.114	.000
OLEB * EPCCE	9433106.361	1	9433106.361	3.141	.078
OLPG * EPCCE	16024399.295	1	16024399.295	5.336	.022
OLTH * EPCCE	50588278.596	1	50588278.596	16.847	.000
OLAG * EPCCTH	7281052.247	1	7281052.247	2.425	.121
OLAV * EPCCTH	8057053.865	1	8057053.865	2.683	.103
OLEB * EPCCTH	5445070.574	1	5445070.574	1.813	.180
OLPG * EPCCTH	9850449.024	1	9850449.024	3.280	.071
OLTH * EPCCTH	58460245.565	1	58460245.565	19.468	.000
OLAG * OLAV	445220.894	1	445220.894	.148	.701
OLAG * OLEB	20342.960	1	20342.960	.007	.934
OLPG * OLAG	15421.604	1	15421.604	.005	.943
OLTH * OLAG	1260834.230	1	1260834.230	.420	.518
OLEB * OLAV	1978182.474	1	1978182.474	.659	.418
OLPG * OLAV	5669262.193	1	5669262.193	1.888	.171
OLTH * OLAV	124133830.010	1	124133830.010	41.339	.000
OLPG * OLEB	494970.290	1	494970.290	.165	.685
OLTH * OLEB	20788.233	1	20788.233	.007	.934
OLTH * OLPG	20798946.944	1	20798946.944	6.926	.009
Error	657620703.126	219	3002834.261		
Total	7845414889.972	256			
Corrected Total	4626680757.274	255			

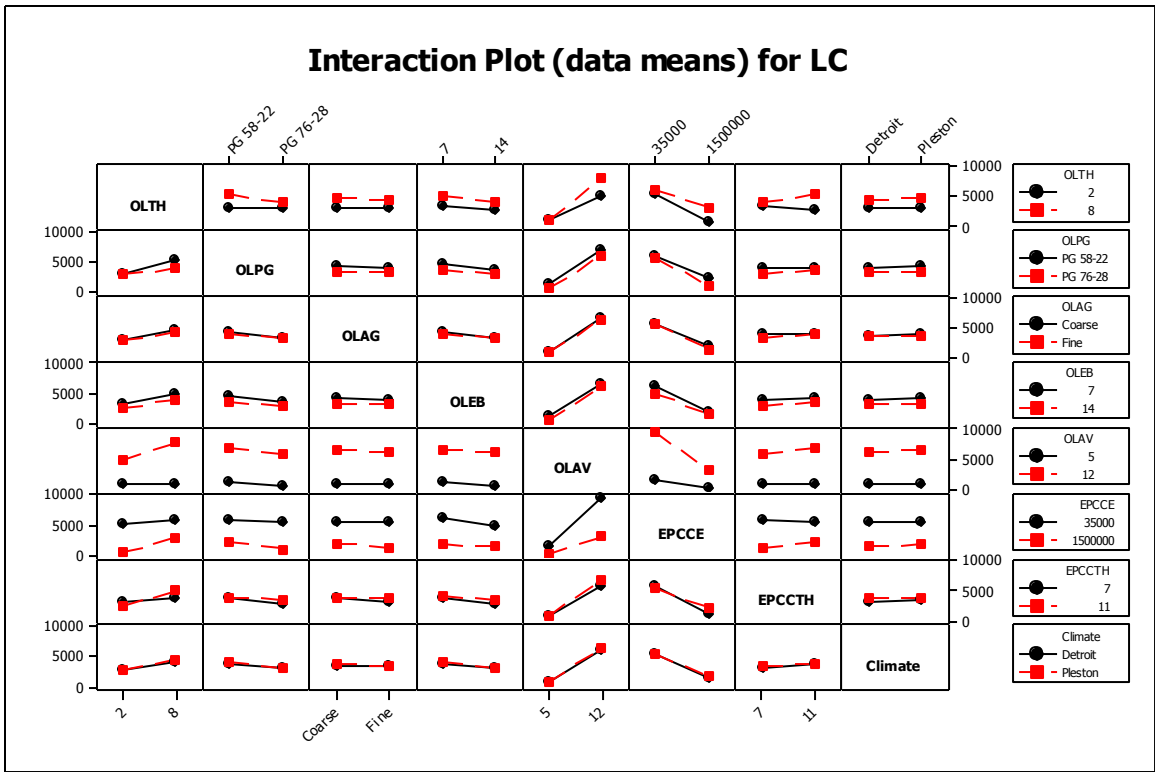

Figure A-60 Summary of interactions

EPCCE	OLAV	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
35000 psi	5 in	1537.15	216.609	1110.252	1964.060
	12 in	9522.84	216.609	9095.941	9949.750
1500000 psi	5	11.04	216.609	-415.861	437.947
	12	3112.42	216.609	2685.523	3539.332

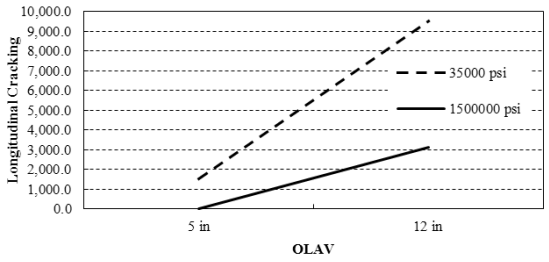

Figure A-61 Overlay air voids vs. existing modulus

EPCCE	OLPG	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
35000 psi	PG 58-22	5674.04	216.60	5247.14	6100.95
	PG 76-28	5385.95	216.60	4959.04	5812.85
1500000 psi	PG 58-22	2206.16	216.60	1779.26	2633.06
	PG 76-28	917.307	216.60	490.40	1344.21

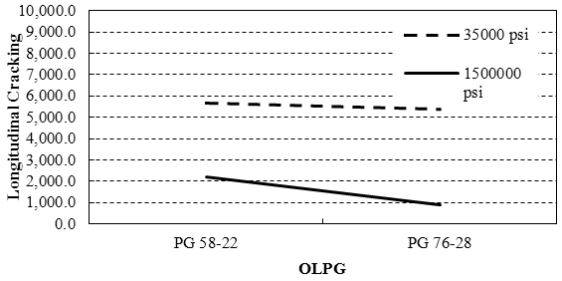

Figure A-62 Overlay PG vs. existing modulus

OLTH	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
2 in	5183.283	216.609	4756.379	5610.187
8 in	5876.719	216.609	5449.815	6303.623
2	325.949	216.609	-100.955	752.854
8	2797.521	216.609	2370.617	3224.425

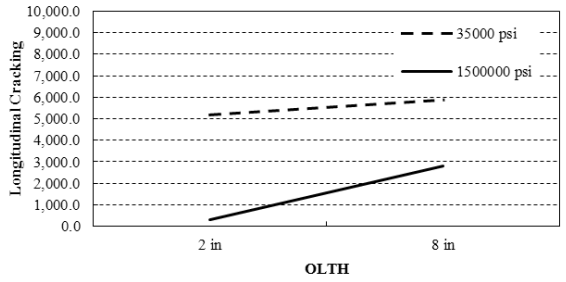

Figure A-63 Overlay thickness vs. existing modulus

OLTH	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
2 in	3040.783	216.609	2613.879	3467.687
8 in	3667.546	216.609	3240.642	4094.450
2	2468.449	216.609	2041.545	2895.353
8	5006.694	216.609	4579.790	5433.598

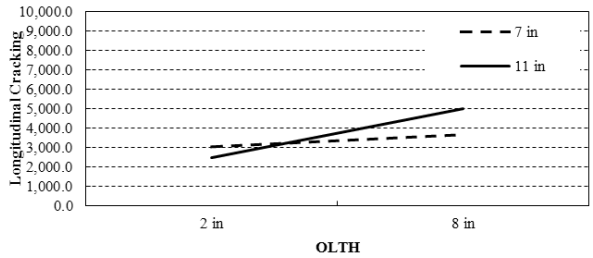

Figure A-64 Overlay thickness vs. existing thickness

A.2.3.2. Alligator cracking

Table A-15 ANOVA table for rubblized factorial matrix for alligator cracking

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	336962.881	36	9360.080	38.659	.000
Intercept	215796.244	1	215796.244	891.271	.000
OLTH	45357.821	1	45357.821	187.335	.000
OLPG	57.287	1	57.287	.237	.627
OLAG	15.698	1	15.698	.065	.799
OLEB	8815.965	1	8815.965	36.411	.000
OLAV	25024.145	1	25024.145	103.353	.000
EPCCE	193131.689	1	193131.689	797.663	.000
EPCCTH	912.331	1	912.331	3.768	.054
Climate	.030	1	.030	.000	.991
EPCCE * Climate	.032	1	.032	.000	.991
EPCCTH * Climate	.022	1	.022	.000	.992
OLAG * Climate	.000	1	.000	.000	1.000
OLAV * Climate	4.090	1	4.090	.017	.897
OLEB * Climate	1.558	1	1.558	.006	.936
OLPG * Climate	.927	1	.927	.004	.951
OLTH * Climate	9.831	1	9.831	.041	.840
EPCCE * EPCCTH	26.666	1	26.666	.110	.740
OLAG * EPCCE	441.140	1	441.140	1.822	.178
OLAV * EPCCE	17729.863	1	17729.863	73.227	.000
OLEB * EPCCE	4737.966	1	4737.966	19.569	.000
OLPG * EPCCE	302.937	1	302.937	1.251	.265
OLTH * EPCCE	35379.727	1	35379.727	146.124	.000
OLAG * EPCCTH	620.883	1	620.883	2.564	.111
OLAV * EPCCTH	631.254	1	631.254	2.607	.108
OLEB * EPCCTH	586.534	1	586.534	2.422	.121
OLPG * EPCCTH	619.772	1	619.772	2.560	.111
OLTH * EPCCTH	542.083	1	542.083	2.239	.136
OLAG * OLAV	.032	1	.032	.000	.991
OLAG * OLEB	.185	1	.185	.001	.978
OLPG * OLAG	.036	1	.036	.000	.990
OLTH * OLAG	2.174	1	2.174	.009	.925
OLEB * OLAV	215.269	1	215.269	.889	.347
OLPG * OLAV	4.754	1	4.754	.020	.889
OLTH * OLAV	1751.650	1	1751.650	7.235	.008
OLPG * OLEB	.347	1	.347	.001	.970
OLTH * OLEB	4.178	1	4.178	.017	.896
OLTH * OLPG	34.005	1	34.005	.140	.708
Error	53024.698	219	242.122		
Total	605783.823	256			
Corrected Total	389987.579	255			

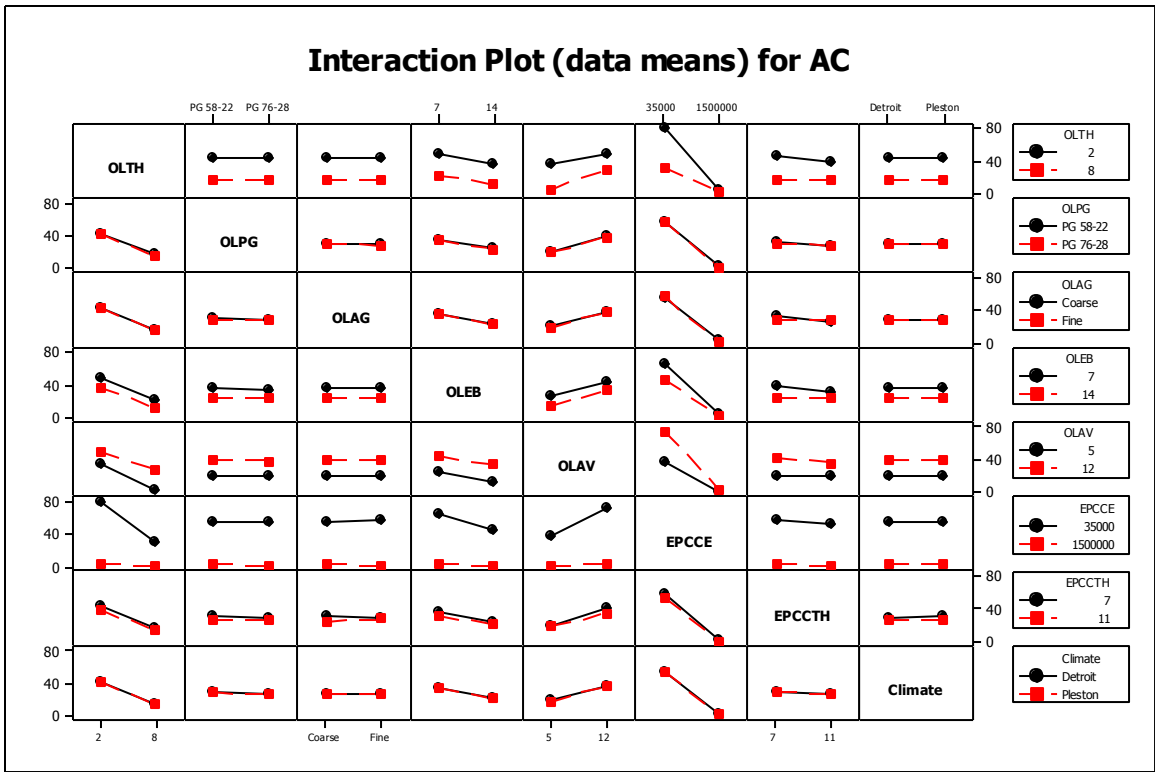

Figure A-65 Summary of interactions

OLAV	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
5%	38.291	1.945	34.458	42.125
12%	74.709	1.945	70.876	78.543
5	.002	1.945	-3.831	3.836
12	3.132	1.945	-.702	6.965

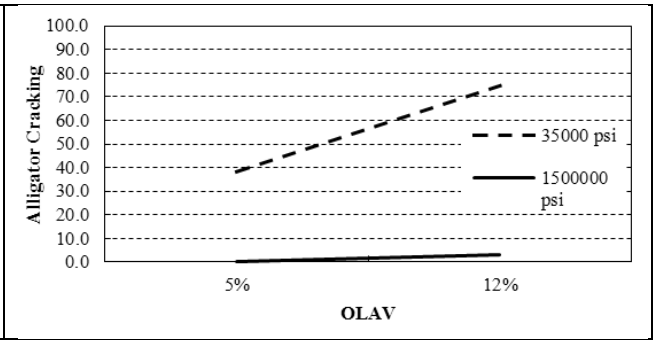

Figure A-66 Overlay air voids vs. Existing modulus

OLEB	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
7%	66.671	1.945	62.837	70.504
14%	46.330	1.945	42.497	50.163
7	3.133	1.945	-.700	6.967
14	.001	1.945	-3.833	3.834

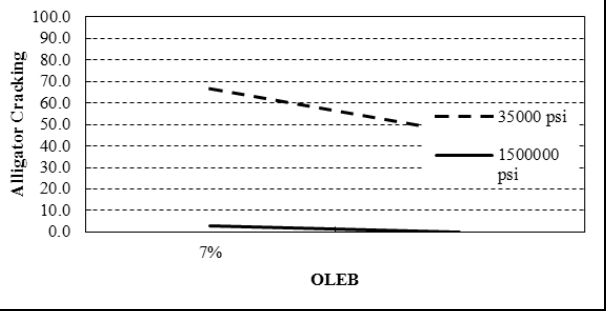

Figure A-67 Overlay effective binder vs. Existing modulus

OLTH	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
2 in	81.567	1.945	77.734	85.401
8 in	31.434	1.945	27.600	35.267
2	3.122	1.945	-.712	6.955
8	.012	1.945	-3.821	3.845

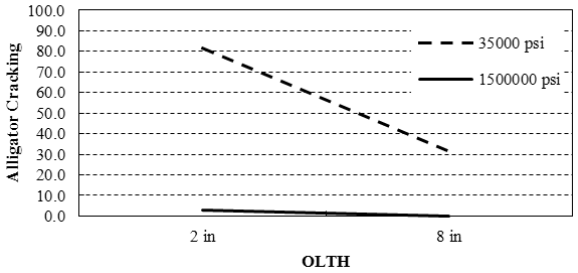

Figure A-68 Overlay thickness vs. Existing modulus

A.2.3.3. Rutting

Table A-16 ANOVA table for rubblized factorial matrix for rutting

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	41.595	36	1.155	169.152	.000
Intercept	509.137	1	509.137	74537.123	.000
OLTH	.014	1	.014	2.075	.151
OLPG	4.230	1	4.230	619.262	.000
OLAG	.258	1	.258	37.808	.000
OLEB	3.905	1	3.905	571.662	.000
OLAV	12.341	1	12.341	1806.670	.000
EPCCE	4.036	1	4.036	590.915	.000
EPCCTH	.123	1	.123	17.979	.000
Climate	.406	1	.406	59.462	.000
EPCCE * Climate	.001	1	.001	.108	.743
EPCCTH * Climate	.001	1	.001	.118	.731
OLAG * Climate	.000	1	.000	.014	.904
OLAV * Climate	.013	1	.013	1.834	.177
OLEB * Climate	.004	1	.004	.615	.434
OLPG * Climate	.001	1	.001	.171	.680
OLTH * Climate	.001	1	.001	.123	.727
EPCCE * EPCCTH	.149	1	.149	21.806	.000
OLAG * EPCCE	.060	1	.060	8.774	.003
OLAV * EPCCE	1.217	1	1.217	178.211	.000
OLEB * EPCCE	.185	1	.185	27.061	.000
OLPG * EPCCE	.398	1	.398	58.210	.000
OLTH * EPCCE	9.461	1	9.461	1385.025	.000
OLAG * EPCCTH	.009	1	.009	1.282	.259
OLAV * EPCCTH	.000	1	.000	.044	.834
OLEB * EPCCTH	.024	1	.024	3.441	.065
OLPG * EPCCTH	.003	1	.003	.456	.500
OLTH * EPCCTH	.107	1	.107	15.696	.000
OLAG * OLAV	.019	1	.019	2.852	.093
OLAG * OLEB	.004	1	.004	.571	.451
OLPG * OLAG	.004	1	.004	.658	.418
OLTH * OLAG	.044	1	.044	6.475	.012
OLEB * OLAV	.367	1	.367	53.796	.000
OLPG * OLAV	.274	1	.274	40.054	.000
OLTH * OLAV	2.336	1	2.336	341.950	.000
OLPG * OLEB	.077	1	.077	11.309	.001
OLTH * OLEB	.687	1	.687	100.536	.000
OLTH * OLPG	.836	1	.836	122.452	.000
Error	1.496	219	.007		
Total	552.228	256			
Corrected Total	43.091	255			

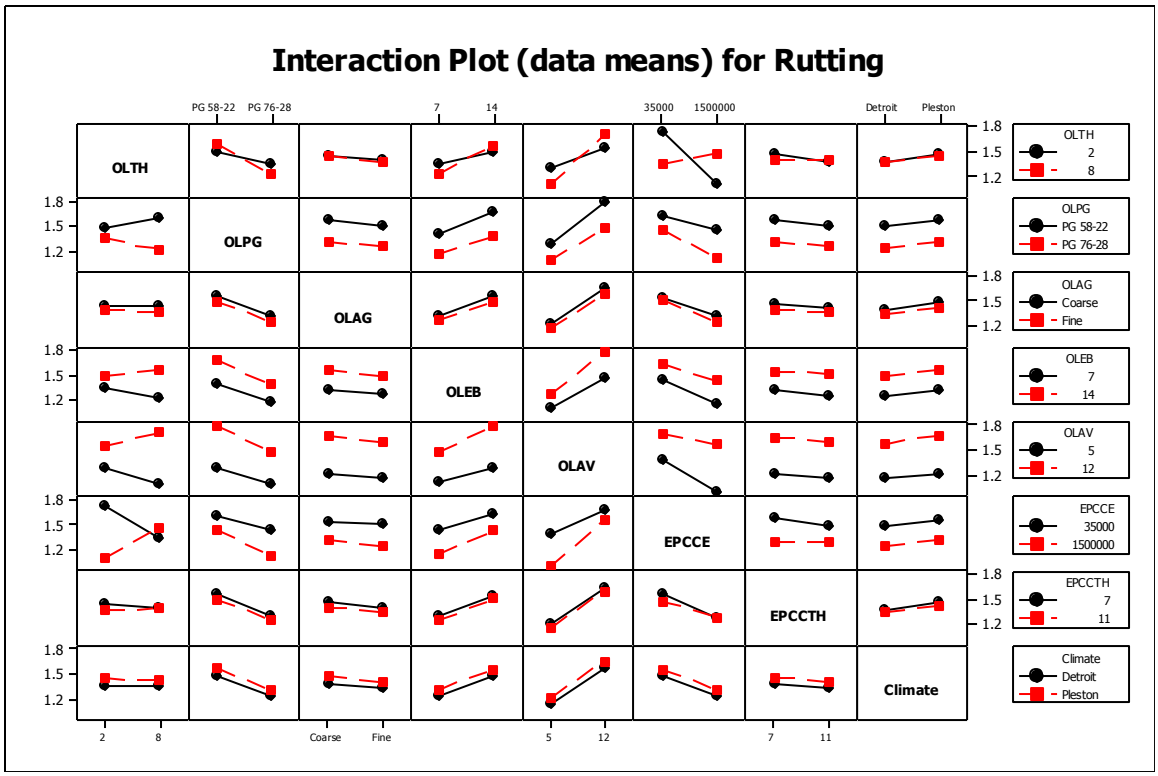

Figure A-69 Summary of interactions

OLAG	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Coarse	1.552	.010	1.532	1.573
Fine	1.519	.010	1.499	1.540
Coarse	1.332	.010	1.311	1.352
Fine	1.238	.010	1.217	1.258

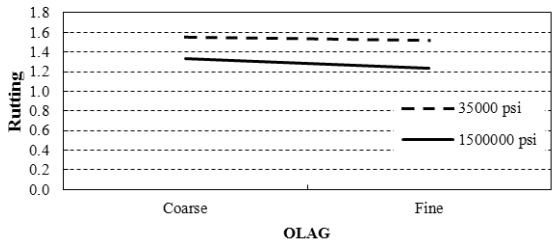

Figure A-70 Overlay aggregate gradation vs. existing modulus

OLAV	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
5%	1.385	.010	1.365	1.406
12%	1.686	.010	1.666	1.707
5	.996	.010	.976	1.017
12	1.573	.010	1.553	1.594

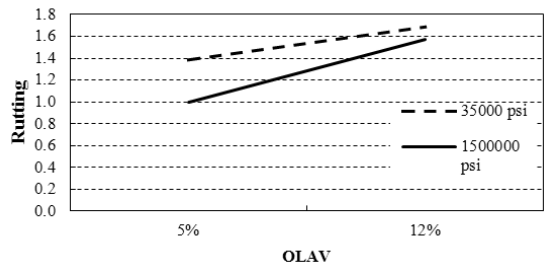

Figure A-71 Overlay air voids vs. existing modulus

OLEB	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
7%	1.439	.010	1.419	1.460
14%	1.632	.010	1.612	1.653
7	1.134	.010	1.114	1.155
14	1.435	.010	1.415	1.455

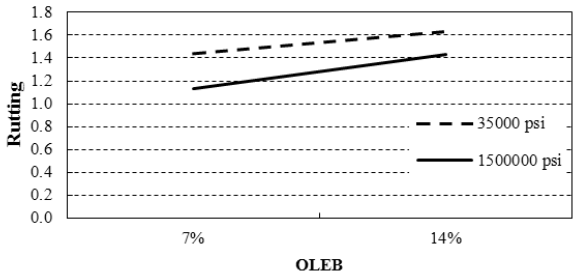

Figure A-72 Overlay effective binder vs. existing modulus

OLPG	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
PG 58-22	1.625	.010	1.605	1.645
PG 76-28	1.447	.010	1.426	1.467
PG 58-22	1.453	.010	1.432	1.473
PG 76-28	1.117	.010	1.096	1.137

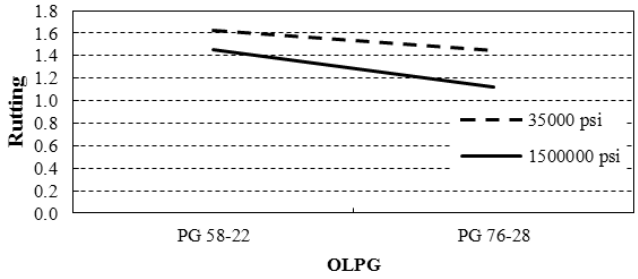

Figure A-73 Overlay PG vs. existing modulus

OLTH	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
2 in	1.460	.010	1.440	1.480
8 in	1.404	.010	1.384	1.425
2	1.375	.010	1.355	1.396
8	1.401	.010	1.381	1.422

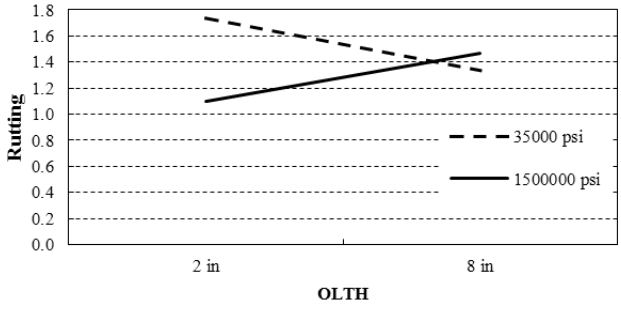

Figure A-74 Overlay thickness vs. existing modulus

A.2.3.4. IRI

Table A-17 ANOVA table for rubblized factorial matrix for IRI

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	64495565.173	36	1791543.477	11.942	.000
Intercept	33102546.494	1	33102546.494	220.657	.000
OLTH	9196397.409	1	9196397.409	61.302	.000
OLPG	14657.642	1	14657.642	.098	.755
OLAG	6216.337	1	6216.337	.041	.839
OLEB	5153609.399	1	5153609.399	34.353	.000
OLAV	9128971.263	1	9128971.263	60.852	.000
EPCCE	7674943.011	1	7674943.011	51.160	.000
EPCCTH	544616.325	1	544616.325	3.630	.058
Climate	2267.545	1	2267.545	.015	.902
EPCCE * Climate	3979.244	1	3979.244	.027	.871
EPCCTH * Climate	1095.196	1	1095.196	.007	.932
OLAG * Climate	3.353	1	3.353	.000	.996
OLAV * Climate	4379.958	1	4379.958	.029	.864
OLEB * Climate	3551.415	1	3551.415	.024	.878
OLPG * Climate	486.478	1	486.478	.003	.955
OLTH * Climate	8058.428	1	8058.428	.054	.817
EPCCE * EPCCTH	11415.587	1	11415.587	.076	.783
OLAG * EPCCE	340698.394	1	340698.394	2.271	.133
OLAV * EPCCE	4858525.193	1	4858525.193	32.386	.000
OLEB * EPCCE	3006127.458	1	3006127.458	20.038	.000
OLPG * EPCCE	382998.530	1	382998.530	2.553	.112
OLTH * EPCCE	6342433.000	1	6342433.000	42.278	.000
OLAG * EPCCTH	404201.903	1	404201.903	2.694	.102
OLAV * EPCCTH	503168.556	1	503168.556	3.354	.068
OLEB * EPCCTH	499893.188	1	499893.188	3.332	.069
OLPG * EPCCTH	401852.982	1	401852.982	2.679	.103
OLTH * EPCCTH	517437.447	1	517437.447	3.449	.065
OLAG * OLAV	2809.663	1	2809.663	.019	.891
OLAG * OLEB	1880.848	1	1880.848	.013	.911
OLPG * OLAG	.553	1	.553	.000	.998
OLTH * OLAG	1308.178	1	1308.178	.009	.926
OLEB * OLAV	4153826.134	1	4153826.134	27.689	.000
OLPG * OLAV	2360.138	1	2360.138	.016	.900
OLTH * OLAV	6512799.700	1	6512799.700	43.413	.000
OLPG * OLEB	491.453	1	491.453	.003	.954
OLTH * OLEB	4807083.656	1	4807083.656	32.043	.000
OLTH * OLPG	1019.605	1	1019.605	.007	.934
Error	32853973.263	219	150018.143		
Total	130452084.930	256			
Corrected Total	97349538.436	255			

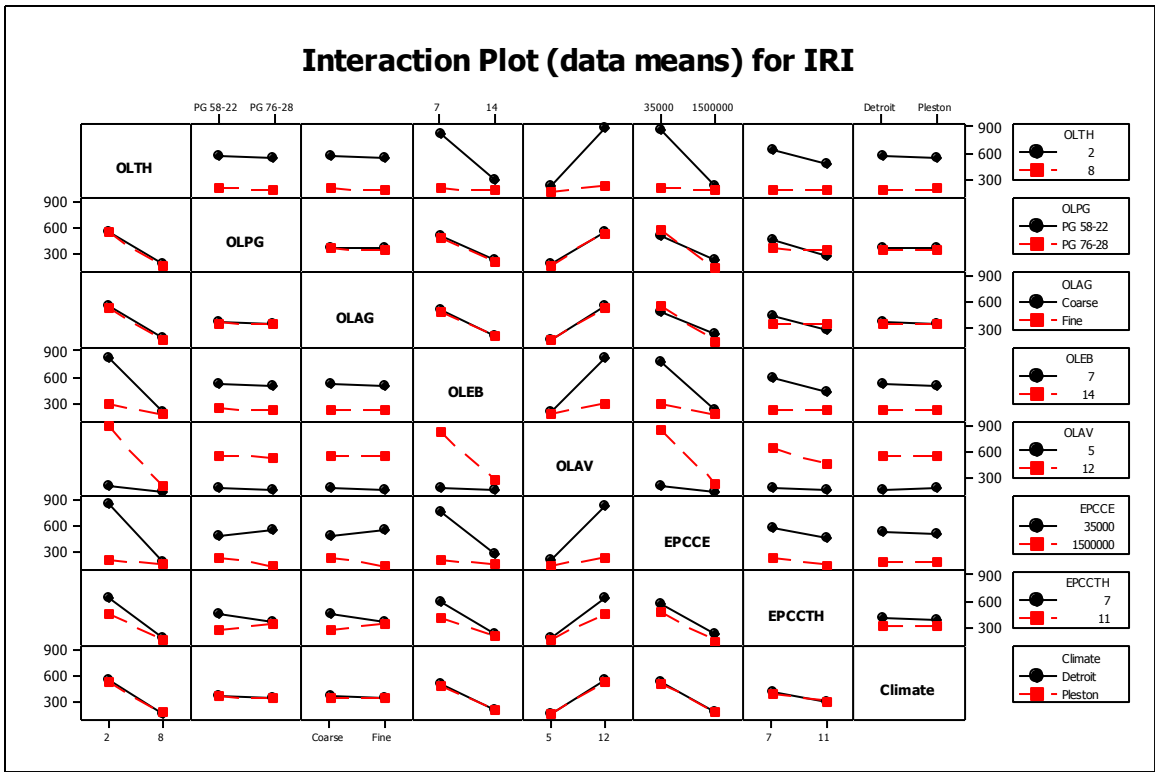

Figure A-75 Summary of interactions

EPCCE	OLAV	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
35000 psi	5%	206.139	48.415	110.72	301.558
	12%	859.342	48.415	763.92	954.762
1500000 psi	5	135.369	48.415	39.949	230.788
	12	237.520	48.415	142.10	332.940

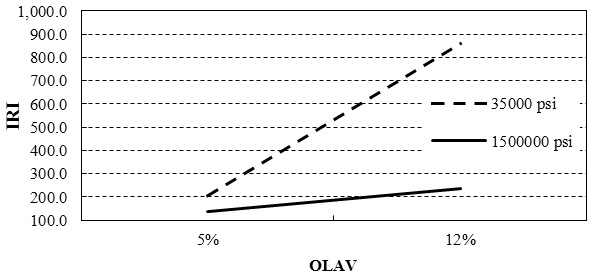

Figure A-76 Overlay air voids vs. existing modulus

EPCCE	OLEB	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
35000	7	782.989	48.415	687.570	878.408
	14	282.492	48.415	187.073	377.912
1500000	7	219.966	48.415	124.546	315.385
	14	152.923	48.415	57.504	248.343

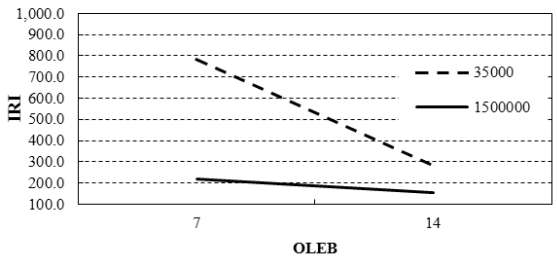

Figure A-77 Overlay effective binder vs. existing modulus

EPCCE	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
35000 psi	2 in	879.677	48.415	784.257	975.096
	8 in	185.805	48.415	90.385	281.224
1500000 psi	2	218.578	48.415	123.159	313.998
	8	154.311	48.415	58.892	249.730

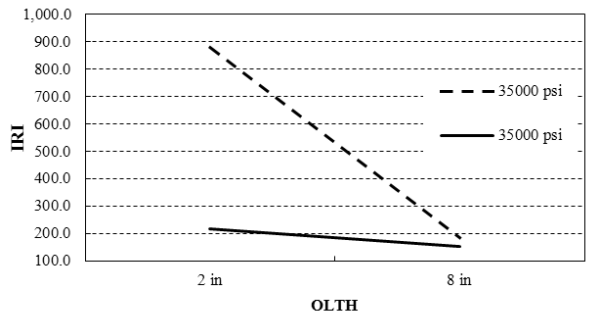

Figure A-78 Overlay thickness vs. existing modulus

A.2.4 Unbonded Overlay

Table A-18 Factorial matrix of ANOVA for unbonded overlay

Overlay PCC Thickness (in)	Overlay PCC CTE	Overlay Joint Spacing (ft)	Overlay PCC MOR (psi)	Subgrade Modulus (psi/in)	Existing PCC Thickness (in) / Existing PCC MOR (psi) / Climate							
					7				11			
					500000		3000000		500000		3000000	
					Pellston	Detroit	Pellston	Detroit	Pellston	Detroit	Pellston	Detroit
7	4	10	450	50	1	2	3	4	5	6	7	8
				300	9	10	11	12	13	14	15	16
			800	50	17	18	19	20	21	22	23	24
				300	25	26	27	28	29	30	31	32
		15	450	50	33	34	35	36	37	38	39	40
				300	41	42	43	44	45	46	47	48
			800	50	49	50	51	52	53	54	55	56
				300	57	58	59	60	61	62	63	64
	7	10	450	50	65	66	67	68	69	70	71	72
				300	73	74	75	76	77	78	79	80
			800	50	81	82	83	84	85	86	87	88
				300	89	90	91	92	93	94	95	96
		15	450	50	97	98	99	100	101	102	103	104
				300	105	106	107	108	109	110	111	112
			800	50	113	114	115	116	117	118	119	120
				300	121	122	123	124	125	126	127	128
9	4	10	450	50	129	130	131	132	133	134	135	136
				300	137	138	139	140	141	142	143	144
			800	50	145	146	147	148	149	150	151	152
				300	153	154	155	156	157	158	159	160
		15	450	50	161	162	163	164	165	166	167	168
				300	169	170	171	172	173	174	175	176
			800	50	177	178	179	180	181	182	183	184
				300	185	186	187	188	189	190	191	192
	7	10	450	50	193	194	195	196	197	198	199	200
				300	201	202	203	204	205	206	207	208
			800	50	209	210	211	212	213	214	215	216
				300	217	218	219	220	221	222	223	224
		15	450	50	225	226	227	228	229	230	231	232
				300	233	234	235	236	237	238	239	240
			800	50	241	242	243	244	245	246	247	248
				300	249	250	251	252	253	254	255	256

A.2.4.1. Cracking

Table A-19 ANOVA table for unbonded overlay factorial matrix for cracking

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	277700.595	36	7713.905	34.692	.000
Intercept	150597.355	1	150597.355	677.278	.000
OLTH	41817.694	1	41817.694	188.066	.000
OLCTE	23872.181	1	23872.181	107.360	.000
OLJS	29538.867	1	29538.867	132.845	.000
OLMOR	75072.575	1	75072.575	337.622	.000
SGMOD	11322.290	1	11322.290	50.920	.000
EXTH	1457.808	1	1457.808	6.556	.011
EXMOD	17640.820	1	17640.820	79.336	.000
CL	7029.774	1	7029.774	31.615	.000
EXMOD * CL	21.103	1	21.103	.095	.758
EXTH * CL	.110	1	.110	.000	.982
OLCTE * CL	2309.403	1	2309.403	10.386	.001
OLJS * CL	2750.347	1	2750.347	12.369	.001
OLMOR * CL	619.699	1	619.699	2.787	.096
OLTH * CL	402.755	1	402.755	1.811	.180
SGMOD * CL	206.461	1	206.461	.929	.336
EXTH * EXMOD	1006.079	1	1006.079	4.525	.035
OLCTE * EXMOD	63.103	1	63.103	.284	.595
OLJS * EXMOD	71.720	1	71.720	.323	.571
OLMOR * EXMOD	8193.644	1	8193.644	36.849	.000
OLTH * EXMOD	6208.455	1	6208.455	27.921	.000
SGMOD * EXMOD	1107.642	1	1107.642	4.981	.027
OLCTE * EXTH	41.522	1	41.522	.187	.666
OLJS * EXTH	3.827	1	3.827	.017	.896
OLMOR * EXTH	891.396	1	891.396	4.009	.046
OLTH * EXTH	706.563	1	706.563	3.178	.076
SGMOD * EXTH	349.456	1	349.456	1.572	.211
OLCTE * OLJS	9708.407	1	9708.407	43.661	.000
OLCTE * OLMOR	6178.943	1	6178.943	27.788	.000
OLTH * OLCTE	1806.781	1	1806.781	8.126	.005
OLCTE * SGMOD	2066.271	1	2066.271	9.293	.003
OLJS * OLMOR	6032.435	1	6032.435	27.130	.000
OLTH * OLJS	1106.810	1	1106.810	4.978	.027
OLJS * SGMOD	7.528	1	7.528	.034	.854
OLTH * OLMOR	8320.860	1	8320.860	37.421	.000
OLMOR * SGMOD	5667.267	1	5667.267	25.487	.000
OLTH * SGMOD	4100.001	1	4100.001	18.439	.000
Error	48696.100	219	222.357		
Total	476994.050	256			
Corrected Total	326396.695	255			

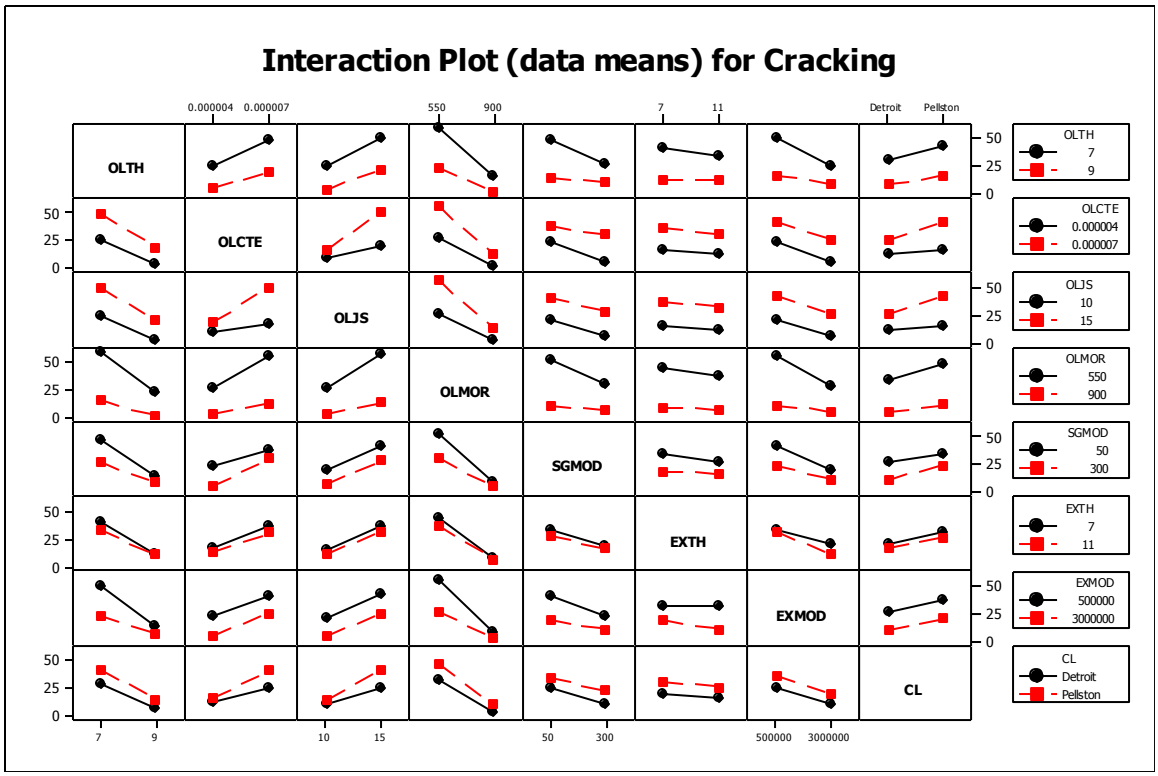

Figure A-79 Summary of Interactions

EXMOD	OLMOR	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
500,000 psi	550 psi	55.338	1.864	51.664	59.011
	900 psi	9.773	1.864	6.100	13.447
3,000,000 psi	550 psi	27.420	1.864	23.747	31.094
	900 psi	4.486	1.864	.812	8.160

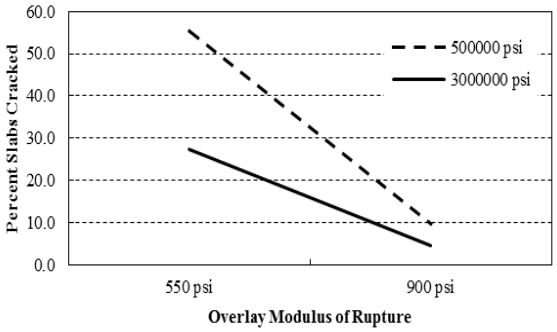

Figure A-80 Existing elastic modulus vs. overlay modulus of rupture

EXMOD	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
500,000 psi	7 in	50.261	1.864	46.587	53.935
	9 in	14.850	1.864	11.176	18.524
3,000,000 psi	7 in	23.809	1.864	20.136	27.483
	9 in	8.097	1.864	4.423	11.770

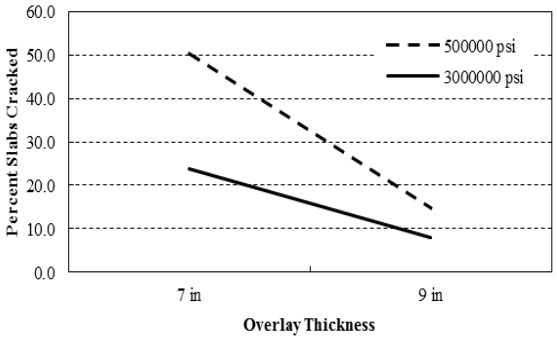

Figure A-81 Existing elastic modulus vs. overlay thickness

EXTH	OLMOR	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
7 in	550 psi	45.631	1.864	41.958	49.305
	900 psi	7.650	1.864	3.976	11.324
11 in	550 psi	37.127	1.864	33.453	40.800
	900 psi	6.609	1.864	2.936	10.283

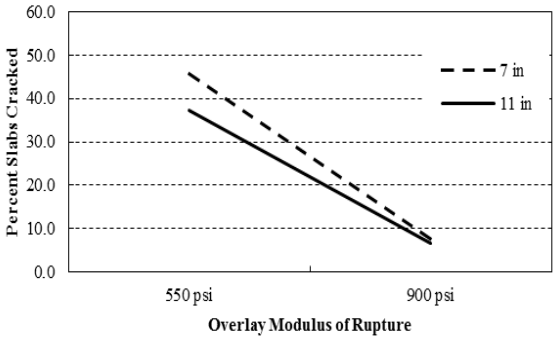

Figure A-82 Existing thickness vs. overlay modulus of rupture

SGMOD	OLCTE	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
50	4	24.089	1.864	20.415	27.763
	7	37.720	1.864	1.433	8.780
300	4	5.106	1.864	34.047	41.394
	7	30.102	1.864	26.428	33.775

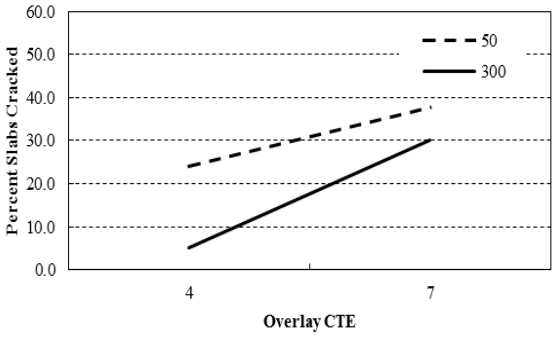

Figure A-83 Modulus of subgrade reaction vs. overlay CTE

SG MOD	OL MOR	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
50 psi/in	550 psi	52.734	1.864	49.061	56.408
	900 psi	9.075	1.864	26.350	33.697
300 psi/in	550 psi	30.023	1.864	5.401	12.749
	900 psi	5.184	1.864	1.511	8.858

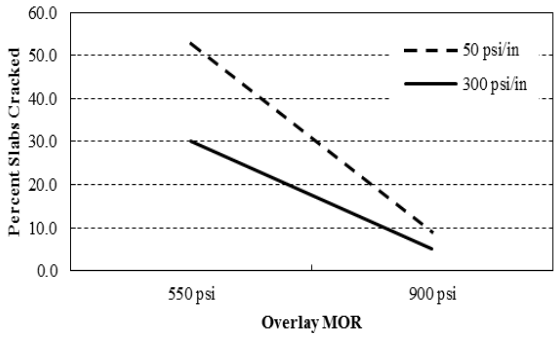

Figure A-84 Modulus of subgrade reaction vs. overlay modulus of rupture

SGMOD	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
50 psi/in	7 in	47.688	1.864	44.014	51.361
	9 in	14.122	1.864	22.709	30.056
300 psi/in	7 in	26.383	1.864	10.448	17.795
	9 in	8.825	1.864	5.151	12.499

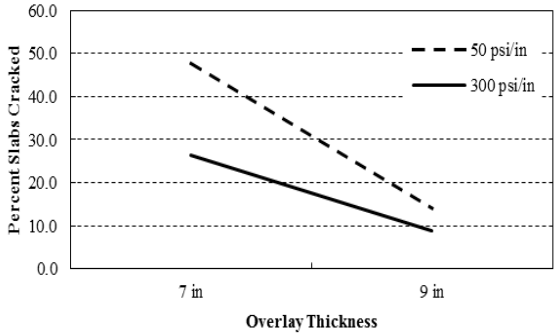

Figure A-85 Modulus of subgrade reaction vs. overlay thickness

A.2.4.2. Faulting

Table A-20 ANOVA table for unbonded overlay factorial matrix for faulting

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.938	36	.026	156.797	.000
Intercept	1.746	1	1.746	10511.664	.000
OLTH	.182	1	.182	1095.751	.000
OLCTE	.462	1	.462	2782.771	.000
OLJS	.055	1	.055	333.534	.000
OLMOR	.013	1	.013	77.044	.000
SGMOD	.021	1	.021	123.756	.000
EXTH	.045	1	.045	268.984	.000
EXMOD	.049	1	.049	292.709	.000
CL	.000	1	.000	.003	.954
EXMOD * CL	.000	1	.000	.680	.411
EXTH * CL	.000	1	.000	.054	.816
OLCTE * CL	.000	1	.000	2.592	.109
OLJS * CL	.000	1	.000	2.348	.127
OLMOR * CL	.000	1	.000	.009	.923
OLTH * CL	.000	1	.000	.461	.498
SGMOD * CL	.000	1	.000	2.173	.142
EXTH * EXMOD	.006	1	.006	35.694	.000
OLCTE * EXMOD	.020	1	.020	120.115	.000
OLJS * EXMOD	.003	1	.003	15.353	.000
OLMOR * EXMOD	.000	1	.000	.074	.786
OLTH * EXMOD	.009	1	.009	51.790	.000
SGMOD * EXMOD	.001	1	.001	7.375	.007
OLCTE * EXTH	.014	1	.014	87.235	.000
OLJS * EXTH	.002	1	.002	11.855	.001
OLMOR * EXTH	.000	1	.000	.027	.869
OLTH * EXTH	.006	1	.006	36.276	.000
SGMOD * EXTH	.000	1	.000	1.244	.266
OLCTE * OLJS	.013	1	.013	75.350	.000
OLCTE * OLMOR	.003	1	.003	19.474	.000
OLTH * OLCTE	.022	1	.022	131.202	.000
OLCTE * SGMOD	.003	1	.003	16.045	.000
OLJS * OLMOR	.002	1	.002	11.855	.001
OLTH * OLJS	.001	1	.001	5.195	.024
OLJS * SGMOD	.000	1	.000	.041	.839
OLTH * OLMOR	.002	1	.002	12.670	.000
OLMOR * SGMOD	.003	1	.003	16.357	.000
OLTH * SGMOD	.001	1	.001	6.606	.011
Error	.036	219	.000		
Total	2.720	256			
Corrected Total	.974	255			

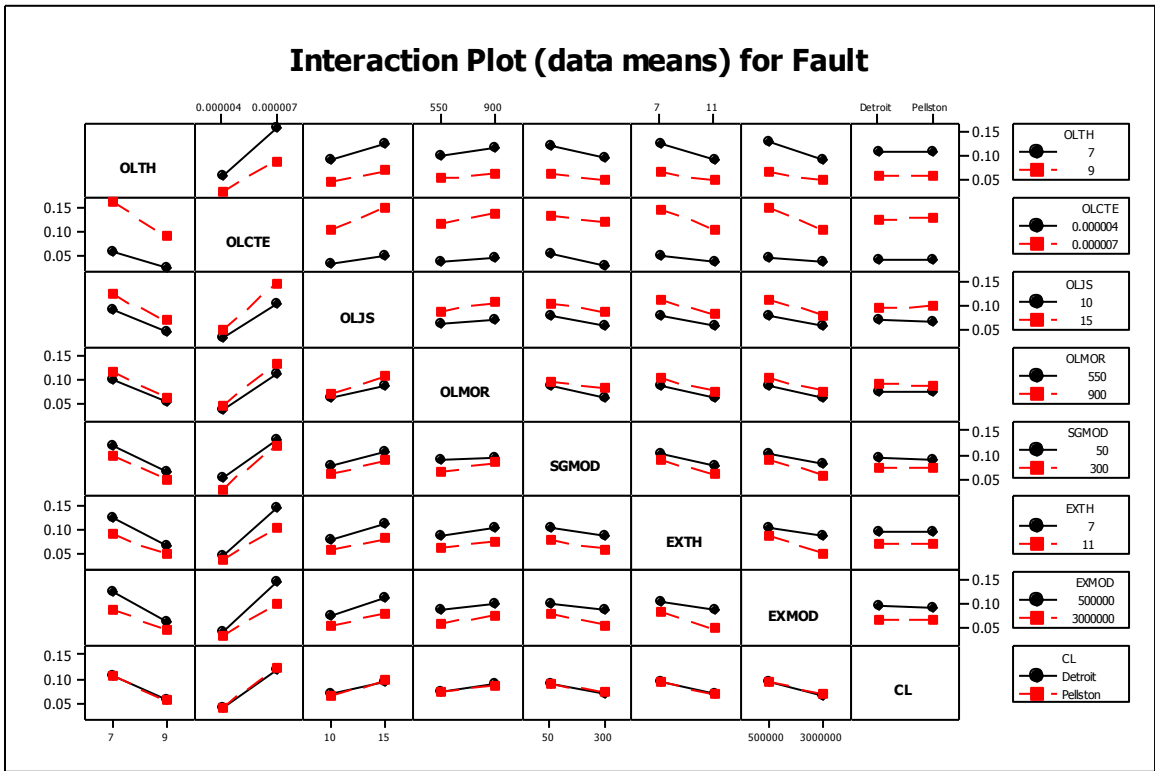

Figure A-86 Summary of interactions

A.2.4.3. IRI

Table A-21 ANOVA table for unbonded overlay factorial matrix for IRI

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	433282.321	36	12035.620	55.780	.000
Intercept	3113323.428	1	3113323.428	14428.986	.000
OLTH	105558.638	1	105558.638	489.221	.000
OLCTE	157444.661	1	157444.661	729.692	.000
OLJS	6367.561	1	6367.561	29.511	.000
OLMOR	18610.028	1	18610.028	86.250	.000
SGMOD	15975.781	1	15975.781	74.041	.000
EXTH	17307.301	1	17307.301	80.212	.000
EXMOD	33813.001	1	33813.001	156.709	.000
CL	22716.461	1	22716.461	105.282	.000
EXMOD * CL	1.015	1	1.015	.005	.945
EXTH * CL	517.615	1	517.615	2.399	.125
OLCTE * CL	2072.070	1	2072.070	9.603	.003
OLJS * CL	1547.070	1	1547.070	7.170	.009
OLMOR * CL	512.000	1	512.000	2.373	.127
OLTH * CL	444.020	1	444.020	2.058	.155
SGMOD * CL	316.890	1	316.890	1.469	.229
EXTH * EXMOD	1199.275	1	1199.275	5.558	.021
OLCTE * EXMOD	4079.303	1	4079.303	18.906	.000
OLJS * EXMOD	1.088	1	1.088	.005	.944
OLMOR * EXMOD	2726.911	1	2726.911	12.638	.001
OLTH * EXMOD	9241.201	1	9241.201	42.829	.000
SGMOD * EXMOD	17.553	1	17.553	.081	.776
OLCTE * EXTH	3936.063	1	3936.063	18.242	.000
OLJS * EXTH	22.950	1	22.950	.106	.745
OLMOR * EXTH	317.520	1	317.520	1.472	.228
OLTH * EXTH	4324.500	1	4324.500	20.042	.000
SGMOD * EXTH	1.088	1	1.088	.005	.944
OLCTE * OLJS	1819.553	1	1819.553	8.433	.005
OLCTE * OLMOR	205.031	1	205.031	.950	.332
OLTH * OLCTE	9072.045	1	9072.045	42.045	.000
OLCTE * SGMOD	2375.328	1	2375.328	11.009	.001
OLJS * OLMOR	1474.245	1	1474.245	6.833	.010
OLTH * OLJS	174.845	1	174.845	.810	.370
OLJS * SGMOD	79.695	1	79.695	.369	.545
OLTH * OLMOR	1103.325	1	1103.325	5.113	.026
OLMOR * SGMOD	5253.125	1	5253.125	24.346	.000
OLTH * SGMOD	2653.561	1	2653.561	12.298	.001
Error	19634.952	91	215.769		
Total	3566240.700	128			
Corrected Total	452917.272	127			

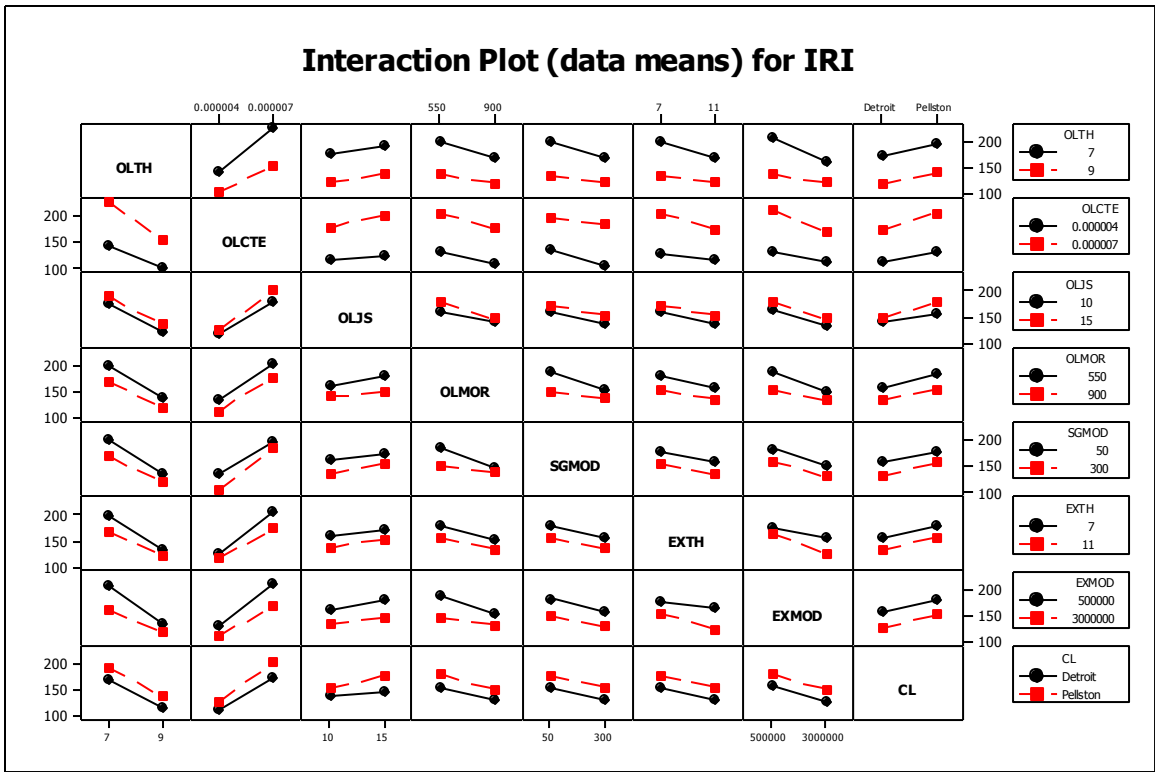

Figure A-87 Summary of interactions

EXMOD	OLCTE	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
500000 psi	4 CTE	131.41	2.00	127.461	135.355
	7 CTE	211.05	2.00	207.108	215.002
3000000 psi	4	110.81	2.00	106.859	114.753
	7	170.25	2.00	166.303	174.197

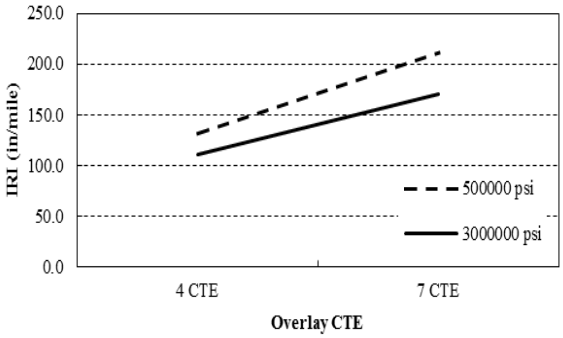

Figure A-88 Overlay CTE vs. existing elastic modulus

EXMOD	OLMOR	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
500000 psi	550 psi	188.95	2.00	185.002	192.895
	900 psi	153.51	2.00	149.567	157.461
3000000 psi	550	148.32	2.00	144.375	152.269
	900	132.73	2.00	128.787	136.681

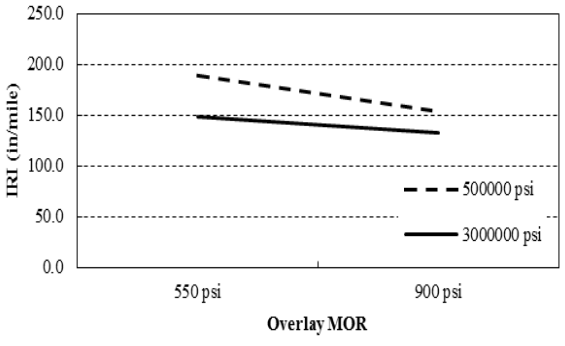

Figure A-89 Overlay MOR vs. existing elastic modulus

EXMOD	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
500000 psi	7 in	207.40	2.00	203.450	211.344
	9 in	135.07	2.00	131.119	139.013
3000000 psi	7	161.44	2.00	157.492	165.386
	9	119.62	2.00	115.670	123.564

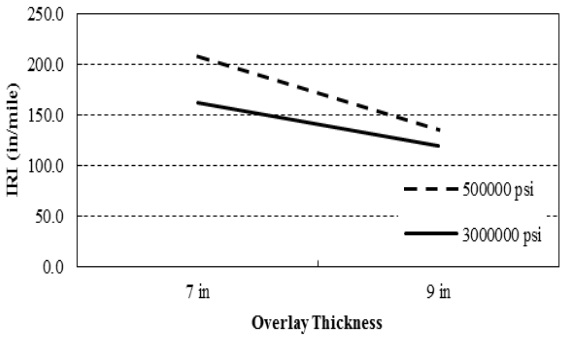

Figure A-90 Overlay thickness vs. existing elastic modulus

EXTH	OLCTE	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
7 in	4	126.30	2.00	122.358	130.252
	7	206.07	2.00	202.119	210.013
11 in	4	115.91	2.00	111.962	119.856
	7	175.24	2.00	171.292	179.186

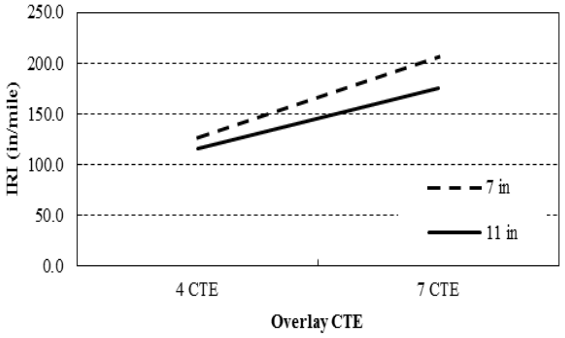

Figure A-91 Overlay CTE vs. existing thickness

EXTH	OLTH	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
7 in	7 in	199.22	2.00	195.277	203.170
	9 in	133.15	2.00	129.200	137.094
11 in	7	169.61	2.00	165.666	173.559
	9	121.54	2.00	117.589	125.483

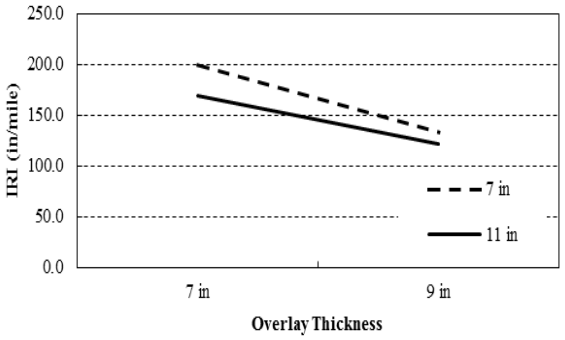

Figure A-92 Overlay thickness vs. existing thickness

OLCTE	SGMOD	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
4 CTE	50 psi/in	136.96	2.00	133.012	140.906
	300 psi/in	105.25	2.00	101.308	109.202
7 CTE	50	197.69	2.00	193.745	201.639
	300	183.61	2.00	179.666	187.559

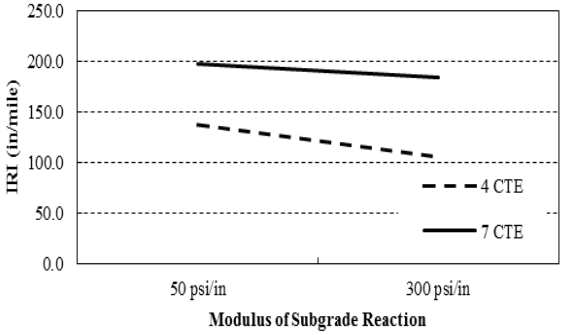

Figure A-93 Overlay CTE vs. modulus of subgrade reaction

OLMOR	SGMOD	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
550 psi	50 psi/in	186.11	2.00	182.167	190.061
	300 psi/in	151.16	2.00	147.209	155.103
900 psi	50	148.54	2.00	144.591	152.484
	300	137.71	2.00	133.764	141.658

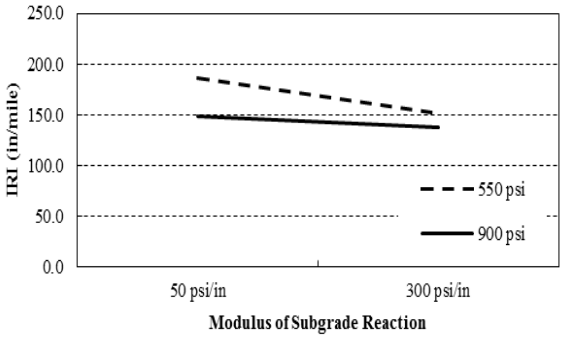

Figure A-94 Overlay MOR vs. modulus of subgrade reaction

OLTH	SGMOD	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
7 in	50 psi/in	200.65	2.00	196.698	204.592
	300 psi/in	168.19	2.00	164.244	172.138
9 in	50	134.01	2.00	130.059	137.953
	300	120.68	2.00	116.730	124.623

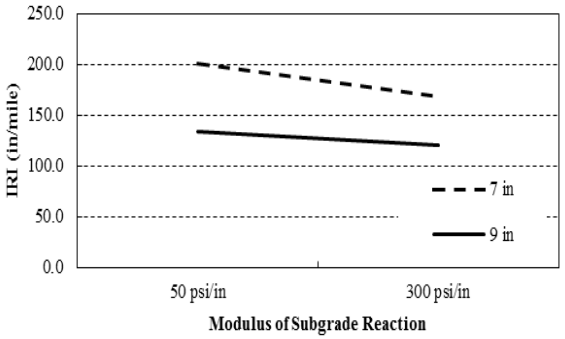

Figure A-95 Overlay thickness vs. modulus of subgrade reaction

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