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**To:** **Bonnie Lavelle, Chris Weis**
**From:** **Adrian Bradley**
**Date:** **October 6, 1999**
**Subj.:** **Swine Soil Selection and Preparation - VBI70**
**cc:** **Project File**

This memorandum describes the criteria used for selection of soil samples included in the VBI70 swine bioavailability study. Preparation procedures are also described.

Sample Selection

Test soils number 1 to 5 were selected from existing samples of soil that had previously been sampled during Phase 3 or the risk-based activities at the Vasquez Boulevard and I-70 site. Samples were selected to cover a range of arsenic concentrations in soil (target range = 200-2,000 ppm), and were also selected to provide reasonable spatial representativeness across the site. Soils with arsenic concentrations < 200 ppm were not included because the mass required for swine dosing was not available. Table 1 lists the estimated arsenic concentrations at each of the five properties, along with the neighborhood in which they are located. Actual street addresses are not provided in order to maintain confidentiality.

Test material 6 was prepared by mixing clean site soil (As < 10 ppm) with sufficient PAX to yield a concentration of approximately 500 ppm arsenic.

Sample Preparation

In all cases, each test material was prepared by combining all soil samples that had been collected from the selected property. For example, for properties that had been sampled during the risk based program, over 100 subsamples were combined (Test materials 1 and 2). For properties selected from Phase 3, three samples (each a composite of 10 subsamples) were combined. The samples that were combined to create each test material are listed in Appendix A.

All sub-samples from a property were composited using a stainless steel bowl and mixing spoon. The composites were then air dried, homogenized, and sieved to < 250 $\mu$m. Soil for Test material 6 was also prepared by drying and sieving prior to the addition of the PAX

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After compositing, drying, sieving, and mixing, an aliquot was removed and the concentration of arsenic and lead were measured by XRF. Results from the XRF analysis for Test Material #1-6 are included in Table 2. This XRF value was used to calculate the appropriate dose of each soil to administer to the test animals. A second aliquot of each test material was removed and submitted for TAL analysis (in duplicate). The results of the duplicate TAL measurement of arsenic will be used in the calculation of actual administered doses to the animals. At the conclusion of the study, a summary report will include results from these analyses.

Table 1. List of Test Materials Selected

| Test Material | Estimated Arsenic Concentration (ppm) (a) | Neighborhood |
|---|---|---|
| 1 | 578 | Swansea/Elyria |
| 2 | 1792 | Swansea/Elyria |
| 3 | 349 | Cole |
| 4 | 488 | Cole |
| 5 | 238 | Clayton |

(a) This value is only approximate, and is derived simply by averaging all of the subsamples combined to form the test material. The value was used for selection purposes only. Measured concentrations (see Table 2) were used for all dose calculations.

Table 2. XRF Results from Composite Samples used in the Swine Bioavailability Studies

| Test Material No. | Residential Location Code | Arsenic (ppm) | Lead (ppm) |
|---|---|---|---|
| 1 | B1 | 422 | 938 |
| 2 | B2 | 1450 | 1050 |
| 3 | B3 | 710 | 308 |
| 4 | B4 | 1087 | 670 |
| 5 | B5 | 448 | 146 |
| 6 | B6 | 796 | 323 |

# APPENDIX A

## LIST OF SUBSAMPLES COMBINED TO PRODUCE TEST MATERIAL 1-5

Appendix A. Arsenic Concentrations of Sub-Samples Included in the Bioavailability Study

## Test Material # 1

| Sub-sample ID | As conc. (mg/kg) | Sub-sample ID | As conc. (mg/kg) | Sub-sample ID | As conc. (mg/kg) |
|---|---|---|---|---|---|
| ND-98-1097 | 23 | ND-98-1199 | 53 | ND-98-206 | 255 |
| ND-98-1098 | 877 | ND-98-1200 | 23 | ND-98-207 | 109 |
| ND-98-1099 | 187 | ND-98-1201 | 52 | ND-98-208 | 23 |
| ND-98-1100 | 93 | ND-98-1202 | 2561 | ND-98-213 | 53 |
| ND-98-1110 | 108 | ND-98-1203 | 2977 | ND-98-214 | 59 |
| ND-98-1111 | 160 | ND-98-1204 | 831 | ND-98-215 | 55 |
| ND-98-1112 | 145 | ND-98-1205 | 831 | ND-98-222 | 50 |
| ND-98-1113 | 178 | ND-98-1206 | 1897 | ND-98-238 | 23 |
| ND-98-1114 | 208 | ND-98-1208 | 155 | ND-98-242 | 102 |
| ND-98-1115 | 97 | ND-98-1209 | 145 | ND-98-243 | 47 |
| ND-98-1116 | 83 | ND-98-1210 | 140 | ND-98-244 | 23 |
| ND-98-1117 | 64 | ND-98-1211 | 978 | ND-98-260 | 23 |
| ND-98-1118 | 234 | ND-98-1212 | 65 | ND-98-261 | 23 |
| ND-98-1119 | 78 | ND-98-1213 | 109 | ND-98-262 | 104 |
| ND-98-1120 | 92 | ND-98-1241 | 23 | ND-98-268 | 63 |
| ND-98-1121 | 98 | ND-98-1242 | 23 | ND-98-269 | 241 |
| ND-98-1122 | 387 | ND-98-1243 | 23 | ND-98-271 | 161 |
| ND-98-1123 | 148 | ND-98-1244 | 139 | ND-98-272 | 104 |
| ND-98-1128 | 122 | ND-98-1245 | 82 | ND-98-343 | 2848 |
| ND-98-1129 | 122 | ND-98-1246 | 96 | ND-98-344 | 1972 |
| ND-98-1130 | 23 | ND-98-1247 | 111 | ND-98-345 | 2625 |
| ND-98-1131 | 23 | ND-98-1248 | 197 | ND-98-346 | 887 |
| ND-98-1132 | 73 | ND-98-1249 | 233 | ND-98-347 | 4514 |
| ND-98-1133 | 52 | ND-98-1250 | 800 | ND-98-348 | 67 |
| ND-98-1134 | 23 | ND-98-1251 | 704 | ND-98-349 | 1454 |
| ND-98-1135 | 57 | ND-98-1252 | 265 | ND-98-350 | 494 |
| ND-98-1150 | 87 | ND-98-1253 | 62 | ND-98-351 | 846 |
| ND-98-1151 | 23 | ND-98-1254 | 66 | ND-98-352 | 622 |
| ND-98-1152 | 105 | ND-98-1255 | 550 | ND-98-353 | 72 |
| ND-98-1159 | 23 | ND-98-1257 | 55 | ND-98-354 | 1160 |
| ND-98-1160 | 80 | ND-98-1258 | 164 | ND-98-355 | 2177 |
| ND-98-1161 | 60 | ND-98-1259 | 69 | ND-98-356 | 678 |
| ND-98-1162 | 61 | ND-98-1260 | 57 | ND-98-357 | 2426 |
| ND-98-1163 | 23 | ND-98-1261 | 55 | ND-98-358 | 912 |
| ND-98-1164 | 68 | ND-98-1262 | 89 | ND-98-359 | 2362 |
| ND-98-1165 | 23 | ND-98-1263 | 195 | ND-98-360 | 47 |
| ND-98-1166 | 97 | ND-98-1264 | 175 | ND-98-361 | 602 |
| ND-98-1167 | 23 | ND-98-1265 | 111 | ND-98-362 | 342 |
| ND-98-1168 | 56 | ND-98-1266 | 143 | ND-98-364 | 109 |
| ND-98-1169 | 53 | ND-98-1267 | 23 | ND-98-365 | 1049 |
| ND-98-1170 | 214 | ND-98-1268 | 23 | Nd-98-366 | 104 |
| ND-98-1189 | 166 | ND-98-1269 | 23 | ND-98-370 | 540 |
| ND-98-1190 | 96 | ND-98-1270 | 23 | ND-98-375 | 744 |
| ND-98-1191 | 88 | ND-98-1271 | 23 | ND-98-376 | 1272 |
| ND-98-1192 | 23 | ND-98-203 | 1029 | ND-98-377 | 23 |
| ND-98-1193 | 22.5 | ND-98-204 | 23 | ND-98-378 | 1115 |
| ND-98-1194 | 23 | ND-98-205 | 108 | ND-98-379 | 245 |

Appendix A. Arsenic Concentrations of Sub-Samples Included in the Bioavailability Study

## Test Material # 1

| Sub-sample ID | As conc. (mg/kg) | Sub-sample ID | As conc. (mg/kg) | Sub-sample ID | As conc. (mg/kg) |
|---|---|---|---|---|---|
| ND-98-380 | 2714 | ND-98-513 | 52 | ND-98-593 | 23 |
| ND-98-381 | 515 | ND-98-514 | 78 | ND-98-595 | 23 |
| ND-98-382 | 698 | ND-98-515 | 256 | ND-98-596 | 23 |
| ND-98-383 | 2027 | ND-98-516 | 170 | ND-98-599 | 23 |
| ND-98-1109 | 1303 | ND-98-517 | 988 | ND-98-600 | 60 |
| ND-98-1039 | 882 | ND-98-518 | 2007 | ND-98-610 | 23 |
| ND-98-1077 | 64 | ND-98-519 | 1736 | ND-98-611 | 56 |
| ND-98-1299 | 3576 | ND-98-520 | 958 | Nd-98-612 | 277 |
| ND-98-388 | 128 | ND-98-521 | 360 | Nd-98-613 | 198 |
| ND-98-389 | 831 | ND-98-522 | 887 | ND-98-614 | 149 |
| ND-98-390 | 1445 | ND-98-523 | 704 | ND-98-615 | 23 |
| ND-98-391 | 1972 | ND-98-524 | 1500 | ND-98-616 | 566 |
| ND-98-393 | 683 | ND-98-525 | 591 | ND-98-617 | 877 |
| ND-98-394 | 698 | ND-98-526 | 1282 | ND-98-618 | 988 |
| ND-98-395 | 239 | ND-98-527 | 1242 | ND-98-619 | 115 |
| ND-98-396 | 445 | ND-98-533 | 1434 | ND-98-620 | 448 |
| ND-98-397 | 405 | ND-98-550 | 1414 | ND-98-621 | 460 |
| ND-98-398 | 1100 | ND-98-551 | 408 | ND-98-622 | 775 |
| ND-98-399 | 892 | ND-98-552 | 770 | ND-98-623 | 409 |
| ND-98-401 | 749 | ND-98-553 | 953 | ND-98-624 | 111 |
| ND-98-403 | 134 | ND-98-554 | 2127 | ND-98-625 | 68 |
| ND-98-404 | 343 | ND-98-555 | 339 | ND-98-626 | 1565 |
| ND-98-405 | 704 | ND-98-556 | 2912 | ND-98-627 | 831 |
| ND-98-406 | 1686 | ND-98-557 | 1676 | ND-98-628 | 124 |
| ND-98-407 | 1902 | ND-98-558 | 454 | ND-98-629 | 59 |
| ND-98-408 | 719 | ND-98-559 | 282 | ND-98-648 | 66 |
| ND-98-409 | 1786 | ND-98-560 | 591 | ND-98-654 | 23 |
| ND-98-410 | 486 | ND-98-561 | 1459 | ND-98-655 | 23 |
| ND-98-411 | 1207 | ND-98-562 | 535 | ND-98-657 | 23 |
| ND-98-412 | 1368 | ND-98-563 | 198 | ND-98-673 | 197 |
| ND-98-413 | 1277 | ND-98-564 | 1262 | ND-98-694 | 82 |
| ND-98-414 | 499 | ND-98-565 | 938 | ND-98-717 | 23 |
| ND-98-415 | 1298 | ND-98-566 | 912 | ND-98-720 | 59 |
| ND-98-448 | 1700 | ND-98-572 | 872 | ND-98-721 | 132 |
| ND-98-454 | 264 | ND-98-573 | 277 | ND-98-736 | 123 |
| ND-98-455 | 23 | ND-98-574 | 510 | ND-98-737 | 274 |
| ND-98-456 | 2615 | ND-98-575 | 658 | ND-98-740 | 153 |
| ND-98-457 | 1267 | ND-98-576 | 1464 | | |
| ND-98-458 | 540 | ND-98-577 | 2610 | | |
| ND-98-459 | 678 | ND-98-578 | 1247 | | |
| ND-98-460 | 23 | ND-98-579 | 2496 | | |
| ND-98-461 | 187 | ND-98-580 | 1842 | | |
| ND-98-462 | 1282 | ND-98-581 | 1348 | | |
| ND-98-463 | 851 | ND-98-582 | 23 | | |
| ND-98-464 | 373 | ND-98-583 | 23 | | |
| | | ND-98-584 | 912 | | |
| | | ND-98-586 | 765 | | |

Appendix A. Arsenic Concentrations of Sub-Samples Included in the Bioavailability Study

## Test Material # 2

| Sub-sample ID | As conc. (mg/kg) | Sub-sample ID | As conc. (mg/kg) | Sub-sample ID | As conc. (mg/kg) | Sub-sample ID | As conc. (mg/kg) |
|---|---|---|---|---|---|---|---|
| ND-98-1030 | 1464 | ND-98-1229 | 121 | ND-98-1081 | 3311 | ND-98-1301 | 5903 |
| ND-98-1031 | 1867 | ND-98-1230 | 23 | ND-98-1082 | 261 | ND-98-1303 | 11913 |
| ND-98-1032 | 1100 | ND-98-1231 | 74 | ND-98-1083 | 86 | ND-98-1304 | 9656 |
| ND-98-1033 | 83 | ND-98-1232 | 100 | ND-98-1084 | 83 | ND-98-1305 | 11657 |
| ND-98-1034 | 127 | ND-98-1233 | 138 | ND-98-1089 | 1897 | ND-98-1306 | 6654 |
| ND-98-1035 | 126 | ND-98-1234 | 3552 | ND-98-1090 | 525 | ND-98-1307 | 137 |
| ND-98-1036 | 365 | ND-98-1235 | 1479 | ND-98-1091 | 4904 | ND-98-1308 | 100 |
| ND-98-1037 | 100 | ND-98-1236 | 2709 | ND-98-1092 | 917 | ND-98-1309 | 437 |
| ND-98-1038 | 1585 | ND-98-1237 | 892 | ND-98-1093 | 2868 | ND-98-1311 | 3816 |
| ND-98-1041 | 60 | ND-98-1238 | 1510 | ND-98-1094 | 7026 | ND-98-1312 | 5048 |
| ND-98-1042 | 85 | ND-98-1239 | 1378 | ND-98-1095 | -- | ND-98-1313 | 8898 |
| ND-98-1043 | 1666 | ND-98-1240 | 3498 | ND-98-1096 | 1520 | ND-98-1314 | 3874 |
| ND-98-1044 | 3218 | ND-98-1274 | 2848 | ND-98-1104 | 622 | ND-98-1315 | 3928 |
| ND-98-1045 | 3208 | ND-98-1278 | 410 | ND-98-1105 | 3630 | ND-98-1316 | 5334 |
| ND-98-1048 | 78 | ND-98-1279 | 315 | ND-98-1106 | 4519 | ND-98-676 | 1897 |
| ND-98-1049 | 515 | ND-98-1280 | 3424 | ND-98-1107 | 7165 | ND-98-677 | 140 |
| ND-98-1050 | 4952 | ND-98-1281 | 85 | ND-98-1108 | 622 | ND-98-678 | 2685 |
| ND-98-1051 | 1232 | ND-98-1282 | 2570 | ND-98-1136 | 780 | ND-98-686 | 138 |
| ND-98-1052 | 1054 | ND-98-1283 | 3095 | ND-98-1139 | 887 | ND-98-687 | 127 |
| ND-98-1053 | 23 | ND-98-1284 | 846 | ND-98-1141 | 3169 | ND-98-688 | 102 |
| ND-98-1054 | 66 | ND-98-1285 | 576 | ND-98-1147 | 922 | ND-98-745 | 53 |
| ND-98-1055 | 23 | ND-98-1287 | 75 | ND-98-1171 | 2391 | ND-98-746 | 83 |
| ND-98-1056 | 1469 | ND-98-1288 | 5239 | ND-98-1172 | 363 | ND-98-749 | 199 |
| ND-98-1057 | 882 | ND-98-1290 | 1676 | ND-98-1173 | 968 | ND-98-750 | 137 |
| ND-98-1063 | 1014 | ND-98-1291 | 902 | ND-98-1176 | 2446 | ND-98-752 | 688 |
| ND-98-1064 | 591 | ND-98-1292 | 1686 | ND-98-1177 | 2779 | ND-98-824 | 94 |
| ND-98-1065 | 1054 | ND-98-1293 | 121 | ND-98-1178 | 143 | ND-98-831 | 2660 |
| ND-98-1066 | 98 | ND-98-1294 | 4224 | ND-98-1187 | 1535 | ND-98-832 | 75 |
| ND-98-1075 | 109 | ND-98-1295 | 3454 | ND-98-1188 | 2247 | ND-98-836 | 105 |
| ND-98-1076 | 51 | ND-98-1297 | 70 | ND-98-1219 | 3134 | ND-98-837 | 103 |
| ND-98-1078 | 73 | ND-98-1298 | 1651 | ND-98-1220 | 2312 | ND-98-844 | 148 |
| ND-98-1079 | 23 | ND-98-1300 | 6701 | ND-98-1221 | 2322 | ND-98-847 | 348 |
| | | | | ND-98-1222 | 1902 | ND-98-848 | 540 |
| | | | | ND-98-1227 | 165 | ND-98-849 | 46 |
| | | | | ND-98-1228 | 398 | ND-98-850 | 98 |
| | | | | | | ND-98-947 | 493 |
| | | | | | | ND-98-967 | 2127 |
| | | | | | | ND-98-968 | 617 |

- result not available

## Appendix A. Arsenic Concentrations of Sub-Samples Included in the Bioavailability Study

### Test Material # 3

| Sub-sample ID | As conc. (mg/kg) |
|---|---|
| 3-01106 | 268 |
| 3-01104 | 389 |
| 3-01108 | 391 |

### Test Material # 4

| Sub-sample ID | As conc. (mg/kg) |
|---|---|
| 3-00291-B | 143 |
| 3-00293-B | 395 |
| 3-00296-B | 927 |

### Test Material # 5

| Sub-sample ID | As conc. (mg/kg) |
|---|---|
| 3-00841-B | 137 |
| 3-00845-B | 160 |
| 3-00847-B | 417 |