# A Spatial Approach to Phytolith Analysis for the Detection of Interior and Exterior Spaces at Songo Mnara, Tanzania

**Volume 2 of 2**

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Appendix 1: Songo Mnara Reference Collection Data

| Slide Ref No. | Field Ref. Coll. No. | Family | Genus | Species | Vernacular | Element |
|---|---|---|---|---|---|---|
| 1 | - | Poaceae | Pennisetum | glaucum | Pearl Millet | Stalk |
| 2 | - | Poaceae | Pennisetum | glaucum | Pearl Millet | Seed and Husk |
| 3 | - | Poaceae | Pennisetum | glaucum | Pearl Millet | Leaf |
| 4 | - | Poaceae | Oryza | sp. | Rice | Leaf |
| 5 | - | Poaceae | Oryza | sp. | Rice | Seed and Husk |
| 6 | - | Poaceae | Oryza | sp. | Rice | Stalk |
| 7 | - | Poaceae | Sorghum | bicolor | Sorghum | Stalk |
| 8 | - | Asteraceae | Unid. | ~ | Asteraceae | Stem |
| 9 | - | Asteraceae | Unid. | ~ | Asteraceae | Inflorescence |
| 10 | - | Musaceae | Musa | sp. | Banana | Leaf |
| 11 | - | Malvaceae | Gossypium | sp. | Cotton | Seed and Fibre |
| 12 | - | Malvaceae | Gossypium | sp. | Cotton | Stem |
| 13 | - | Malvaceae | Gossypium | sp. | Cotton | Leaf |
| 14 | - | Malvaceae | Gossypium | sp. | Cotton | Seed Casing (pod) |
| 15 | - | Arecaceae | Cocos | nucifera | Coconut | Leaf Frond |
| 16 | - | Arecaceae | Cocos | nucifera | Coconut | Exocarp? |
| 17 | - | Arecaceae | Cocos | nucifera | Coconut | Leaf Stem |
| 18 | - | Arecaceae | Cocos | nucifera | Coconut | Mesocarp? |
| 19 | - | Arecaceae | Cocos | nucifera | Coconut | Bark |
| 20 | - | Poaceae | Sorghum | bicolor | Sorghum | Seed and Husk |
| 21 | - | Asteraceae | Unid. | - | Asteraceae | Inflorescence |
| 22 | - | Asteraceae | Unid. | - | Asteraceae | Stem |

| Slide Ref No. | Field Ref. Coll. No. | Family | Genus | Species | Vernacular | Element |
|---|---|---|---|---|---|---|
| 23 | - | Asteraceae | Unid. | - | Asteraceae | Leaf |
| 24 | - | Malvaceae | Adansonia | digitata | Baobab | Fruit Exocarp |
| 25 | - | Malvaceae | Adansonia | digitata | Baobab | Seed and Pulp |
| 26 | - | Malvaceae | Adansonia | digitata | Baobab | Fruit Pulp (Mesocarp) |
| 27 | - | Malvaceae | Adansonia | digitata | Baobab | Bark |
| 28 | - | Rhizophoraceae | Ceriops | tagal | Yellow Mangrove | Stem |
| 29 | - | Rhizophoraceae | Ceriops | tagal | Yellow Mangrove | Fruit |
| 30 | - | Rhizophoraceae | Ceriops | tagal | Yellow Mangrove | Leaf |
| 31 | - | Rhizophoraceae | Ceriops | tagal | Yellow Mangrove | Inflorescence |
| 32 | - | Rhizophoraceae | Bruguiera | gymnorrhiza | Black Mangrove | Stem |
| 33 | - | Rhizophoraceae | Bruguiera | gymnorrhiza | Black Mangrove | Flower |
| 34 | - | Rhizophoraceae | Bruguiera | gymnorrhiza | Black Mangrove | Leaf |
| 35 | - | Rhizophoraceae | Bruguiera | gymnorrhiza | Black Mangrove | Fruit |
| 36 | - | Combretaceae | Lumnitzera | racemosa | Red-Branched Mangrove | Stem |
| 37 | - | Combretaceae | Lumnitzera | racemosa | Red-Branched Mangrove | Leaf |
| 38 | - | Anacardiaceae | Mangifera | indica | Mango | Stem |
| 39 | - | Anacardiaceae | Mangifera | indica | Mango | Leaf |
| 40 | - | Anacardiaceae | Mangifera | indica | Mango | Inflorescence and Stem |
| 41 | - | Malvaceae | Adansonia | digitata | Baobab | Seed and Pulp |
| 42 | - | Malvaceae | Adansonia | digitata | Baobab | Bark |
| 43 | - | Rhizophoraceae | Ceriops | tagal | Yellow Mangrove | Fruit |
| 44 | - | Rhizophoraceae | Ceriops | tagal | Yellow Mangrove | Leaf |

| Slide Ref No. | Field Ref. Coll. No. | Family | Genus | Species | Vernacular | Element |
|---|---|---|---|---|---|---|
| 45 | - | Rhizophoraceae | Ceriops | tagal | Yellow Mangrove | Stem |
| 46 | - | Rhizophoraceae | Bruguiera | gymnorrhiza | Black Mangrove | Flower |
| 47 | - | Rhizophoraceae | Bruguiera | gymnorrhiza | Black Mangrove | Stem |
| 48 | - | Rhizophoraceae | Bruguiera | gymnorrhiza | Black Mangrove | Leaf |
| 49 | - | Anacardiaceae | Mangifera | indica | Mango | Stem |
| 50 | 2013.8.4 | Poaceae | Unid. | - | Grass | Inflorescence |
| 51 | 2013.8.4 | Poaceae | Unid. | - | Grass | Stem |
| 52 | 2013.8.4 | Poaceae | Unid. | - | Grass | Leaf |
| 53 | 2013.31.2 | Poaceae | Unid. | - | Grass | Inflorescence |
| 54 | 2013.31.2 | Poaceae | Unid. | - | Grass | Leaf |
| 55 | 2013.31.2 | Poaceae | Unid. | - | Grass | Stem |
| 56 | 2013.1 | Poaceae | Unid. | - | Grass | Inflorescence |
| 57 | 2013.1 | Poaceae | Unid. | - | Grass | Leaf |
| 58 | 2013.1 | Poaceae | Unid. | - | Grass | Stem |
| 59 | 2013.19 | Cyperaceae? | Unid. | - | cf. carex? | Inflorescence |
| 60 | 2013.19 | Cyperaceae? | Unid. | - | cf. carex? | Stem |
| 61 | 2013.6.2 | Poaceae | Unid. | - | Grass | Inflorescence |
| 62 | 2013.6.2 | Poaceae | Unid. | - | Grass | Stem |
| 63 | 2013.6.2 | Poaceae | Unid. | - | Grass | Leaf |
| 64 | 2013.20.3 | Poaceae | Unid. | - | Grass | Inflorescence |
| 65 | 2013.20.3 | Poaceae | Unid. | - | Grass | Stem |
| 66 | 2013.20.3 | Poaceae | Unid. | - | Grass | Leaf |

| Slide Ref No. | Field Ref. Coll. No. | Family | Genus | Species | Vernacular | Element |
|---|---|---|---|---|---|---|
| 67 | 2013.13.10 | Poaceae | Unid. | - | Grass | Inflorescence |
| 68 | 2013.13.10 | Poaceae | Unid. | - | Grass | Stem |
| 69 | 2013.13.10 | Poaceae | Unid. | - | Grass | Leaf |
| 70 | 2013.8.4 | Poaceae | Unid. | - | Grass | Inflorescence |
| 71 | 2013.8.4 | Poaceae | Unid. | - | Grass | Leaf |
| 72 | 2013.8.4 | Poaceae | Unid. | - | Grass | Stem |
| 73 | 2013.49.1 | Poaceae | Unid. | - | Grass | Inflorescence |
| 74 | 2013.49.1 | Poaceae | Unid. | - | Grass | Leaf |
| 75 | 2013.49.1 | Poaceae | Unid. | - | Grass | Stem |
| 76 | 2013.31.1 | Poaceae | Unid. | - | Grass | Inflorescence |
| 77 | 2013.31.1 | Poaceae | Unid. | - | Grass | Stem |
| 78 | 2013.31.1 | Poaceae | Unid. | - | Grass | Leaf |
| 79 | 2013.34.1 | Poaceae | Unid. | - | Grass | Stem |
| 80 | 2013.34.1 | Poaceae | Unid. | - | Grass | Leaf |
| 81 | 2013.34.1 | Poaceae | Unid. | - | Grass | Inflorescence |
| 82 | 2013.4.2 | Poaceae | Unid. | - | Grass | Leaf |
| 83 | 2013.4.2 | Poaceae | Unid. | - | Grass | Stem |
| 84 | 2013.4.2 | Poaceae | Unid. | - | Grass | Inflorescence |
| 85 | 2013.9 | Poaceae | Unid. | - | Grass | Stem |
| 86 | 2013.9 | Poaceae | Unid. | - | Grass | Leaf |
| 87 | 2013.9 | Poaceae | Unid. | - | Grass | Inflorescence |
| 88 | 2013.19 | Cyperaceae? | Unid. | - | cf. carex? | Inflorescence |

| Slide Ref No. | Field Ref. Coll. No. | Family | Genus | Species | Vernacular | Element |
|---|---|---|---|---|---|---|
| 89 | 2013.19 | Cyperaceae? | Unid. | - | cf. carex? | Stem |
| 90 | - | Arecaceae | Phoenix | dactylifera? | Date Palm? | Leaf |
| 91 | - | Arecaceae | Phoenix | dactylifera? | Date Palm? | Bark |
| 92 | - | Arecaceae | Phoenix | reclinata? | Wild Date Palm? | Leaf |
| 93 | - | Rutaceae | Citrus | aurantifolia | Lime | Leaf |
| 94 | - | Rutaceae | Citrus | aurantifolia | Lime | Stem |
| 95 | 2013.43.1 | Rutaceae | Citrus | sinensis | Orange | Leaf |
| 96 | 2013.43.1 | Rutaceae | Citrus | sinensis | Orange | Stem |

| Slide Ref No. | Sonicated/ Unsonicated | Date created | Sample Location | Weight of Plant Material Ashed (g) | Tube Weight before sample (g) | Tube weight after sample added (g) | Weight of Sample (g) | Tube Weight after slide mount (g) | Weight mounted (g) | Affiliations |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Unsonicated | 2015 | Songo Mnara | - | 14.8334 | 14.8667 | 0.0333 | 14.8582 | 0.0085 | University of York |
| 2 | Unsonicated | 2015 | Songo Mnara | - | 14.646 | 14.6591 | 0.0131 | 14.6544 | 0.0047 | University of York |
| 3 | Unsonicated | 2015 | Songo Mnara | - | 14.7933 | 14.8398 | 0.0465 | 14.8348 | 0.005 | University of York |
| 4 | Unsonicated | 2015 | Songo Mnara | - | 14.7725 | 14.8704 | 0.0979 | 14.8585 | 0.0119 | University of York |
| 5 | Unsonicated | 2015 | Songo Mnara | - | 14.8724 | 14.9127 | 0.0403 | 14.9051 | 0.0076 | University of York |
| 6 | Unsonicated | 2015 | Songo Mnara | - | 14.8441 | 14.858 | 0.0139 | 14.8523 | 0.0057 | University of York |
| 7 | Unsonicated | 2015 | Songo Mnara | - | 14.6553 | 14.6622 | 0.0069 | 14.6591 | 0.0031 | University of York |
| 8 | Unsonicated | 2015 | Songo Mnara | - | 14.7286 | 14.74 | 0.0114 | 14.7366 | 0.0034 | University of York |
| 9 | Unsonicated | 2015 | Songo Mnara | - | 14.7616 | 14.7723 | 0.0107 | 14.7671 | 0.0052 | University of York |
| 10 | Unsonicated | 2015 | Songo Mnara | - | 14.7622 | 14.8444 | 0.0822 | 14.8398 | 0.0046 | University of York |
| 11 | Unsonicated | 2015 | Songo Mnara | - | 14.7579 | 14.7843 | 0.0264 | 14.774 | 0.0103 | University of York |
| 12 | Unsonicated | 2015 | Songo Mnara | - | 14.7895 | 14.7964 | 0.0069 | 14.7906 | 0.0058 | University of York |
| 13 | Unsonicated | 2015 | Songo Mnara | - | 14.6374 | 14.7196 | 0.0822 | 14.7058 | 0.0138 | University of York |
| 14 | Unsonicated | 2015 | Songo Mnara | - | 14.8165 | 14.8902 | 0.0737 | 14.8793 | 0.0109 | University of York |
| 15 | Unsonicated | 2015 | Songo Mnara | - | 14.6124 | 14.732 | 0.1196 | 14.7241 | 0.0079 | University of York |
| 16 | Unsonicated | 2015 | Songo Mnara | - | 14.879 | 14.9212 | 0.0422 | 14.9158 | 0.0054 | University of York |
| 17 | Unsonicated | 2015 | Songo Mnara | - | 14.8691 | 15.097 | 0.2279 | 15.0855 | 0.0115 | University of York |
| 18 | Unsonicated | 2015 | Songo Mnara | - | 14.6398 | 14.6664 | 0.0266 | 14.6611 | 0.0053 | University of York |
| 19 | Unsonicated | 2015 | Songo Mnara | - | 14.7695 | 14.8523 | 0.0828 | 14.8416 | 0.0107 | University of York |
| 20 | Unsonicated | 2015 | Songo Mnara | - | 14.7623 | 14.7855 | 0.0232 | 14.7765 | 0.009 | University of York |
| 21 | Unsonicated | 2015 | Songo Mnara | 0.2477 | 14.9001 | 14.9088 | 0.0087 | 14.9033 | 0.0055 | University of York |
| 22 | Unsonicated | 2015 | Songo Mnara | 0.1422 | 14.8427 | 14.8465 | 0.0038 | 14.8451 | 0.0014 | University of York |

| Slide Ref No. | Sonicated/ Unsonicated | Date created | Sample Location | Weight of Plant Material Ashed (g) | Tube Weight before sample (g) | Tube weight after sample added (g) | Weight of Sample (g) | Tube Weight after slide mount (g) | Weight mounted (g) | Affiliations |
|---|---|---|---|---|---|---|---|---|---|---|
| 23 | Unsonicated | 2015 | Songo Mnara | 0.2223 | 14.801 | 14.8375 | 0.0365 | 14.8374 | 0.0001 | University of York |
| 24 | Unsonicated | 2015 | Songo Mnara | 0.6462 | 14.7586 | 14.7894 | 0.0308 | 14.7868 | 0.0026 | University of York |
| 25 | Unsonicated | 2015 | Songo Mnara | 0.7535 | 14.7612 | 14.7945 | 0.0333 | 14.7896 | 0.0049 | University of York |
| 26 | Unsonicated | 2015 | Songo Mnara | 0.2205 | 14.8295 | 14.8335 | 0.004 | 14.8313 | 0.0022 | University of York |
| 27 | Unsonicated | 2015 | Songo Mnara | 1.4466 | 14.7272 | 14.7675 | 0.0403 | 14.7587 | 0.0088 | University of York |
| 28 | Unsonicated | 2015 | Songo Mnara | 2.3606 | 14.8274 | 15.0386 | 0.2112 | - | - | University of York |
| 29 | Unsonicated | 2015 | Songo Mnara | 0.4668 | 14. 8664 | 15.0053 | 0.1389 | - | - | University of York |
| 30 | Unsonicated | 2015 | Songo Mnara | 2.3305 | 14.9389 | 15.1966 | 0.2577 | - | - | University of York |
| 31 | Unsonicated | 2015 | Songo Mnara | 0.6074 | 14.6953 | 14.7397 | 0.0444 | - | - | University of York |
| 32 | Unsonicated | 2015 | Songo Mnara | 3.0326 | 14.7854 | 15.1005 | 0.3151 | - | - | University of York |
| 33 | Unsonicated | 2015 | Songo Mnara | 1.2175 | 14.7818 | 14.8936 | 0.1118 | - | - | University of York |
| 34 | Unsonicated | 2015 | Songo Mnara | 2.0748 | 14.7491 | 14.968 | 0.2189 | - | - | University of York |
| 35 | Unsonicated | 2015 | Songo Mnara | 1.7681 | 14.8586 | 14.9161 | 0.0575 | - | - | University of York |
| 36 | Unsonicated | 2015 | Songo Mnara | 0.8183 | 14.7557 | 14.8222 | 0.0665 | 14.8073 | 0.0149 | University of York |
| 37 | Unsonicated | 2015 | Songo Mnara | 0.6373 | 14.8207 | 14.9198 | 0.0991 | 14.8918 | 0.028 | University of York |
| 38 | Unsonicated | 2015 | Songo Mnara | 1.7217 | 14.8193 | 14.9422 | 0.1229 | 14.9122 | 0.03 | University of York |
| 39 | Unsonicated | 2015 | Songo Mnara | 0.888 | 14.8576 | 14.9257 | 0.0681 | 14.9075 | 0.0182 | University of York |
| 40 | Unsonicated | 2015 | Songo Mnara | 0.5985 | 14.7179 | 14.756 | 0.0381 | 14.7455 | 0.0105 | University of York |
| 41 | Unsonicated | 2015 | Songo Mnara | 1.2442 | 14.7699 | 14.8293 | 0.0594 | 14.8207 | 0.0086 | University of York |
| 42 | Unsonicated | 2015 | Songo Mnara | 4.3543 | 14.7115 | 14.8745 | 0.163 | 14.8542 | 0.0203 | University of York |
| 43 | Unsonicated | 2015 | Songo Mnara | 2.7157 | 14.8559 | 14.9197 | 0.0638 | 14.9072 | 0.0125 | University of York |
| 44 | Unsonicated | 2015 | Songo Mnara | 2.4144 | 14.7011 | 15.0534 | 0.3523 | 15.0321 | 0.0213 | University of York |

| Slide Ref No. | Sonicated/ Unsonicated | Date created | Sample Location | Weight of Plant Material Ashed (g) | Tube Weight before sample (g) | Tube weight after sample added (g) | Weight of Sample (g) | Tube Weight after slide mount (g) | Weight mounted (g) | Affiliations |
|---|---|---|---|---|---|---|---|---|---|---|
| 45 | Unsonicated | 2015 | Songo Mnara | 1.6803 | 14.7269 | 14.8896 | 0.1627 | 14.8658 | 0.0238 | University of York |
| 46 | Unsonicated | 2015 | Songo Mnara | 0.8998 | 14.6564 | 14.747 | 0.0906 | 14.7057 | 0.0413 | University of York |
| 47 | Unsonicated | 2015 | Songo Mnara | 4.4616 | 14.9341 | 15.4766 | 0.5425 | 15.4379 | 0.0387 | University of York |
| 48 | Unsonicated | 2015 | Songo Mnara | 1.7883 | 14.8087 | 15.0037 | 0.195 | 14.9844 | 0.0193 | University of York |
| 49 | Unsonicated | 2015 | Songo Mnara | 1.84 | 14.633 | 14.8019 | 0.1689 | 14.7684 | 0.0335 | University of York |
| 50 | Unsonicated | 2015 | Songo Mnara | 0.4187 | 14.724 | 14.7273 | 0.0033 | 14.7252 | 0.0021 | University of York |
| 51 | Unsonicated | 2015 | Songo Mnara | 0.2397 | 14.7158 | 14.721 | 0.0052 | 14.7166 | 0.0044 | University of York |
| 52 | Unsonicated | 2015 | Songo Mnara | 0.2261 | 14.7097 | 14.7245 | 0.0148 | 14.7169 | 0.0076 | University of York |
| 53 | Unsonicated | 2015 | Songo Mnara | 0.1775 | 14.7018 | 14.7063 | 0.0045 | 14.7035 | 0.0028 | University of York |
| 54 | Unsonicated | 2015 | Songo Mnara | 0.2693 | 14.8659 | 14.8952 | 0.0293 | 14.8871 | 0.0081 | University of York |
| 55 | Unsonicated | 2015 | Songo Mnara | 0.204 | 14.8434 | 14.8482 | 0.0048 | 14.8445 | 0.0037 | University of York |
| 56 | Unsonicated | 2015 | Songo Mnara | 0.1338 | 14.6784 | 14.6822 | 0.0038 | 14.68 | 0.0022 | University of York |
| 57 | Unsonicated | 2015 | Songo Mnara | 0.0952 | 14.6891 | 14.6968 | 0.0077 | 14.6922 | 0.0046 | University of York |
| 58 | Unsonicated | 2015 | Songo Mnara | 0.1532 | 14.7849 | 14.7916 | 0.0067 | 14.7883 | 0.0033 | University of York |
| 59 | Unsonicated | 2015 | Songo Mnara | 0.2563 | 14.6791 | 14.6815 | 0.0024 | 14.6797 | 0.0018 | University of York |
| 60 | Unsonicated | 2015 | Songo Mnara | 0.3165 | 14.8068 | 14.8237 | 0.0169 | 14.8146 | 0.0091 | University of York |
| 61 | Unsonicated | 2015 | Songo Mnara | 0.6505 | 14.7874 | 14.8398 | 0.0524 | 14.7829 | 0.0569 | University of York |
| 62 | Unsonicated | 2015 | Songo Mnara | 0.3832 | 14.7208 | 14.7882 | 0.0674 | 14.7171 | 0.0711 | University of York |
| 63 | Unsonicated | 2015 | Songo Mnara | 0.1897 | 14.7268 | 14.8041 | 0.0773 | 14.7217 | 0.0824 | University of York |
| 64 | Unsonicated | 2015 | Songo Mnara | 0.5723 | 14.7736 | 14.7717 | -0.0019 | 14.7651 | 0.0066 | University of York |
| 65 | Unsonicated | 2015 | Songo Mnara | 0.5828 | 14.6986 | 14.6963 | -0.0023 | 14.6867 | 0.0096 | University of York |
| 66 | Unsonicated | 2015 | Songo Mnara | 0.2603 | 14.6761 | 14.6744 | -0.0017 | 14.67 | 0.0044 | University of York |

| Slide Ref No. | Sonicated/ Unsonicated | Date created | Sample Location | Weight of Plant Material Ashed (g) | Tube Weight before sample (g) | Tube weight after sample added (g) | Weight of Sample (g) | Tube Weight after slide mount (g) | Weight mounted (g) | Affiliations |
|---|---|---|---|---|---|---|---|---|---|---|
| 67 | Unsonicated | 2015 | Songo Mnara | 0.3785 | 14.7629 | 14.7604 | -0.0025 | 14.7576 | 0.0028 | University of York |
| 68 | Unsonicated | 2015 | Songo Mnara | 0.1153 | 14.8101 | 14.8087 | -0.0014 | 14.805 | 0.0037 | University of York |
| 69 | Unsonicated | 2015 | Songo Mnara | 0.069 | 14.7352 | 14.7339 | -0.0013 | 14.7309 | 0.003 | University of York |
| 70 | Unsonicated | 2015 | Songo Mnara | 0.0494 | 14.6286 | 14.6267 | -0.0019 | 14.6243 | 0.0024 | University of York |
| 71 | Unsonicated | 2015 | Songo Mnara | 0.1082 | 14.6624 | 14.6609 | -0.0015 | 14.6536 | 0.0073 | University of York |
| 72 | Unsonicated | 2015 | Songo Mnara | 0.0097 | 14.8295 | 14.8271 | -0.0024 | 14.8244 | 0.0027 | University of York |
| 73 | Unsonicated | 2015 | Songo Mnara | 0.169 | 14.7321 | 14.7328 | 0.0007 | 14.7266 | 0.0062 | University of York |
| 74 | Unsonicated | 2015 | Songo Mnara | 0.0731 | 14.6637 | 14.6325 | -0.0312 | 14.6248 | 0.0077 | University of York |
| 75 | Unsonicated | 2015 | Songo Mnara | 0.124 | 14.8329 | 14.8312 | -0.0017 | 14.8279 | 0.0033 | University of York |
| 76 | Unsonicated | 2015 | Songo Mnara | 0.1789 | 14.7926 | 14.7929 | 0.0003 | 14.7865 | 0.0064 | University of York |
| 77 | Unsonicated | 2015 | Songo Mnara | 0.1693 | 14.8865 | 14.8658 | -0.0207 | 14.8592 | 0.0066 | University of York |
| 78 | Unsonicated | 2015 | Songo Mnara | 0.1617 | 14.7219 | 14.7216 | -0.0003 | 14.7164 | 0.0052 | University of York |
| 79 | Unsonicated | 2015 | Songo Mnara | 0.1919 | 14.6295 | 14.6595 | 0.03 | 14.6504 | 0.0091 | University of York |
| 80 | Unsonicated | 2015 | Songo Mnara | 0.13 | 14.7628 | 14.8031 | 0.0403 | 14.7913 | 0.0118 | University of York |
| 81 | Unsonicated | 2015 | Songo Mnara | 0.0001 | 14.6666 | 14.6719 | 0.0053 | 14.6678 | 0.0041 | University of York |
| 82 | Unsonicated | 2015 | Songo Mnara | 0.0001 | 14.7462 | 14.7474 | 0.0012 | 14.7448 | 0.0026 | University of York |
| 83 | Unsonicated | 2015 | Songo Mnara | 0.142 | 14.7735 | 14.7767 | 0.0032 | 14.7724 | 0.0043 | University of York |
| 84 | Unsonicated | 2015 | Songo Mnara | 0.1538 | 14.6724 | 14.6775 | 0.0051 | 14.6741 | 0.0034 | University of York |
| 85 | Unsonicated | 2015 | Songo Mnara | 0.1542 | 14.7775 | 14.7858 | 0.0083 | 14.7824 | 0.0034 | University of York |
| 86 | Unsonicated | 2015 | Songo Mnara | 0.11 | 14.681 | 14.6911 | 0.0101 | 14.6866 | 0.0045 | University of York |
| 87 | Unsonicated | 2015 | Songo Mnara | 0.044 | 14.7107 | 14.7143 | 0.0036 | 14.7104 | 0.0039 | University of York |
| 88 | Unsonicated | 2015 | Songo Mnara | 0.0045 | 14.6278 | 14.6281 | 0.0003 | 14.6257 | 0.0024 | |

| Slide Ref No. | Sonicated/ Unsonicated | Date created | Sample Location | Weight of Plant Material Ashed (g) | Tube Weight before sample (g) | Tube weight after sample added (g) | Weight of Sample (g) | Tube Weight after slide mount (g) | Weight mounted (g) | Affiliations |
|---|---|---|---|---|---|---|---|---|---|---|
| 89 | Unsonicated | 2015 | Songo Mnara | 0.2106 | 14.8119 | 14.8212 | 0.0093 | 14.8142 | 0.007 | |
| 90 | Unsonicated | 2015 | Songo Mnara | 1.0791 | 14.7625 | 14.7994 | 0.0369 | 14.7876 | 0.0118 | University of York |
| 91 | Unsonicated | 2015 | Songo Mnara | 0.5643 | 14.7384 | 14.751 | 0.0126 | 14.7446 | 0.0064 | University of York |
| 92 | Unsonicated | 2015 | Songo Mnara | 1.625 | 14.7737 | 14.8478 | 0.0741 | 14.8361 | 0.0117 | University of York |
| 93 | Unsonicated | 2015 | Songo Mnara | 0.3448 | 14.7524 | 14.7999 | 0.0475 | 14.7892 | 0.0107 | |
| 94 | Unsonicated | 2015 | Songo Mnara | 1.0865 | 14.7189 | 14.8225 | 0.1036 | 14.7999 | 0.0226 | |
| 95 | Unsonicated | 2015 | Songo Mnara | 0.3582 | 14.8976 | 14.9428 | 0.0452 | 14.9338 | 0.009 | |
| 96 | Unsonicated | 2015 | Songo Mnara | 0.5804 | 14.8286 | 14.8784 | 0.0498 | 14.8604 | 0.018 | |

Appendix 2: Phytolith Methodological Review References Supporting Figure 2

## Phytolith Methodologies

| Ref. | Author | Year | Sample Size | Stage 1 | | Stage 2 | | Stage 3 | | Stage 4 | | Stage 5 | | Stage 6 | | Stage 7 | | Stage 8 | | Stage 9 | | Stage 10 | | Stage 11 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Albert *et al.* | 1999 | 0.5g | Crushing | - | RoC & RoO | $HCl+HNO_3$ | RoO | $H_2O_2$ | HLF | $Na_6(H_2W_{12}O_{40})\cdot H_2O$ | Drying | Air | MoS | Entellan™ | - | - | - | - | - | - | - | - | - | - |
| 2 | Albert *et al.* | 2006 | 1g | RoC & RoO | $HCl + HNO_3$ | RoO | $H_2O_2$ | HLF | $Na_6(H_2W_{12}O_{40})\cdot H_2O$ | Drying | Air | MoS | Entellan™ | - | - | - | - | - | - | - | - | - | - | - | - |
| 3 | Barboni *et al.* | 1999 | 10g | RoC | $CH_3COOH$ | RoO | $H_2O_2$ | GS | B/C? | HLF | $ZnBr_2$ | MoS | Glycerin | - | - | - | - | - | - | - | - | - | - | - | - |
| 4 | Barboni *et al.* | 2010 | 8-10g | RoC | HCl | RoO | $H_2O_2$ | D | $(NaPO_3)_6$ | HLF | $ZnBr_2$ | MoS | Glycerin | - | - | - | - | - | - | - | - | - | - | - | - |
| 5 | Bremond *et al.* | 2005 | 20g | Sieving | 2mm | RoC | HCl | RoO | $H_2O_2$ | Sieving | 60µm | GS | B/C? | HLF | $ZnBr_2$ | MoS | Glycerin (Obs.) & Canada Balsam (count.) | - | - | - | - | - | - | - | - |
| 6 | Bremond *et al.* | 2008 | 20g | Crushing | - | Sieving | 2mm | Grinding | - | RoC | HCl | RoIr | $(C_6H_5Na_3O_7) + (Na_2O_4S_2{\cdot}H_2O_2)$ | RoO | $H_2O_2$ | Sieving | 60µm | GS | B/C? | HLF | $ZnBr_2$ | MoS | Glycerin (Obs.) & Canada Balsam (count.) | - | - |
| 7 | Burrough *et al*. | 2012 | 5g | Sieving | 2mm | RoC | HCl | RoO | $H_2O_2$ | RoCl | $H_2O$ @ 70°C | HLF | $Na_6(H_2W_{12}O_{40})\cdot H_2O$ | D | $(NaPO_3)_6$ | VPF | 5µm | Drying | Air? | MoS | Canada Balsam | | | - | - |
| 8 | Calegari *et al.* | 2013 | 4g | RoC | HCl | D | $(NaPO_3)_6$ | GS | C | RoO | $H_2O_2$ | HLF | $Na_6(H_2W_{12}O_{40})\cdot H_2O$ | MoS | Immersion Oil | | | - | - | - | - | - | - | - | - |
| 9 | Calegari *et al.* | 2013 | 4g | RoO | $H_2O_2$ | RoIr | NaOAc | Drying | $C_2H_6O$ | RoIr | $C_6H_5Na_3O_7 + NaHCO_3$ | Drying | NaCl + $C_3H_6O$ | HLF | $Na_6(H_2W_{12}O_{40})\cdot H_2O$ | MoS | Immersion Oil | - | - | - | - | - | - | - | - |
| 10 | Calegari *et al.* | 2013 | 4g | RoO | $H_2O_2$ | RoIr | NaOAc | Drying | $C_2H_6O$ | RoIr | $Na_2O_4S_2{\cdot}H_2O_2$ | HLF | $Na_6(H_2W_{12}O_{40})\cdot H_2O$ | MoS | UNS | - | - | - | - | - | - | - | - | - | - |
| 11 | Cordova* | 2013 | 5g | Crushing | - | RoC | HCl | Sieving | 250µm | GS | C | Drying | $C_2H_6O$ | RoO | MF | MoS | $C_{14}H_{12}O_2$ | - | - | - | - | - | - | - | - |
| 12 | Fahmy *et al.* | 2006 | 5g | RoC | HCl | RoO | $H_2O_2$ | D | $Na_2H_2 + C_{10}H_{16}N_2O_8$ | HLF | $ZnBr_2$ + HCl | MoS | Glycerine | - | - | - | - | - | - | - | - | - | - | - | - |
| 13 | Garnier *et al.* | 2013 | 15-20g | D | $C_{10}H_{16}N_2O_8$ | Sieving | 250µm | GS | B | RoC | HCl | RoO | $HNO_3 + KClO_3$ | HLF | $ZnBr_2$ | Drying | $C_3H_6O$ | MoS | $C_6H_5CH_2O_2CC_6H_5$ | - | - | - | - | - | - |
| 14 | Holmgren *et al.*** | 2012 | UNS | RoO | $H_2O_2$ | GS | B | MoS | Naphrax® | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 15 | Horrocks*** | 2005 | 2.5-3g | D | $(NaPO_3)_6$ | GS | C | HLF | $Na_6(H_2W_{12}O_{40})\cdot H_2O$ | Sieving | 250µm | RoO | $HNO_3$ | RoC | HCl | RoHC | KOH | HLF | $Na_6(H_2W_{12}O_{40})\cdot H_2O$ | MoS | Canada Balsam or Caedex | - | - | - | - |
| 16 | Horrocks | 2002 | UNS | Sieving | 250µm | RoO | $HNO_3 + KClO_3$ | GS | B | HLF | $Na_6(H_2W_{12}O_{40})\cdot H_2O$ | MoS | UNS. | | | | | | | - | - | - | - | - | - |
| 17 | Iriarte & Paz | 2009 | 50g | Dispersal of Clay | $(NaPO_3)_6$ | Sieving | 2mm, 50µm, >25 µm | GS | B | RoC | HCl | RoO | $HNO_3 + KClO_3$ | HLF | $ZnBr_2$ | Drying | $C_3H_6O$ | MoS | Permount™ | - | - | - | - | - | - |
| 18 | Katz *et al.**** | 2010 | 0.02-0.05g | Sieving | 500 µm | RoC | HCl | RoO | $H_2O_2$ | HLF | $Na_6(H_2W_{12}O_{40})\cdot H_2O$ | Deflocculation | UNS | MoS | 50µl aliquot | - | - | - | - | - | - | - | - | - | - |
| 19 | Lentfer & Boyd | 1998 | 5g | Crushing | - | RoO | $H_2O_2$ | RoC | HCl | Sieving | 250µm | GS | C | HLF | $CdI_2$ | Drying | $C_2H_6O$ | MoS | $C_{14}H_{12}O_2$ | - | - | - | - | - | - |
| 20 | Lentfer & Boyd | 1998 | 5g | Crushing | - | RoC | HCl | Sieving | 250µm | GS | C | Drying | $C_2H_6O$ | RoO | MF | MoS | $C_{14}H_{12}O_2$ | - | - | - | - | - | - | - | - |
| 21 | Lentfer & Boyd | 1998 | 1g | Crushing | - | RoHC | KOH | RoC | HCl | Sieving | 250µm | GS | C | HLF | $CdI_2$ | Drying | $C_2H_6O$ | MoS | Silicone Oil | - | - | - | - | - | - |
| 22 | Lentfer & Boyd | 1999 | 5g | Crushing | - | D | $(NaPO_3)_6$ | RoO | $H_2O_2$ | RoC | HCl | Sieving | 250µm | GS | C | HLF | $CdI_2$ + KI | Drying | $CH_4O$ | MoS | $C_{14}H_{12}O_2$ | - | - | - | - |
| 23 | Lentfer & Boyd | 1999 | 5g | Crushing | - | D | $(NaPO_3)_6$ | RoO | $H_2O_2$ | RoC | HCl | Sieving | 250µm | GS | F - 5µm | HLF | $CdI_2$ + KI | Drying | $C_2H_6O$ | MoS | $C_{14}H_{12}O_2$ | - | - | - | - |
| 24 | Madella *et al.* | 1998 | 2-4g | RoC | HCl | D | $(NaPO_3)_6$ | GS | C | RoO | $H_2O_2$ | HLF | $Na_6(H_2W_{12}O_{40})\cdot H_2O$ | Drying | $MC_2H_6O$ | MoS | UNS | - | - | - | - | - | - | - | - |
| 25 | Mercarder *et al.* | 2011 | UNS | RoMO HLF | $Na_6(H_2W_{12}O_{40})\cdot H_2O$ | Drying | 100°C | Weighed | - | RoO | $HCl + HNO_3$ | Drying | 100°C | RoO | $H_2O_2$ | Drying | 100°C | HLF | $Na_6(H_2W_{12}O_{40})\cdot H_2O$ | Drying | 70°C | MoS | Entellan™ | - | - |
| 26 | Mercarder *et al.* | 2013 | UNS | Drying | 100°C | Drying | 100°C | Weighed | - | RoO | $HCl + HNO_3$ | Drying | 100°C | RoO | $H_2O_2$ | Drying | 100°C | HLF | $Na_6(H_2W_{12}O_{40})\cdot H_2O$ | Drying | 70°C | MoS | Entellan™ | - | - |
| 27 | Mercarder *et al.* | 2000 | 10-50g | D | $Na_4P_2O_7H_2O$ | Sieving | 63µm, 20µm, 2µm | GS | B/C? | Drying | - | RoO | $H_2O_2$ | RoC & HLF | $ZnBr_2$ + HCl | MoS | UNS | - | - | - | - | - | - | - | - |
| 28 | Neumann *et al.* | 2009 | 15-20g | D | $C_{10}H_{16}N_2O_8$ | Sieving | 250µm | GS | B | RoC | HCl | RoO | $HNO_3 + KClO_3$ | HLF | $ZnBr_2$ | Drying | $C_2H_6O$ | MoS | $C_6H_5CH_2O_2CC_6H_5$ | - | - | - | - | - | - |
| 29 | Parr | 2002 | 5g | Crushing | - | D | $(NaPO_3)_6$ | RoO | $H_2O_2$ | RoC | HCl | Sieving | 250µm | GS | C | HLF | UNS | Drying | UNS | MoS | UNS | - | - | - | - |
| 30 | Parr ***** | 2002 | 0.25g | Crushing | - | RoO | $HNO_3$ | RoC | HCl | Sieving | 250µm | Microwave | - | Drying | $C_2H_6O$ | MoS | $C_6H_5CH_2O_2CC_6H_5$ | - | - | - | - | - | - | - | - |
| 31 | Pearsall | 2001 | 10g | Crushing | - | Sieving | 16 mm | RoC | $HCl + HNO_3$ | RoO | $H_2O_2$ | D | $Na_2H_2 + C_{10}H_{16}N_2O_8$ | Sieving | 60 µm | GS | B | Sieving | 2mm, 50µm, >25 µm | HLF | $ZnI_2$ | Drying | UNS | MoS | UNS |
| 32 | Pearsall | 1989 | UNS | RoO | $H_2O_2$ | D | $(NaPO_3)_6$ | GS | B | RoC | HCl | RoHC | KOH | Sieving | 60 µm | HLF | $CdI_2$ + KI | Drying | UNS | MoS | UNS | - | - | - | - |
| 33 | Piperno | 2006 | 5-50g | Dispersal of Clay | $(NaPO_3)_6$ | Sieving | 2mm, 50µm, >25 µm | GS | B | RoC | HCl | RoO | $HNO_3$ + KC1$O_3$ or $H_2O_2$ | RoHC | KOH | HLF | $CdI_2$ + KI or $ZnBr_2$ or $Na_6(H_2W_{12}O_{40})\cdot H_2O$ | Drying | $C_3H_6O$ or $C_2H_6O$ | MoS | Permount™/ $C^{14}H^{12}O^2$/Canada Balsam/Glycerin | - | - | - | - |
| 34 | Powers & Gilbertson | 1987 | 1g | Sieving | 1mm | RoC | HCl | Drying | $CH_4O$ | MoS | Canada Balsam/Styrolite | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 35 | Rovner | 1971 | 2-5g | RoC | HCl | HLF | $C_2H_2Br_4$ | MoS | UNS | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 36 | Zhao & Pearsall | 1998 | 10g | Crushing | - | Sieving | 16 mm | RoC | $HCl + HNO_3$ | RoO | $H_2O_2$ | D | $Na_2H_2EDTA$ | Sieving | 60 µm | GS | B | Sieving | 2mm, 50µm, >25 µm | HLF | $ZnI_2$ | Drying | UNS | MoS | UNS |
| 37 | Novello *et al.* | 2012 | 10g | RoC | HCl | RoO | $H_2O_2$ | RoIr | $(C_6H_5Na_3O_7) + (Na_2O_4S_2{\cdot}H_2O_2)$ | GS | B | HLF | $ZnBr_2$ | MoS | Glycerine/Canada Balsam | - | - | - | - | - | - | - | - | - | - |
| 38 | Alexandre *et al.* | 2011 | 20g | Crushing | - | Sieving | 2mm | RoC | HCl | RoIr | $(C_6H_5Na_3O_7) + (Na_2O_4S_2{\cdot}H_2O_2)$ | RoO | $H_2O_2$ | D | $(NaPO_3)_6$ | Sieving | 60 µm | HLF | $ZnBr_2$ | Drying | 24 hours | MoS | UNS | - | - |
| 39 | Alam *et al.* | 2009 | 10g | Drying | Air | Crushing | - | Sieving | 100µm | RoO | $H_2O_2$ | RoC | HCl | D | $H_2O$ | HLF | $ZnI_2$ | RoC | $C_2H_6O_2$ | Drying | $C_2H_6O$ | MoS | Glycerin | - | - |
| 40 | Misra & Bhattacharyya | 2014 | 10g | Drying | 50°C | Crushing | - | Sieving | 250µm | RoC | HCl | RoO | $H_2O_2$ | MoS | Canada Balsam/Glycerine | | - | - | - | - | - | - | - | - | - |

**Notes**

*Cordova states that this is a modification on Lentfer & Boyd 1999 but doesn't state which modifications have been made.
**Combined Phytolith and Diatom methodology
***Starch & Phytolith Combined Methodology
****Rapid Extraction Protocol
*****Microwave Digestion

**Key**

| | |
|---|---|
| B | Beaker |
| C | Centrifuge |
| D | Disaggregation/Dispersal of Clays |
| F | Sieving (Fractionation) |
| GS | Deflocculation by Gravity Sedimentation |
| HLF | Heavy Liquid Flotation |
| MF | Muffle Furnace |
| MoS | Mounting of Slides |
| RoC | Removal of Carbonates |
| RoCl | Removal of Calcium Ions |
| RoHC | Removal of Humic Colloids |
| RoIr | Removal of Iron |
| RoMO HLF | Removal of Modern Organic Material by Heavy Liquid Flotation |
| RoO | Removal of Organics |
| S | Sonication |
| UNS | Unspecified |
| VPF | Vacuum pump filtration |

**Key to Chemicals**

| | |
|---|---|
| $(C_6H_5Na_3O_7)$ | Trisodium Citrate |
| $(Na_2O_4S_2{\cdot}H_2O_2)$ | Sodium Dithionite |
| $(NaPO_3)_6$ | Sodium hexametaphosphate |
| $C_{10}H_{16}N_2O_8$ | Ethylenediaminetetraacetic acid (EDTA) |
| $C_{14}H_{12}O_2$ | Benzyl Benzoate |
| $C_2H_2Br_4$ | Tetrabromoethane |
| $C_6H_5CH_2O_2CC_6H_5$ | Benzyl Benzoate |
| $CdI_2$ | Cadmium Iodide |
| $CH_3COOH$ | Acetic Acid |
| $ClKO_3$ | Potassium Chlorate |
| $H_2O_2$ | Hydrogen Peroxide |
| HCl | Hydrochloric Acid |
| $HNO_3$ | Nitric Acid |
| KI | Potassium Iodide |
| KOH | Potassium Hydroxide |
| $Na_4P_2O_7H_2O$ | Tetrasodium pyrophosphate |
| $Na_6(H_2W_{12}O_{40})\cdot H_2O$ | Sodium Polytungstate (SPT) |
| $NaHCO_3$ | Sodium Bicarbonate |
| NaOAc | Sodium Acetate |
| $ZnI_2$ | Zinc Iodide |
| $Na_2H_2$ | |
| $C_3H_6O$ | Acetone |
| $C_2H_6O$ | Ethanol |
| $CH_4O$ | Methanol |
| $ZnBr_2$ | Zinc Bromide |
| NaCl | Sodium Chloride |

Appendix 3: COSHH Risk Assessment for Phytolith Extraction

# SUBSTANCES HAZARDOUS TO HEALTH: RISK ASSESSMENT FORM

| **RESEARCH GROUP LEADER** | **ASSESSOR** (where not Group Leader) |
|---|---|
| **Hayley McParland** | **Hayley McParland** |

**TITLE OF PROJECT OR PROCESS: Exploring Interior and Exterior Space at Songo Mnara through Phytolith Analysis**

| **TECHNIQUE(S) / DESCRIPTION OF WORK ACTIVITY** | **FREQUENCY** | **LOCATION OF WORK** |
|---|---|---|
| **Phytolith Extraction from sediments and modern plant materials. See project specific SOP's.** | **30.09.2013-16.09.2016** | **BioArCh – Biology S Block Laboratory (until January 2016), University of York, Wentworth Way, York, YO10 5DD**<br><br>**BioArCh - Environment Building (from January 2016), University of York,Wentworth Way, York, YO10 5DD** |

**HAZARDS IDENTIFIED:**

Harmful (**R20**, **R21**,**R22**). Harmful by inhalation, ingestion and skin contact.
Risk of serious damage to eyes (**R41**).
Harmful to aquatic life, may cause long term adverse effects (**R52**, **R53**).
Toxic, corrosive (**R23**, **R24**, **R25**); Toxic by inhalation, in contact with skin, if swallowed.
Irritant (**R36**, **R37**, **R38**). Irritating to eyes (**R36**).
Corrosive, causes burns (**R34**).
Flammable (**R8, R10**).
Highly flammable (**R11**);

Repeated exposure may cause skin dryness or cracking (**R66**).
Vapours may cause drowsiness and dizziness (**R67**).

| **Substance/ Agent** | **Workplace Exposure Limit (WEL)** (if applicable) | **Hazardous properties** e.g. harmful, irritant, toxic, corrosive | **Hazard Severity Level Code** | **Quantity** | **Safety Phrases** |
|---|---|---|---|---|---|
| HCl (dilute) 10% solution (conc.) Hydrochloric Acid | 5 ppm 8mg/m3 | Toxic, corrosive (**R23**, **R24**, **R25**); Toxic by inhalation, in contact with skin, if swallowed. Irritant (**R36**, **R37**, **R38**). | 3. High | **Physical Form:** Liquid<br><br>**Volume:** 0-50ml | **S26:** In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. If possible, remove Contact Lenses.<br><br>**S45:** In case of accident or if you feel unwell, seek medical advice immediately. |

| | | | | | |
|---|---|---|---|---|---|
| Sodium Polutungstate (SPT)<br><br>Specific Gravity 2.3 | | Harmful (**R20**, **R21**,**R22**); harmful by inhalation, ingestion and skin contact. Risk of serious damage to eyes (**R41**). Harmful to aquatic life, may cause long term adverse effects (**R52**, **R53**). | 2-3. Medium-High | **Physical Form:** Powder/ Liquid<br><br>**Volume:** 0-50ml | **S 22:** Do not breathe dust.<br>**S 26:** In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.<br>**S 39:** Wear eye/face protection.<br>**S 61:** Avoid release to the environment. Refer to special instructions/Safety data sheets. |
| $H_2O_2$ ≥30% Hydrogen Peroxide | 1 ppm 1.4 mg/m3 | Corrosive, causes burns (**R34**); Risk of serious damage to the eyes (**R41**); Harmful (**R20**, **R21**,**R22**); harmful by inhalation, ingestion and skin contact. Flammable (**R8**). | 2. Medium | **Physical Form:** Liquid<br><br>**Volume:** 0-50ml | **S25:** Avoid contact with eyes.<br>**S26:** In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.<br>**S39:** Wear eye/face protection.<br>**S60:** This material and its container must be disposed of as hazardous waste. |
| Sodium Hexametaphosphate $(NaPO_3)_6$ | N/A | Not Classified | 1. Low | **Physical Form:** Powder/Liquid<br><br>**Volume:** 0-50ml | Not Classified.<br>**Wear standard PPE:** gloves, glasses, lab coat. |

| | | | | | |
|---|---|---|---|---|---|
| Acetone<br>$C_3H_6O$ | 500 ppm<br>1210<br>mg/m3 | Highly flammable (**R11**); Irritating to eyes (**R36**); Repeated exposure may cause skin dryness or cracking (**R66**); Vapours may cause drowsiness and dizziness (**R67**). | 2. Medium | **Physical Form:**<br>Liquid<br><br>**Volume:**<br>0-50ml | **S2:** Keep out of the reach of children<br>**S9:** Keep container in a well-ventilated place.<br>**S16:** Keep away from sources of ignition - No smoking.<br>**S26:** In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. |
| Methanol<br>$CH_3OH$ | 266<br>mg/m3 | Highly flammable (**R11**); Toxic by inhalation, in contact with skin, if swallowed (**R36**, **R37**, **R38**); danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed. | 2.<br>Medium | **Physical Form:**<br>Liquid<br><br>**Volume:**<br>0-50ml | **S16:** Keep away from sources of ignition.<br>**S24:** Avoid contact with skin.<br>**S33:** Take precautionary measures against static discharges.<br>**S36, S37:** Wear suitable protective clothing and gloves.<br>**S38:** In case of insufficient ventilation, wear suitable respiratory equipment.<br>**S45:** In case of accident or if you feel unwell, seek medical advice immediately.<br>**S63:** In case of accident by inhalation, remove casualty to fresh air and keep at rest. |

| | | | | | |
|---|---|---|---|---|---|
| EntellanNew® | 50ppm<br>220<br>mg/m3 | Flammable (**R10**).<br>Harmful (**R20**, **R21**). In contact with skin or inhaled.<br>Irritant (**R38**). | 2. Medium | **Physical Form:**<br>Liquid<br><br>**Volume:**<br>0-10ml | **S36, S37:** Wear suitable protective clothing and gloves. |

**WHO MAY BE EXPOSED AND HOW?** Consider different types of workers (e.g. lab. workers, cleaners, waste handlers) and routes of exposure (inhalation, ingestion, direct absorption or injection)

**Lab Technicians.**
**Students and staff undertaking phytolith extraction.**
**Other lab uses entering the workspace during processing – restricted to those who have undertaken lab induction training.**

| EXPOSURE POTENTIAL | LOW | MEDIUM | HIGH |
|---|---|---|---|
| ***Quantity used*** | 1g ☐ | 1g - 100g ☒ | >100g ☐ |
| ***Physical characteristics affecting exposure*** | Dense solid/ Non-volatile Liquid ☐ | Dusty solid/ Volatile Liquid ☒ | Gas/Aerosol/ Highly volatile liquid ☐ |
| ***Primary containment* (excluding fume cupboard, etc)** | Closed system ☐ | Partially closed system ☐ | Open system ☒ |
| ***Frequency of use*** | Occasional ☐ | Frequent ☒ | Continuous ☐ |

***OVERALL EXPOSURE POTENTIAL:*** **Negligible / Low** ☐ **Medium** ☒ **High** ☐

**METHODS OF PREVENTION OR CONTROL OF EXPOSURE**

**Access control e.g.:**

a) Is the work area (e.g. laboratory) restricted to competent personnel? **Yes – laboratory access requires induction training.**

b) Any other access controls? **Training must be undertaken in phytolith extraction prior to handling chemicals.**

**Engineering controls**

a) Will total containment be used to prevent exposure? **No.**

b) Will fume cupboard, or safety cabinet or other local exhaust ventilation be used to partially contain substance? **Where required e.g. HCl.**

c) Other? **N/A**

**What, if any, Personal Protective Equipment (PPE) is required?**

a) gloves (including type), etc. **Yes.**

b) eye protection? **Yes.**

c) other PPE? **Yes – lab coat.**

**Other Controls**
Identify any other control measures that are necessary to prevent or control exposure

**Special procedures**

a) Is a Standard Operating Procedure required for this work activity? **Yes.**

b) Is a Code of practice, Local Rules, etc. required for this activity? **Disposal streams to be complied with.**

**ASSESSMENT OF EXISTING CONTROLS**
You should state here if the existing available risk control measures are sufficient to prevent or adequately control exposure. If the work requires a specific code of practice, its identity should be written here. Note that the application of 'Good Laboratory Practices' is a minimum set of measures that must be applied for all activities using hazardous substances.

**Songo Mnara Project Specific SOP – see attached.**

**MONITORING OF EXPOSURE AND HEALTH SURVEILLANCE REQUIREMENTS**
Does the work require monitoring of exposure levels or health surveillance for the protection of health?
**No.**

**TRAINING REQUIREMENTS**
(Identify any specialised training that is required before work can commence)

The work activity consists of well documented routine procedures carried out frequently in a controlled environment and requiring only simple and easily understood instructions ☐

The work activity requires a specific SOP / scheme of work ☒

The activity is of such a simple nature and of such low risk that no special training is required ☐

The activity requires specific training to ensure that it is carried out safely* ☐

*If yes, list of specified training before work can commence

**STORAGE REQUIREMENTS**
(Note any special requirements, e.g., ventilation, incompatibility, etc.)

**Hydrochloric Acid:** Stored in the acids cupboard below the fume hood in Biology S Block Laboratory (until January 2016). Stored in the acids cupboard below the fume hood in Research Lab Env/209, Environment Building (from January 2016).
**Sodium Polutungstate (SPT):** Stored in wall mounted cupboard in Wet Preparation room, Biology S Block laboratory (until January 2016). Stored in phytolith consumables cupboard below work bench in Research Lab Env/209, Environment Building (from January 2016).
**Hydrogen Peroxide:** Stored in the alkali cupboard below the fume hood in Biology S Block Laboratory (until January 2016). Stored in the alkali cupboard below the fume hood in Research Lab Env/209, Environment Building (from January 2016).
**Sodium Hexametaphosphate:** No storage requirements.
**Acetone/Methanol:** Stored in closed container on

| | |
|---|---|
| | work benches within each lab in Biology S Block laboratory (until January 2016). Stored in alcohol storage cupboard below the fume hood and in closed container on work benches in Research Lab Env/209, Environment Building (from January 2016).<br>**Entellan™/Permount™:** Stored in the Microscope Room, Biology S-Block laboratory (until January 2016). Stored in the alcohol storage cupboard below below the fume hood in Research Lab Env/209, Environment Building (from January 2016). |
| **WASTE DISPOSAL ARRANGEMENTS**<br>(List **all** waste routes/packaging/arrangements to be used)<br><br>**Solvent waste stream:** un-evaporated acetone/methanol to be decanted to Flammable solvent waste bottle.<br>**Incineration stream:** Centrifuge tubes containing minimal residues of EntellanNew® will be sealed and disposed of via the incineration stream.<br>**Disposal of Acid/Alkali solutions, and Sodium Hexametaphosphate:** small volumes <500ml to be diluted and disposed of down the sink, after treatment with AviSafe. Water to be flushed through following disposal.<br>**Recycling:** Sodium Polytungstate soulution will be recycled for re-use; residues will be rinsed and filtered, before incineration.<br>**DEFRA Plant License Protocol:** All liquid deriving from direct or indirect (via equipment) contact with plant material or soils imported under the DEFRA Plant Health License will be treated with AviSafe before disposal down the sink. | **EMERGENCY SPILLAGE**<br>(Describe procedure – cross refer if appropriate)<br><br>**EntellanNew®:** Take up with liquid-absorbent material (e.g. Chemizorb® ). Dispose of properly. Clean up affected area. Do not allow to enter water source, cover drains. Collect, bind, and pump off spills.<br>**Sodium Polytungstate:** Take up mechanically, avoid dust formation. Do not allow to enter water source. Return to labelled, sealable plastic containers.<br>**Hydrogen Peroxide ($H_2O_2$):** Absorb in dry sand and place into containers. Ensure contaminated area is rinsed with water.<br>**Hydrochloric acid (HCl):** Absorb in dry sand and place into containers. Ensure contaminated area is rinsed with water.<br>**Acetone:** Absorb in dry sand and place into containers. Ensure contaminated area is rinsed with water.<br>**Methanol:** Absorb in dry sand and place into containers. Ensure contaminated area is rinsed with water. |

**DECLARATION**
The information on this form is accurate, to the best of my knowledge. All persons conducting this project have been thoroughly instructed and trained in the work and are competent to carry it out. When implemented, the selected control measures will ensure that any exposure to risk is not significant.
**Signed: H.McParland** (Group Leader) **Date: 30.10.12**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Review** | **Date** | 08.05.2014 | 16.08.16 | | | |
| | **Signed** | H. McParland | H.McParland | | | |

Appendix 4: Example Phytolith Count Sheet

| Site: Songo Mnara 2013 | | | Date: |
|---|---|---|---|
| Trench: | | Sample No: | |
| Context: | | GPS Location: | |
| Feature Type: | | Context Description: | |
| Phytolith Weight: | | | |
| Sample Weight: | | | |
| Weight Mounted: | | | |

| Morphotype Id. | SS/ MC | Count | Image ID # | Total |
|---|---|---|---|---|
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| | | | | |

| Site: Songo Mnara 2013 | Date: | Page: |
|---|---|---|

| Morphotype Id. | SS/ MC | Count | Image ID # | Total |
|---|---|---|---|---|
| | | | | |
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| | | | | |

| Other | | Count | Image ID # | Total |
|---|---|---|---|---|
| **Other Silicates** (e.g. Diatoms) | | | | |
| **Other Plant Microfossils** (e.g. Crystoliths/Spores etc.) | | | | |
| **Microcharcoal** | | | | |

**Observations:**

Appendix 5: FERA License

fera
The Food and Environment Research Agency

13 June 2013

Mr M. Von Tersch
University of York
Biology S. Block
Wentworth Way
Heslington
York
YO10 5DD

Our Ref PHL 106074

Dear Mr von Tersch,

**PLANT HEALTH LICENCE NO: 106074/198568-1**

1. Please find enclosed a copy of your renewed Plant Health Licence.

2. Please read the licence and enclosed explanatory leaflet carefully. It is your responsibility to ensure that all the conditions are observed. It is essential that all personnel who are involved in handling licensed material are also aware of the licence requirements and the precautions necessary to ensure that they are carried out.

3. Please see overleaf for details of our new electronic licensing system.

Yours sincerely

UK Plant Health Service
DEFRA

Guy Crouch
Plant Health Admin Support Team
**Direct Line** 01904 465618
**Fax** 01904 465628
**Email** guy.crouch@fera.gsi.gov.uk

cc. Sam Bishop
Katie Lacey
Paul Bratby

fera

The Food and Environment Research Agency

## Plant Health Licences - Fera Launch an Electronic Application System

From **22nd January 2013** a new system will be launched by Fera to allow the electronic application, amendment and renewal of plant health licences.

The electronic system, called IPML (Import of Prohibited Material Licensing), is accessed through the existing Fera Plant Health online application system called eDomero.

To use the eDomero system you will first need to be registered with the Government Gateway and enrolled for the eDomero service. If you are not already registered or enrolled, further information can be obtained at: http://www.fera.defra.gov.uk/plants/plantHealth/imports/licensing.cfm.
For part of this process you will be asked to provide your 'Known Facts'.
To obtain this information you will need to telephone Fera Plant Health on 01904-465626.

Once you are registered with the Government Gateway you will be able to access eDomero to apply for new applications, amend an existing licence or renew your licence electronically (see:http://edomero.defra.gov.uk/). A full set of guidance on how to use eDomero for each application type can be viewed at: http://www.fera.defra.gov.uk/plants/plantHealth/imports/licensing.cfm.

Please note that the format of your unique licence number will also change from **22nd January**. Your new licence number will be **106074/198568-1**.This number will remain constant, apart from the suffix which denotes the latest issue number, and should be quoted in all correspondence. An explanation of what constitutes the structure of this number is explained fully in the guidance mentioned above. Also from this date, notice to renew your licences will be sent to you direct by email to the following email address: richard.allen@york.ac.uk
You should then renew your licence using the eDomero system.
If you wish emails to be sent to a different email address than the one shown above, please send confirmation of the new email address to PlantHealth.Info@fera.gsi.gov.uk

If you have any questions about the new system, in the first instance please contact Fera PHSI at Sand Hutton, York on telephone: 01904-465618 or email: PlantHealth.Info@fera.gsi.gov.uk.

Fera Plant Health
Room 10GA01
Sand Hutton
York YO41 1LZ

Tel +44 (0)1904 465618
Fax +44 (0)1904 465628

defra
Department for Environment Food and Rural Affairs

**Department for Environment, Food and Rural Affairs**
**Welsh Government**

**THE PLANT HEALTH (ENGLAND) ORDER 2005**
**THE PLANT HEALTH (WALES) ORDER 2006**

**RESTRICTED - COMMERCIAL**

**Date :** 13/06/2013

# Licence to import, move and keep prohibited soil for chemical and physical analysis

**Licence No. 106074/198568/1**

**This licence is issued for the purposes of plant health legislation only and provides no authority in respect of any other matters, e.g. in relation to human or animal health. It is the applicant's responsibility to ensure that he/she complies with any other relevant regulations and requirements in addition to those relating to plant health.**

In pursuance of Part 8 of the Plant Health (England) Order 2005 and of the Plant Health (Wales) Order 2006 (hereafter referred to as 'the Orders') the Secretary of State of the Department for Environment, Food and Rural Affairs (hereafter referred to as 'the Secretary of State') in relation to England, and the Welsh Government, in relation to Wales, hereby authorises:

University of York
Biology S. Block
Wentworth Way
Heslington
YORK
YO10 5DD

('the licensee') to import, move and keep the material specified in Annex 1, subject to the limitations and conditions set out below.
The soil may be obtained or landed directly in England and Wales from the sources stated in Annex 1, and/or from licensed sources in England and Wales.

**1. Validity**
This licence is valid from 01 June 2013 but subject to annual review.

**2. Person(s) responsible**
The person(s) responsible for the soil and under whose direct supervision it shall be kept is:

Mr M. Von Tersch

**3. Containment facilities**
The material covered by this licence shall be held and used in:

Laboratory X/D001, Rooms G62 and G27 at King's Manor Laboratories S007, S008 annex, S012 and S005 in Biology S Block, Heslington Campus at the above address.

All consignments imported under the terms of this licence must be accompanied by a letter of authority as provided with this licence. For further details please refer to explanatory leaflet PHI 1.

**4. Precautions during transit**
Any material obtained under the terms of this licence must be conveyed directly to the containment facilities authorised under this licence.

The material shall be transported within an unbreakable container, which is within two additional layers of secure, closed packaging

**5. Standard Operating Procedures**
Standard Operating Procedures must be drawn up for the handling, containment and culturing of the material, and circulated to all personnel authorised to enter the approved facilities. These procedures must be displayed at all entrances to the approved facilities and be available for inspection by an authorised officer of the Secretary of State or of the Welsh Government.

**6. Notification**
In the event of the discovery on the licensee's premises of any non-indigenous plant pest or pathogen, the licensee must immediately notify the Plant Health and Seeds Inspectorate of the Food and Environment Research Agency, at Sand Hutton, York (hereafter referred to as "PHSI") or the local Plant Health and Seeds Inspector.

The licensee shall send to PHSI with any application for extension of this licence, full details of:

(a) all the material obtained under the licence in the previous 12 months;
(b) all material currently held under the licence;
(c) all licensed material destroyed in the previous 12 months;
(d) a list showing the personnel working with the licensed material and their relevant qualifications.

The licensee must notify PHSI when the activities to which this licence relates are completed and all materials have been destroyed.

The authority given by the licence shall be acknowledged, and the licence number quoted, in all publications relating to work with the licensed material.

**7. Inspection**
The licensee shall permit an authorised officer of the Secretary of State or of the Welsh Government to inspect the conditions under which the material is kept and shall allow samples of plants, plant pathogens and pests to be taken for scientific examinations. Records as required above (see 6. Notifications) must be made available on request during the inspection.

If required by an authorised officer of the Secretary of State or of the Secretary of State or of the Welsh Government, by written notice, the licensee must destroy or treat the licensed material at the licensee's own expense and risk, according to the terms specified in the notice.

**8. Containment**
All activities relating to the use of and keeping of the licensed material must be confined to the approved containment facilities. Except for destruction and disposal purposes (see 9. Destruction of Licensed Material and Associated waste), the material, including any infected/inoculated plants and control plants, must not be removed from the containment facilities without written permission from PHSI.

Access to the containment facilities shall be restricted to the licensee and personnel authorised by the licensee as specified in the sop.

The licensee must take all necessary precautions, as discussed and agreed with an authorised officer of the Secretary of State or of the Welsh Government, to prevent dissemination of the material from the containment facilities.

**9. Destruction of Licensed Material and Associated waste**
On arrival of the material at the licensee's premises, all accompanying packing material and any discarded or extraneous material, must be treated or destroyed according to the procedures described below.

When the activities using the licensed material are complete, the licensed material and any associated waste, infected/inoculated plants, control plants and soil must be treated on site as follows:

a) i) Incinerated

or

ii) Autoclaved. 121°C (15psi) must be maintained in the centre of the load for 30 minutes. If available, probes are to be used to monitor temperature and vacuuming or "free steaming" used to reduce the amount of air in the load. The autoclave must be loaded so as to comply with the manufacturers' instructions.

b) Following treatment, as above, the remaining material should be disposed of at an authorised landfill or similar disposal site.

All equipment and containment facilities used in association with the licensed material must be suitably treated after use as detailed in the approved Standard Operating Procedure.

**10. Sending licensed material to other persons or organisations**
The Material covered by this licence may be sent to persons or organisations who hold a current Plant Health licence providing written agreement has first been obtained from PHSI. Material may also be sent to persons or organisations overseas who have authority from their national plant health authorities to receive such material.

**11. Revocation/variation**
This licence may be varied or revoked by the Secretary of State of the Department for Environment, Food and Rural Affairs and of the Welsh Government, at any time

Signed and Dated: 13 JUN 2013

UK Plant Health Service
DEFRA

pp **PAUL KILBY**
For and on behalf of the Secretary of State of the Department for Environment, Food and Rural Affairs and of the Welsh Government.

# Licence to import, move and keep prohibited soil for chemical and physical analysis

**Licence No. 106074/198568/1**

1. **The material covered by this licence:**

   Soil and sediment
   Amount: 20 kg per consignment
   From: All countries

2. **The work to be undertaken is:**

   Analysis of imported samples for archaeological purposes, including assessment of microfossils, shell fragments and artefact material.

3. **Special Precautions**

   Plants must not be grown in the imported samples

   No living organisms (including micro-organisms) are to be isolated from the soil.

---

**PHSI can be contacted at:**

**The Food and Environment Research Agency (Fera)**
**Plant Health and Seeds Inspectorate**
**Room 10GA01**
**Sand Hutton**
**York**
**YO41 1LZ**

**Tel: 01904 465618**
**Fax: 01904 465628**

**Your local Plant Health and Seeds Inspector can be contacted at:**

**Tel: 07831 157583**
**Email: Amanda.riley@fera.gsi.gov.uk**

1. Name and address of consignor/Plant protection organization of the country of origin

# Letter of Authority

for the introduction and/or movement of harmful organisms, plants, plant products and other objects for trial or scientific purposes and for work on varietal selections
( issued under Directive 2008/61/EC )

2. Name and address of person responsible for the approved activities

Mr M. Von Tersch
University of York
Biology S. Block
Wentworth Way
Heslington
York
YO10 5DD

3. Name of the responsible official body of the Member State of issue

**Department for Environment, Food and Rural Affairs (Defra)**
**Welsh Government**

4. Address and description of the specific site or sites for quarantine containment

Laboratory X/D001, Rooms G62 and G27 at King's Manor Laboratories S007, S008 annex, S012 and S005 in Biology S Block, Heslington Campus at the above address.

5. Place of origin (documentary evidence attached for material originating in a third country)

As per description in box 8

6. Plant passport number:

or Phytosanitary certificate number:

7. Declared point of entry for material introduced from a third country

Great Britain

8. Scientific name(s) of the material, including the harmful organisms concerned:

Soil and sediment
Amount: 20 kg per consignment
From: All countries

9. Quantity of material

As Required

10. Type of material

Licence to import, move and keep prohibited soil for chemical and physical analysis

11. Additional declaration

**This material is introduced into/moved within (1) the Community under Commission Directive 2008/61/EC**

**and Defra plant health licence no 106074/198568/1**

12. Additional information

**Valid Until 31 May 2014**

13. Endorsement by the responsible official body of the Member State of origin of the material

Place of endorsement:

Date:

Signature of authorized officer:

Name in BLOCK LETTERS

14. Stamp of the responsible official body of issue

Place of issue: York

Date: 13 JUN 2013

Signature of authorized officer:

Name in BLOCK LETTERS
Guy Crouch

UK Plant Health Service
DEFRA

Appendix 6: Phytolith Raw Counts per Sample

Appendix 6: Total Raw Phytolith Counts Per Sample

| Area | Sample Number 'GT' | Phytoliths Present | Poaceae | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Leaf Elements | | | | | | | | | | | | Inflorescence | | | Other | | |
| | | | Unidentified cf. | Saddle Short Cell | Bilobate Short Cell | cf. Bilobate Short Cell | Parallelepipedal Bulliform | cf. Oryza Type Bulliform | Parallelepipedal Bulliform Silica Skeleton | Smooth Elongate | Smooth Elongate Silica Skeleton | cf. Elongate | cf. Elongate Silica Skeleton | Sinuate Elongate | Dendritic | Dendritic Silica Skeleton | Rondel | Prickle | TOTAL |
| Open Areas (adjacent to structure SM32) | 24 | Yes | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| | 47 | Yes | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 8 | 0 | 4 | 0 | 0 | 0 | 0 | 1 | 1 | 17 |
| | 69 | Yes | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 1 | 6 | 0 | 1 | 0 | 0 | 0 | 0 | 33 |
| | 71 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 102 | Yes | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| | 133 | Yes | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| | 135 | Yes | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 3 | 5 | 0 | 0 | 0 | 0 | 0 | 13 |
| | 149 | Yes | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 |
| | 151 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| | 176 | Yes | 1 | 0 | 0 | 0 | 1 | 0 | 2 | 27 | 3 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 41 |
| | 178 | No | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 180 | Yes | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 15 | 5 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 26 |
| | 182 | Yes | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 1 | 0 | 0 | 0 | 0 | 0 | 11 |
| | 184 | Yes | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 47 | 0 | 9 | 1 | 0 | 0 | 0 | 0 | 1 | 63 |
| | 186 | Yes | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 5 | 1 | 1 | 0 | 0 | 0 | 0 | 12 |
| | 201 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 203 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 205 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| | 207 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 2 | 0 | 0 | 0 | 0 | 0 | 27 |
| | 209 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| | 234 | Yes | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 4 | 0 | 3 | 1 | 0 | 0 | 0 | 0 | 1 | 11 |
| | 254 | No | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 263 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| | 267 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |

Appendix 6: Total Raw Phytolith Counts Per Sample

| Area | Sample Number 'GT' | Phytoliths Present | Poaceae | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Leaf Elements | | | | | | | | | | | | Inflorescence | | | Other | | |
| | | | Unidentified cf. | Saddle Short Cell | Bilobate Short Cell | cf. Bilobate Short Cell | Parallelepipedal Bulliform | cf. Oryza Type Bulliform | Parallelepipedal Bulliform Silica Skeleton | Smooth Elongate | Smooth Elongate Silica Skeleton | cf. Elongate | cf. Elongate Silica Skeleton | Sinuate Elongate | Dendritic | Dendritic Silica Skeleton | Rondel | Prickle | TOTAL |
| External Context Associated with Structure | 20 | No | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 22 | Yes | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| | 43[1] | Yes | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 |
| | 65 | Yes | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| | 67 | Yes | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 6 | 3 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 15 |
| | 98 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| | 100 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| | 129 | Yes | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 12 | 0 | 5 | 0 | 0 | 0 | 0 | 1 | 0 | 21 |
| | 131 | Yes | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| | 155 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| | 157 | Yes | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 6 | 0 | 1 | 0 | 0 | 0 | 0 | 18 |
| | 238[1] | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 2 |
| | 271[1] | Yes | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 7 | 1 | 0 | 0 | 0 | 0 | 0 | 12 |
| Daub Structure Interior | 14 | Yes | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 3 | 3 | 0 | 1 | 0 | 0 | 0 | 1 | 27 |
| | 16 | Yes | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 2 | 3 | 0 | 0 | 0 | 0 | 0 | 19 |
| | 18 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 |
| | 39 | Yes | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 |
| | 41 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| | 61 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30 | 7 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 39 |
| | 88 | Yes | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 28 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 35 |
| | 90 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 92 | Yes | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 14 | 0 | 7 | 1 | 0 | 0 | 0 | 0 | 0 | 23 |
| | 94 | Yes | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 9 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 15 |
| | 96 | Yes | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 8 | 1 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 17 |
| | 121 | Yes | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 13 | 0 | 8 | 1 | 0 | 0 | 0 | 0 | 0 | 25 |
| | 123 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| | 125 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 12 | 4 | 13 | 1 | 0 | 0 | 0 | 0 | 0 | 31 |
| | 127 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 5 |

Non-Viable Samples

No data Samples 45, 63, 159, 211, 249, 258
Sample not selected as security/context of deposit unclear - sample 242
Not assessed due to intrusive feature - sample 250

Appendix 7: Normalised Phytolith Ratios by Percentage of Sample Total

| Area | Sample Number 'GT' | Phytoliths Present | Non-Poaceae Monocots | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Arecaceae Echinate Sphere | cf. Arecaceae Echinate Sphere | Rectangular 'Blocky' | Rectnagular 'Blocky' Silica Skeleton | cf. Cyperaceae Achene Silica Skeleton | TOTAL |
| Open Areas (adjacent to structure SM32) | 24 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 47 | Yes | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.5 |
| | 69 | Yes | 0.0 | 0.0 | 0.8 | 0.0 | 0.0 | 0.8 |
| | 71 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 102 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 133 | Yes | 0.0 | 0.0 | 3.8 | 0.0 | 0.0 | 3.8 |
| | 135 | Yes | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.4 |
| | 149 | Yes | 4.8 | 0.0 | 4.8 | 0.0 | 0.0 | 9.5 |
| | 151 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 176 | Yes | 0.0 | 0.0 | 1.9 | 0.0 | 0.0 | 1.9 |
| | 178 | No | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 180 | Yes | 1.1 | 0.0 | 0.7 | 0.0 | 0.0 | 1.8 |
| | 182 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 184 | Yes | 0.0 | 0.5 | 0.5 | 0.0 | 0.0 | 1.0 |
| | 186 | Yes | 0.0 | 0.0 | 5.3 | 0.0 | 0.0 | 5.3 |
| | 201 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 203 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 205 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 207 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 209 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 234 | Yes | 0.0 | 0.4 | 1.2 | 0.0 | 0.0 | 1.5 |
| | 254 | No | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 263 | Yes | 0.0 | 0.0 | 1.2 | 0.0 | 0.0 | 1.2 |
| | 267 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Appendix 7: Normalised Phytolith Ratios by Percentage of Sample Total

| Area | Sample Number 'GT' | Phytoliths Present | Non-Poaceae Monocots | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Arecaceae Echinate Sphere | cf. Arecaceae Echinate Sphere | Rectangular 'Blocky' | Rectnagular 'Blocky' Silica Skeleton | cf. Cyperaceae Achene Silica Skeleton | TOTAL |
| External Context Associated with Structure | 20 | No | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 22 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 43[1] | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 65 | Yes | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 |
| | 67 | Yes | 0.7 | 0.7 | 1.5 | 0.0 | 0.0 | 3.0 |
| | 98 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 100 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 129 | Yes | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 |
| | 131 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 155 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 157 | Yes | 0.0 | 1.0 | 0.5 | 0.0 | 0.0 | 1.6 |
| | 238[1] | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 271[1] | Yes | 0.0 | 0.0 | 2.3 | 0.0 | 0.0 | 2.3 |
| Daub Structure Interior | 14 | Yes | 0.4 | 0.0 | 0.9 | 0.4 | 0.0 | 1.8 |
| | 16 | Yes | 1.9 | 0.0 | 1.9 | 0.0 | 0.0 | 3.7 |
| | 18 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 39 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 41 | Yes | 9.1 | 0.0 | 0.0 | 0.0 | 0.0 | 9.1 |
| | 61 | Yes | 0.0 | 0.0 | 1.8 | 0.0 | 0.5 | 2.3 |
| | 88 | Yes | 2.6 | 0.0 | 0.0 | 0.0 | 0.5 | 3.1 |
| | 90 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 92 | Yes | 0.0 | 2.2 | 0.0 | 0.0 | 0.0 | 2.2 |
| | 94 | Yes | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 1.0 |
| | 96 | Yes | 0.0 | 0.6 | 0.0 | 0.0 | 0.0 | 0.6 |
| | 121 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 123 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 125 | Yes | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 |
| | 127 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Non-Viable Samples | No data Samples 45, 63, 159, 211, 249, 258<br>Sample not selected as security/context of deposit unclear - sample 242<br>Not assessed due to intrusive feature - sample 250 | | | | | | | |

Appendix 6: Total Raw Phytolith Counts Per Sample

| Area | Sample Number 'GT' | Phytoliths Present | Dicotyledons | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Wood/Leaf Elements | | | | | | | | | |
| | | | Globular Granulate | Globular Smooth | Globular Silicon Skeleton | Unidentified | cf. Tabular Trapezoid | Tabular Ridged | Vascular Cell or Tissue/Tracheid | cf. Vascular Cell or Tissue/Tracheid (Incomplete) | Vascular Cell or Tissue/Tracheid Silica Skeleton | TOTAL |
| Open Areas (adjacent to structure SM32) | 24 | Yes | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 47 | Yes | 0 | 7 | 0 | 0 | 0 | 0 | 98 | 2 | 39 | 146 |
| | 69 | Yes | 7 | 0 | 0 | 0 | 0 | 1 | 122 | 8 | 24 | 162 |
| | 71 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 102 | Yes | 1 | 0 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 15 |
| | 133 | Yes | 0 | 1 | 2 | 0 | 0 | 0 | 29 | 4 | 7 | 43 |
| | 135 | Yes | 3 | 0 | 0 | 2 | 0 | 0 | 138 | 4 | 50 | 197 |
| | 149 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 151 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 176 | Yes | 2 | 5 | 0 | 0 | 0 | 0 | 95 | 1 | 47 | 150 |
| | 178 | No | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 180 | Yes | 1 | 2 | 0 | 0 | 0 | 0 | 80 | 1 | 149 | 233 |
| | 182 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 184 | Yes | 0 | 1 | 0 | 0 | 0 | 0 | 56 | 9 | 17 | 83 |
| | 186 | Yes | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 3 |
| | 201 | Yes | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 203 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 205 | Yes | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| | 207 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| | 209 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 234 | Yes | 1 | 1 | 0 | 0 | 0 | 0 | 166 | 2 | 47 | 217 |
| | 254 | No | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 263 | Yes | 2 | 2 | 0 | 8 | 0 | 0 | 16 | 2 | 3 | 33 |
| | 267 | Yes | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 5 | 1 | 9 |

Appendix 6: Total Raw Phytolith Counts Per Sample

| Area | Sample Number 'GT' | Phytoliths Present | Dicotyledons | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Wood/Leaf Elements | | | | | | | | | |
| | | | Globular Granulate | Globular Smooth | Globular Silicon Skeleton | Unidentified | cf. Tabular Trapezoid | Tabular Ridged | Vascular Cell or Tissue/Tracheid | cf. Vascular Cell or Tissue/Tracheid (Incomplete) | Vascular Cell or Tissue/Tracheid Silica Skeleton | TOTAL |
| External Context Associated with Structure | 20 | No | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 22 | Yes | 0 | 0 | 0 | 0 | 0 | 1 | 14 | 2 | 1 | 19 |
| | 43[1] | Yes | 0 | 20 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 28 |
| | 65 | Yes | 0 | 3 | 0 | 0 | 0 | 0 | 19 | 14 | 7 | 43 |
| | 67 | Yes | 1 | 1 | 0 | 0 | 0 | 0 | 42 | 8 | 15 | 67 |
| | 98 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 100 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 129 | Yes | 0 | 1 | 0 | 0 | 0 | 0 | 100 | 5 | 17 | 123 |
| | 131 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 4 | 10 | 25 |
| | 155 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 157 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 112 | 6 | 31 | 149 |
| | 238[1] | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 2 | 11 |
| | 271[1] | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 4 | 5 | 17 |
| Daub Structure Interior | 14 | Yes | 0 | 1 | 0 | 0 | 0 | 0 | 168 | 3 | 3 | 175 |
| | 16 | Yes | 1 | 6 | 0 | 0 | 1 | 0 | 29 | 0 | 3 | 40 |
| | 18 | Yes | 0 | 4 | 0 | 0 | 0 | 0 | 156 | 2 | 9 | 171 |
| | 39 | Yes | 0 | 0 | 0 | 1 | 0 | 0 | 152 | 0 | 0 | 153 |
| | 41 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 61 | Yes | 0 | 15 | 0 | 0 | 0 | 0 | 76 | 13 | 7 | 111 |
| | 88 | Yes | 0 | 2 | 0 | 4 | 0 | 0 | 90 | 20 | 0 | 116 |
| | 90 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 92 | Yes | 2 | 3 | 0 | 0 | 0 | 0 | 30 | 8 | 23 | 66 |
| | 94 | Yes | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 62 | 67 |
| | 96 | Yes | 1 | 3 | 0 | 0 | 0 | 0 | 90 | 11 | 21 | 126 |
| | 121 | Yes | 1 | 5 | 0 | 0 | 0 | 0 | 59 | 8 | 29 | 102 |
| | 123 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 1 | 7 |
| | 125 | Yes | 0 | 4 | 0 | 0 | 0 | 0 | 50 | 6 | 26 | 86 |
| | 127 | Yes | 0 | 6 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 14 |
| Non-Viable Samples | No data Samples 45, 63, 159, 211, 249, 258<br>Sample not selected as security/context of deposit unclear - sample 242<br>Not assessed due to intrusive feature - sample 250 | | | | | | | | | | | |

Appendix 6: Total Raw Phytolith Counts Per Sample

| Area | Sample Number 'GT' | Phytoliths Present | Eudicots and Basal Angiosperms | | | | Others | | | | TOTALS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Cell Type | | |
| | | | cf. Cucurbitaceae | Mesophyll Palisade Cell Silica Skeleton | Stomata Cell | cf. Hair Cell | Epidermal Single Cell | Epidermal Silica Skeleton | cf. Epidermal Cell | Unidentified | Single Cell | Multi Cell | TOTAL PHYTOLITH COUNT |
| Open Areas (adjacent to structure SM32) | 24 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 16 |
| | 47 | Yes | 1 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 132 | 39 | 184 |
| | 69 | Yes | 0 | 2 | 0 | 0 | 15 | 5 | 5 | 5 | 192 | 32 | 242 |
| | 71 | Yes | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 4 | 5 | 0 | 9 |
| | 102 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 14 | 26 |
| | 133 | Yes | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 2 | 45 | 11 | 78 |
| | 135 | Yes | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 156 | 56 | 232 |
| | 149 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 0 | 21 |
| | 151 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 5 |
| | 176 | Yes | 0 | 0 | 1 | 1 | 0 | 4 | 4 | 1 | 146 | 56 | 211 |
| | 178 | No | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 180 | Yes | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 0 | 110 | 158 | 272 |
| | 182 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 1 | 13 |
| | 184 | Yes | 0 | 0 | 0 | 12 | 0 | 8 | 8 | 4 | 146 | 26 | 199 |
| | 186 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 1 | 19 |
| | 201 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 0 | 13 |
| | 203 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 33 |
| | 205 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 17 |
| | 207 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 28 | 2 | 31 |
| | 209 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 25 |
| | 234 | Yes | 0 | 0 | 0 | 0 | 0 | 7 | 7 | 0 | 184 | 55 | 259 |
| | 254 | No | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 263 | Yes | 0 | 0 | 0 | 1 | 1 | 22 | 22 | 3 | 43 | 25 | 84 |
| | 267 | Yes | 0 | 3 | 0 | 0 | 0 | 3 | 3 | 0 | 15 | 8 | 27 |

Appendix 6: Total Raw Phytolith Counts Per Sample

| Area | Sample Number 'GT' | Phytoliths Present | Eudicots and Basal Angiosperms | | | | Others | | | | TOTALS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Cell Type | | |
| | | | cf. Cucurbitaceae | Mesophyll Palisade Cell Silica Skeleton | Stomata Cell | cf. Hair Cell | Epidermal Single Cell | Epidermal Silica Skeleton | cf. Epidermal Cell | Unidentified | Single Cell | Multi Cell | TOTAL PHYTOLITH COUNT |
| External Context Associated with Structure | 20 | No | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 22 | Yes | 0 | 0 | 0 | 0 | 3 | 2 | 2 | 31 | 30 | 3 | 64 |
| | 43[1] | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 10 | 33 | 8 | 51 |
| | 65 | Yes | 0 | 0 | 0 | 0 | 7 | 1 | 2 | 17 | 51 | 9 | 77 |
| | 67 | Yes | 0 | 1 | 0 | 0 | 2 | 7 | 7 | 32 | 77 | 26 | 135 |
| | 98 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 3 | 11 | 0 | 14 |
| | 100 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 |
| | 129 | Yes | 0 | 0 | 0 | 1 | 1 | 12 | 1 | 16 | 131 | 29 | 176 |
| | 131 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 22 | 11 | 38 |
| | 155 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 |
| | 157 | Yes | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 18 | 142 | 31 | 191 |
| | 238[1] | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 10 | 3 | 14 |
| | 271[1] | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57 | 24 | 7 | 88 |
| Daub Structure Interior | 14 | Yes | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 16 | 200 | 9 | 225 |
| | 16 | Yes | 0 | 1 | 0 | 0 | 2 | 19 | 0 | 23 | 59 | 26 | 108 |
| | 18 | Yes | 0 | 0 | 0 | 0 | 4 | 2 | 3 | 16 | 172 | 11 | 199 |
| | 39 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 26 | 176 | 0 | 202 |
| | 41 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 6 | 0 | 11 |
| | 61 | Yes | 0 | 1 | 0 | 0 | 3 | 16 | 4 | 41 | 147 | 32 | 220 |
| | 88 | Yes | 1 | 0 | 0 | 3 | 0 | 0 | 5 | 30 | 165 | 1 | 196 |
| | 90 | Yes | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 8 | 2 | 2 | 12 |
| | 92 | Yes | 0 | 0 | 0 | 0 | 2 | 15 | 0 | 28 | 70 | 39 | 137 |
| | 94 | Yes | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 9 | 24 | 63 | 96 |
| | 96 | Yes | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 18 | 124 | 24 | 166 |
| | 121 | Yes | 0 | 0 | 0 | 0 | 0 | 7 | 4 | 25 | 100 | 38 | 163 |
| | 123 | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 8 | 1 | 10 |
| | 125 | Yes | 0 | 0 | 0 | 0 | 2 | 15 | 0 | 20 | 88 | 47 | 155 |
| | 127 | Yes | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 10 | 18 | 2 | 30 |
| Non-Viable Samples | No data Samples 45, 63, 159, 211, 249, 258<br>Sample not selected as security/context of deposit unclear - sample 242<br>Not assessed due to intrusive feature - sample 250 | | | | | | | | | | | | |

Appendix 7: Normalised Phytolith Ratios by Percentage of Sample Total

| Area | Sample Number 'GT' | Phytoliths Present | Poaceae | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Leaf Elements | | | | | | | | | | | | Inflorescence | | | Other | | |
| | | | Unidentified cf. | Saddle Short Cell | Bilobate Short Cell | cf. Bilobate Short Cell | Parallelepipedal Bulliform | cf. Oryza Type Bulliform | Parallelepipedal Bulliform Silica Skeleton | Smooth Elongate | Smooth Elongate Silica Skeleton | cf. Elongate | cf. Elongate Silica Skeleton | Sinuate Elongate | Dendritic | Dendritic Silica Skeleton | Rondel | Prickle | TOTAL |
| Open Areas (adjacent to structure SM32) | 24 | Yes | 6.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 31.3 | 0.0 | 12.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 50.0 |
| | 47 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 1.6 | 0.0 | 0.0 | 4.3 | 0.0 | 2.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.5 | 9.2 | |
| | 69 | Yes | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 9.9 | 0.4 | 2.5 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 13.6 | |
| | 71 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| | 102 | Yes | 0.0 | 0.0 | 3.8 | 0.0 | 0.0 | 0.0 | 0.0 | 3.8 | 0.0 | 19.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 26.9 | |
| | 133 | Yes | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.6 | 0.0 | 3.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.7 | |
| | 135 | Yes | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.0 | 1.3 | 2.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.6 | |
| | 149 | Yes | 4.8 | 0.0 | 4.8 | 0.0 | 0.0 | 0.0 | 0.0 | 52.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 61.9 | |
| | 151 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 80.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 80.0 | |
| | 176 | Yes | 0.5 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.9 | 12.8 | 1.4 | 3.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 19.4 | |
| | 178 | No | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| | 180 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 0.0 | 0.0 | 5.5 | 1.8 | 1.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 9.6 | |
| | 182 | Yes | 7.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 69.2 | 7.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 84.6 | |
| | 184 | Yes | 2.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 23.6 | 0.0 | 4.5 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 31.7 | |
| | 186 | Yes | 15.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.5 | 0.0 | 26.3 | 5.3 | 5.3 | 0.0 | 0.0 | 0.0 | 0.0 | 63.2 | |
| | 201 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| | 203 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 | |
| | 205 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.9 | 0.0 | 11.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 17.6 | |
| | 207 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 80.6 | 6.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 87.1 | |
| | 209 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 12.0 | 0.0 | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 32.0 | |
| | 234 | Yes | 0.0 | 0.0 | 0.0 | 0.4 | 0.4 | 0.0 | 0.0 | 1.5 | 0.0 | 1.2 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 4.2 | |
| | 254 | No | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| | 263 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.2 | 0.0 | 7.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 8.3 | |
| | 267 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 22.2 | 3.7 | 3.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 29.6 | |

Appendix 7: Normalised Phytolith Counts by Percentage of Sample Assemblage

Appendix 7: Normalised Phytolith Ratios by Percentage of Sample Total

| Area | Sample Number 'GT' | Phytoliths Present | Poaceae | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Leaf Elements | | | | | | | | | | | | Inflorescence | | | Other | | |
| | | | Unidentified cf. | Saddle Short Cell | Bilobate Short Cell | cf. Bilobate Short Cell | Parallelepipedal Bulliform | cf. Oryza Type Bulliform | Parallelepipedal Bulliform Silica Skeleton | Smooth Elongate | Smooth Elongate Silica Skeleton | cf. Elongate | cf. Elongate Silica Skeleton | Sinuate Elongate | Dendritic | Dendritic Silica Skeleton | Rondel | Prickle | TOTAL |
| External Context Associated with Structure | 20 | No | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 22 | Yes | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.1 | 0.0 | 6.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.9 |
| | 43[1] | Yes | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 5.9 |
| | 65 | Yes | 0.0 | 0.0 | 0.0 | 1.3 | 0.0 | 0.0 | 0.0 | 2.6 | 1.3 | 2.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.8 |
| | 67 | Yes | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 4.4 | 2.2 | 3.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 11.1 |
| | 98 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 42.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 42.9 |
| | 100 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 66.7 | 0.0 | 33.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100. |
| | 129 | Yes | 1.1 | 0.0 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 | 6.8 | 0.0 | 2.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 | 11.9 |
| | 131 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 2.6 | 0.0 | 0.0 | 7.9 | 2.6 | 7.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 21.1 |
| | 155 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100. |
| | 157 | Yes | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.2 | 0.0 | 3.1 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 9.4 |
| | 238[1] | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.1 | 0.0 | 0.0 | 0.0 | 0.0 | 7.1 | 0.0 | 0.0 | 14.3 |
| | 271[1] | Yes | 1.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.3 | 1.1 | 8.0 | 1.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 13.6 |
| Daub Structure Interior | 14 | Yes | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 8.0 | 1.3 | 1.3 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.4 | 0.0 | 12.0 |
| | 16 | Yes | 1.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 11.1 | 0.0 | 1.9 | 2.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 17.6 |
| | 18 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 1.5 |
| | 39 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 | 5.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.9 |
| | 41 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 36.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 36.4 |
| | 61 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 13.6 | 3.2 | 0.5 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 17.7 |
| | 88 | Yes | 0.5 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 14.3 | 0.0 | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 17.9 |
| | 90 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 8.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 8.3 |
| | 92 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 10.2 | 0.0 | 5.1 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 16.8 |
| | 94 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 3.1 | 0.0 | 9.4 | 0.0 | 2.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 15.6 |
| | 96 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 1.2 | 0.0 | 0.0 | 4.8 | 0.6 | 3.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.2 |
| | 121 | Yes | 0.6 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 | 0.6 | 8.0 | 0.0 | 4.9 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 15.3 |
| | 123 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 180.0 | 0.0 | 10.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 20.0 |
| | 125 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 7.7 | 2.6 | 8.4 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 20.0 |
| | 127 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.3 | 10.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.3 | 0.0 | 16.7 |

Non-Viable Samples

No data Samples 45, 63, 159, 211, 249, 258
Sample not selected as security/context of deposit unclear - sample 242
Not assessed due to intrusive feature - sample 250

Appendix 7: Normalised Phytolith Ratios by Percentage of Sample Total

| Area | Sample Number 'GT' | Phytoliths Present | Non-Poaceae Monocots | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Arecaceae Echinate Sphere | cf. Arecaceae Echinate Sphere | Rectangular 'Blocky' | Rectnagular 'Blocky' Silica Skeleton | cf. Cyperaceae Achene Silica Skeleton | TOTAL |
| Open Areas (adjacent to structure SM32) | 24 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 47 | Yes | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 0.5 |
| | 69 | Yes | 0.0 | 0.0 | 0.8 | 0.0 | 0.0 | 0.8 |
| | 71 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 102 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 133 | Yes | 0.0 | 0.0 | 3.8 | 0.0 | 0.0 | 3.8 |
| | 135 | Yes | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.4 |
| | 149 | Yes | 4.8 | 0.0 | 4.8 | 0.0 | 0.0 | 9.5 |
| | 151 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 176 | Yes | 0.0 | 0.0 | 1.9 | 0.0 | 0.0 | 1.9 |
| | 178 | No | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 180 | Yes | 1.1 | 0.0 | 0.7 | 0.0 | 0.0 | 1.8 |
| | 182 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 184 | Yes | 0.0 | 0.5 | 0.5 | 0.0 | 0.0 | 1.0 |
| | 186 | Yes | 0.0 | 0.0 | 5.3 | 0.0 | 0.0 | 5.3 |
| | 201 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 203 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 205 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 207 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 209 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 234 | Yes | 0.0 | 0.4 | 1.2 | 0.0 | 0.0 | 1.5 |
| | 254 | No | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 263 | Yes | 0.0 | 0.0 | 1.2 | 0.0 | 0.0 | 1.2 |
| | 267 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Appendix 7: Normalised Phytolith Ratios by Percentage of Sample Total

| Area | Sample Number 'GT' | Phytoliths Present | Non-Poaceae Monocots | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Arecaceae Echinate Sphere | cf. Arecaceae Echinate Sphere | Rectangular 'Blocky' | Rectnagular 'Blocky' Silica Skeleton | cf. Cyperaceae Achene Silica Skeleton | TOTAL |
| External Context Associated with Structure | 20 | No | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 22 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 43[1] | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 65 | Yes | 1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 |
| | 67 | Yes | 0.7 | 0.7 | 1.5 | 0.0 | 0.0 | 3.0 |
| | 98 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 100 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 129 | Yes | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 |
| | 131 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 155 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 157 | Yes | 0.0 | 1.0 | 0.5 | 0.0 | 0.0 | 1.6 |
| | 238[1] | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 271[1] | Yes | 0.0 | 0.0 | 2.3 | 0.0 | 0.0 | 2.3 |
| Daub Structure Interior | 14 | Yes | 0.4 | 0.0 | 0.9 | 0.4 | 0.0 | 1.8 |
| | 16 | Yes | 1.9 | 0.0 | 1.9 | 0.0 | 0.0 | 3.7 |
| | 18 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 39 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 41 | Yes | 9.1 | 0.0 | 0.0 | 0.0 | 0.0 | 9.1 |
| | 61 | Yes | 0.0 | 0.0 | 1.8 | 0.0 | 0.5 | 2.3 |
| | 88 | Yes | 2.6 | 0.0 | 0.0 | 0.0 | 0.5 | 3.1 |
| | 90 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 92 | Yes | 0.0 | 2.2 | 0.0 | 0.0 | 0.0 | 2.2 |
| | 94 | Yes | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 1.0 |
| | 96 | Yes | 0.0 | 0.6 | 0.0 | 0.0 | 0.0 | 0.6 |
| | 121 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 123 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 125 | Yes | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 |
| | 127 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Non-Viable Samples | No data Samples 45, 63, 159, 211, 249, 258<br>Sample not selected as security/context of deposit unclear - sample 242<br>Not assessed due to intrusive feature - sample 250 | | | | | | | |

Appendix 7: Normalised Phytolith Ratios by Percentage of Sample Total

| Area | Sample Number 'GT' | Phytoliths Present | Dicotyledons | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Wood/Leaf Elements | | | | | | | | | |
| | | | Globular Granulate | Globular Smooth | Globular Silicon Skeleton | Unidentified | cf. Tabular Trapezoid | Tabular Ridged | Vascular Cell or Tissue/Tracheid | cf. Vascular Cell or Tissue/Tracheid (Incomplete) | Vascular Cell or Tissue/Tracheid Silica Skeleton | TOTAL |
| Open Areas (adjacent to structure SM32) | 24 | Yes | 0.0 | 6.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.3 |
| | 47 | Yes | 0.0 | 3.8 | 0.0 | 0.0 | 0.0 | 0.0 | 53.3 | 1.1 | 21.2 | 79.3 |
| | 69 | Yes | 2.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 50.4 | 3.3 | 9.9 | 66.9 |
| | 71 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 102 | Yes | 3.8 | 0.0 | 53.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 57.7 |
| | 133 | Yes | 0.0 | 1.3 | 2.6 | 0.0 | 0.0 | 0.0 | 37.2 | 5.1 | 9.0 | 55.1 |
| | 135 | Yes | 1.3 | 0.0 | 0.0 | 0.9 | 0.0 | 0.0 | 59.5 | 1.7 | 21.6 | 84.9 |
| | 149 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 151 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 176 | Yes | 0.9 | 2.4 | 0.0 | 0.0 | 0.0 | 0.0 | 45.0 | 0.5 | 22.3 | 71.1 |
| | 178 | No | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 180 | Yes | 0.4 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 29.4 | 0.4 | 54.8 | 85.7 |
| | 182 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 184 | Yes | 0.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 28.1 | 4.5 | 8.5 | 41.7 |
| | 186 | Yes | 0.0 | 0.0 | 0.0 | 15.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 15.8 |
| | 201 | Yes | 0.0 | 7.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.7 |
| | 203 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 205 | Yes | 0.0 | 23.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 23.5 |
| | 207 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.2 | 0.0 | 0.0 | 3.2 |
| | 209 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 234 | Yes | 0.4 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 64.1 | 0.8 | 18.1 | 83.8 |
| | 254 | No | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 263 | Yes | 2.4 | 2.4 | 0.0 | 9.5 | 0.0 | 0.0 | 19.0 | 2.4 | 3.6 | 39.3 |
| | 267 | Yes | 3.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.4 | 18.5 | 3.7 | 33.3 |

Appendix 7: Normalised Phytolith Ratios by Percentage of Sample Total

| Area | Sample Number 'GT' | Phytoliths Present | Dicotyledons | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Wood/Leaf Elements | | | | | | | | | |
| | | | Globular Granulate | Globular Smooth | Globular Silicon Skeleton | Unidentified | cf. Tabular Trapezoid | Tabular Ridged | Vascular Cell or Tissue/Tracheid | cf. Vascular Cell or Tissue/Tracheid (Incomplete) | Vascular Cell or Tissue/Tracheid Silica Skeleton | TOTAL |
| External Context Associated with Structure | 20 | No | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 22 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.6 | 21.9 | 3.1 | 1.6 | 29.7 |
| | 43[1] | Yes | 0.0 | 39.2 | 15.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 54.9 |
| | 65 | Yes | 0.0 | 3.9 | 0.0 | 0.0 | 0.0 | 0.0 | 24.7 | 18.2 | 9.1 | 55.8 |
| | 67 | Yes | 0.7 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 31.1 | 5.9 | 11.1 | 49.6 |
| | 98 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 100 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 129 | Yes | 0.0 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 56.8 | 2.8 | 9.7 | 69.9 |
| | 131 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 28.9 | 10.5 | 26.3 | 65.8 |
| | 155 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 157 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 58.6 | 3.1 | 16.2 | 78.0 |
| | 238[1] | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 64.3 | 0.0 | 14.3 | 78.6 |
| | 271[1] | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 9.1 | 4.5 | 5.7 | 19.3 |
| Daub Structure Interior | 14 | Yes | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 74.7 | 1.3 | 1.3 | 77.8 |
| | 16 | Yes | 0.9 | 5.6 | 0.0 | 0.0 | 0.9 | 0.0 | 26.9 | 0.0 | 2.8 | 37.0 |
| | 18 | Yes | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 78.4 | 1.0 | 4.5 | 85.9 |
| | 39 | Yes | 0.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 | 75.2 | 0.0 | 0.0 | 75.7 |
| | 41 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 61 | Yes | 0.0 | 6.8 | 0.0 | 0.0 | 0.0 | 0.0 | 34.5 | 5.9 | 3.2 | 50.5 |
| | 88 | Yes | 0.0 | 1.0 | 0.0 | 2.0 | 0.0 | 0.0 | 45.9 | 10.2 | 0.0 | 59.2 |
| | 90 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 92 | Yes | 1.5 | 2.2 | 0.0 | 0.0 | 0.0 | 0.0 | 21.9 | 5.8 | 16.8 | 48.2 |
| | 94 | Yes | 1.0 | 2.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.1 | 64.6 | 69.8 |
| | 96 | Yes | 0.6 | 1.8 | 0.0 | 0.0 | 0.0 | 0.0 | 54.2 | 6.6 | 12.7 | 75.9 |
| | 121 | Yes | 0.6 | 3.1 | 0.0 | 0.0 | 0.0 | 0.0 | 36.2 | 4.9 | 17.8 | 62.6 |
| | 123 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 30.0 | 30.0 | 10.0 | 70.0 |
| | 125 | Yes | 0.0 | 2.6 | 0.0 | 0.0 | 0.0 | 0.0 | 32.3 | 3.9 | 16.8 | 55.5 |
| | 127 | Yes | 0.0 | 20.0 | 0.0 | 26.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 46.7 |
| Non-Viable Samples | No data Samples 45, 63, 159, 211, 249, 258<br>Sample not selected as security/context of deposit unclear - sample 242<br>Not assessed due to intrusive feature - sample 250 | | | | | | | | | | | |

Appendix 7: Normalised Phytolith Ratios by Percentage of Sample Total

| Area | Sample Number 'GT' | Phytoliths Present | Eudicots and Basal Angiosperms | | | | Others | | | | TOTALS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Cell Type | | |
| | | | cf. Cucurbitaceae | Mesophyll Palisade Cell Silica Skeleton | Stomata Cell | cf. Hair Cell | Epidermal Single Cell | Epidermal Silica Skeleton | cf. Epidermal Cell | Unidentified | Single Cell | Multi Cell | TOTAL PHYTOLITH COUNT |
| Open Areas (adjacent to structure SM32) | 24 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 56.3 | 0.0 | 100.0 |
| | 47 | Yes | 0.5 | 0.0 | 0.0 | 0.0 | 3.3 | 0.0 | 0.0 | 0.0 | 71.7 | 21.2 | 100.0 |
| | 69 | Yes | 0.0 | 0.8 | 0.0 | 0.0 | 6.2 | 2.1 | 2.1 | 2.1 | 79.3 | 13.2 | 100.0 |
| | 71 | Yes | 0.0 | 0.0 | 0.0 | 11.1 | 0.0 | 0.0 | 0.0 | 44.4 | 55.6 | 0.0 | 100.0 |
| | 102 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 30.8 | 53.8 | 100.0 |
| | 133 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.6 | 2.6 | 2.6 | 57.7 | 14.1 | 100.0 |
| | 135 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 0.4 | 0.0 | 67.2 | 24.1 | 100.0 |
| | 149 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 71.4 | 0.0 | 100.0 |
| | 151 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 80.0 | 0.0 | 100.0 |
| | 176 | Yes | 0.0 | 0.0 | 0.5 | 0.5 | 0.0 | 1.9 | 1.9 | 0.5 | 69.2 | 26.5 | 100.0 |
| | 178 | No | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 180 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.5 | 1.5 | 0.0 | 40.4 | 58.1 | 100.0 |
| | 182 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 76.9 | 7.7 | 100.0 |
| | 184 | Yes | 0.0 | 0.0 | 0.0 | 6.0 | 0.0 | 4.0 | 4.0 | 2.0 | 73.4 | 13.1 | 100.0 |
| | 186 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 78.9 | 5.3 | 100.0 |
| | 201 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 15.4 | 23.1 | 0.0 | 100.0 |
| | 203 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 | 6.1 | 0.0 | 100.0 |
| | 205 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 41.2 | 0.0 | 100.0 |
| | 207 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.5 | 90.3 | 6.5 | 100.0 |
| | 209 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 32.0 | 0.0 | 100.0 |
| | 234 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.7 | 2.7 | 0.0 | 71.0 | 21.2 | 100.0 |
| | 254 | No | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 263 | Yes | 0.0 | 0.0 | 0.0 | 1.2 | 1.2 | 26.2 | 26.2 | 3.6 | 51.2 | 29.8 | 100.0 |
| | 267 | Yes | 0.0 | 11.1 | 0.0 | 0.0 | 0.0 | 11.1 | 11.1 | 0.0 | 55.6 | 29.6 | 100.0 |

Appendix 7: Normalised Phytolith Ratios by Percentage of Sample Total

| Area | Sample Number 'GT' | Phytoliths Present | Eudicots and Basal Angiosperms | | | | Others | | | | TOTALS | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Cell Type | | |
| | | | cf. Cucurbitaceae | Mesophyll Palisade Cell Silica Skeleton | Stomata Cell | cf. Hair Cell | Epidermal Single Cell | Epidermal Silica Skeleton | cf. Epidermal Cell | Unidentified | Single Cell | Multi Cell | TOTAL PHYTOLITH COUNT |
| External Context Associated with Structure | 20 | No | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | 22 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 4.7 | 3.1 | 3.1 | 48.4 | 46.9 | 4.7 | 100.0 |
| | 43[1] | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 19.6 | 19.6 | 64.7 | 15.7 | 100.0 |
| | 65 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 9.1 | 1.3 | 2.6 | 22.1 | 66.2 | 11.7 | 100.0 |
| | 67 | Yes | 0.0 | 0.7 | 0.0 | 0.0 | 1.5 | 5.2 | 5.2 | 23.7 | 57.0 | 19.3 | 100.0 |
| | 98 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 35.7 | 21.4 | 78.6 | 0.0 | 100.0 |
| | 100 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| | 129 | Yes | 0.0 | 0.0 | 0.0 | 0.6 | 0.6 | 6.8 | 0.6 | 9.1 | 74.4 | 16.5 | 100.0 |
| | 131 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 13.2 | 57.9 | 28.9 | 100.0 |
| | 155 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 | 0.0 | 100.0 |
| | 157 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 1.6 | 0.0 | 0.0 | 9.4 | 74.3 | 16.2 | 100.0 |
| | 238[1] | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.1 | 71.4 | 21.4 | 100.0 |
| | 271[1] | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 64.8 | 27.3 | 8.0 | 100.0 |
| Daub Structure Interior | 14 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.4 | 7.1 | 88.9 | 4.0 | 100.0 |
| | 16 | Yes | 0.0 | 0.9 | 0.0 | 0.0 | 1.9 | 17.6 | 0.0 | 21.3 | 54.6 | 24.1 | 100.0 |
| | 18 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 1.0 | 1.5 | 8.0 | 86.4 | 5.5 | 100.0 |
| | 39 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.5 | 12.9 | 87.1 | 0.0 | 100.0 |
| | 41 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 9.1 | 45.5 | 54.5 | 0.0 | 100.0 |
| | 61 | Yes | 0.0 | 0.5 | 0.0 | 0.0 | 1.4 | 7.3 | 1.8 | 18.6 | 66.8 | 14.5 | 100.0 |
| | 88 | Yes | 0.5 | 0.0 | 0.0 | 1.5 | 0.0 | 0.0 | 2.6 | 15.3 | 84.2 | 0.5 | 100.0 |
| | 90 | Yes | 0.0 | 16.7 | 0.0 | 0.0 | 0.0 | 0.0 | 8.3 | 66.7 | 16.7 | 16.7 | 100.0 |
| | 92 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 1.5 | 10.9 | 0.0 | 20.4 | 51.1 | 28.5 | 100.0 |
| | 94 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.0 | 2.1 | 9.4 | 25.0 | 65.6 | 100.0 |
| | 96 | Yes | 0.0 | 0.6 | 0.0 | 0.0 | 0.0 | 0.6 | 1.2 | 10.8 | 74.7 | 14.5 | 100.0 |
| | 121 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.3 | 2.5 | 15.3 | 61.3 | 23.3 | 100.0 |
| | 123 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.0 | 80.0 | 10.0 | 100.0 |
| | 125 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 | 9.7 | 0.0 | 12.9 | 56.8 | 30.3 | 100.0 |
| | 127 | Yes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.3 | 0.0 | 33.3 | 60.0 | 6.7 | 100.0 |
| Non-Viable Samples | No data Samples 45, 63, 159, 211, 249, 258<br>Sample not selected as security/context of deposit unclear - sample 242<br>Not assessed due to intrusive feature - sample 250 | | | | | | | | | | | | |

Appendix 8: Ethnographic Interviews with Local Farmers, Songo Mnara

# Appendix 8: Ethnographic Interviews with Local Farmers, Songo Mnara, Kilwa Region, Tanzania

This appendix contains transcripts of interviews with local farmers, undertaken during fieldwork on Songo Mnara in July 2013, with the assistance of Ms. Mariam Mgusi as translator. Dr Federica Sulas assisted with one of the interviews, whilst Dr Sarah Walshaw undertook one of the interviews in my absence. Names, and in some cases, identifying features have been redacted from these transcrips, in order to protect the identities of the farmers and their families, following publication of this thesis.

**Interview with: A[redacted]**

**Interview Date: 20th July 2013**

**Interviewers: Hayley McParland and Dr Federica Sulas**

**Interpreter: Ms. Mariam Mgusi**

**Location: village adjacent to Songo Mnara Ruins**

**A[redacted]** lives with his wife and [redacted] children in a Banda of coconut palm (*Cocos nucifera*) thatch for walls and roof, with two to three similar outbuildings. The family have a bathroom to the rear of the Banda.

The family moved to Songo Mnara [redacted] from M[redacted], a three hour return journey from Songo Mnara. They keep Chickens adjacent to their banda and hang fishing nets on a rack behind the house to dry. They make use of the palm plantation, constructing their home, outbuildings and mats for seating from the palm fronds. They also lay their washing out to dry at the front of the house on palm fronds.

A[redacted] grows Mtama (Sorghum) in his shamba, having been a farmer in M[redacted]. He does not water or fertilise his crops outside of burning the cleared field for planting, the crops being watered by rainfall.

The shamba is large and located to the rear of the banda in an area called [redacted]. The farmer states that the soil (fine reddish sandy loam) is good for growing, but mentions that the large coral inclusions are problematic. He was asked if the coral inclusions were additions to improve the soil, but stated that nothing was added to the soil to improve it.

The Sorghum planted is sown in December. Prior to sowing the thicket and palm are cut and burned. The burned material is left in situ as it adds valuable nutrients to the soil. Following the first rainfall in December, a compacted hole is made with a jembe, in which 3 seeds are planted. This process is replicated throughout the shamba. A[redacted] waits for up to a further 5 days for rain, as any longer will impair the germination of the seeds. During growth, crop weeds are weeded out by A[redacted] himself. After 5 months the Sorghum can be harvested; the seeded part is cut down from its tall stalk by the men, whilst the processing of the grain takes place within the banda. The stalk remains in the field until the following year, when it is burnt. Only one crop of Sorghum is grown per year.

This year the Sorghum crop did not grow well due the low rainfall during the rainy season, the crop is short and stunted and much has not been harvested. In addition to Sorghum, A[redacted] also grows two species of Legume amongst his crops, which are planted and harvested contemporaneously with the Sorghum, which saves on time and space.

Ufuta (peas) are grown and harvested at the same time as the Sorghum. The Ufuta are cut and then bundled together to be dried. Once dried, the peas are harvested within the banda by simply shaking the dehisced pods to extract the peas. The stalk remains in the field and is burned prior to planting the next year.

A[redacted] does not recognise any insect pests which many threaten his crops; however, he does say that bush pigs eat the leaves of the Sorghum, killing the plant.

Overall, Abdul-Rahman is positive about farming on Songo Mnara.

**Interview with: P[redacted]**

**Interview Date: 22nd July 2013**

**Interviewer: Hayley McParland**

**Interpreter: Ms. Mariam Mgusi**

**Location: M[redacted]**

P[redacted] lives with his [redacted] children in a banda of coral and plaster construction with (*Cocos nucifera*) thatch roofing. The family have a bathroom to the rear of the Banda of Coconut thatch construction (Cocos nucifera).

P[redacted] has lived in the village for most of his life, but now spends a lot of time in K[redacted]. He has not sown any crops in his shamba, for harvest this year possibly due to his relocation. However, he usually grows Papai (Papaya) in his shamba and Mpunga (Rice) in his rice plantation, which is a long walk from M[redacted].

P[redacted] grows Papai (Papaya) on his plantation, adjacent to the Ndizi (Banana) plantation of his brother M[redacted].

The shamba is large and located to the rear of the banda, the field does not have a particular name, instead sharing the name of the village.

The Papai (Papaya) plantation is fruiting, although it has not been managed this year. Each Papai (Papaya) tree can live for up to four years and after initial fruiting can take 3-4 years to

fruit again. The Papai (Papaya) trees fruit between March and July and are harvested by the men, who climb the tree to cut down the fruit, it is not usual that women would climb a tree on Songo Mnara. The trees receive their water during the rainy season (December-May) and are not given any additional water or fertiliser. Each tree can produce a crop of up to 50 Papai (Papaya). P[redacted] tells us that the Papai (Papaya) tree is capable of self-seeding, as seen in his shamba, however, they are usually planted by taking a cutting from an existing tree. Each tree can provide up to 20 cuttings, making the Papai a prolific crop and a good investment.

The majority of the plantation is located within the unused shamba, however, three Papai (Papaya) trees are grown in close proximity to the rear of the Banda, either for easy access or protection. Two of the Papai (Papaya) trees are grown in the Choo (toilet) in order to save space, this may enable the provision of extra water and fertilisation. The third is grown close by.

**Interview with: M[redacted]**

**Date: 22nd July 2013**

**Interviewer: Hayley McParland**

**Interpreter: Ms. Mariam Mgusi**

**Location: M[redacted]**

M[redacted] lives with his wife and [redacted] children in a banda of coral and plaster construction with (*Cocos nucifera*) thatch roofing, adjacent to his brother, P[redacted]. Their shared public seating area for receiving guests is outside the front of the property, under cover of the roof.

M[redacted] has lived in the village for [redacted] years, growing Ndizi (Banana), Millet (Mtama), Papai (Papaya) in his shamba; he also grows Rice (Mpunga) at M[redacted], which is a long walk from his village. However, M[redacted] tells us that they have not been

able to grow Tomatoes this year as they require a lot of water and there was little rainfall during the rainy season.

The Ndizi (Banana) plantation is large and located to the rear of the banda, in a natural depression within the coral, filled with pockets of dark reddish-brown sandy loam. This natural depression forms a natural bowl and protects the plantation on all sides; it has two entrances, both of which are fenced off with logs in order to protect the plantation from bush pigs which damage the trees by biting at the stalk. This causes the tree to leak sap, losing water and dehydrating to the point of death.

The Ndizi (Banana) plantation contains more than one hundred Ndizi (Banana) trees, though the exact number is unknown. The crop is planted in December at the start of the rainy season, each crop is taken as cuttings from the previous crop, and each tree planted in a single hole. Aside from the bush pigs, M[redacted] does not know of any crop pests which may damage his crop on Songo Mnara. The fruit is harvested between May and July by men, who cut the trees down and remove the fruit in the field. The fruit is taken back to the banda, where some is stored, and some is sold at market. The trees remain in the plantation and are allowed to dry and degrade into the soil, providing fertilisation for the crop the following year. No animals are grazed within the plantation following the harvest.

M[redacted] and his brother P[redacted] both believe that M[redacted] is an excellent location for farming Ndizi (Banana) and Millet (Mtama).

**Interview with: H[redacted] and M[redacted]**

**Interview Date: 23rd July 2013**

**Interviewer: Dr Sarah Walshaw**

**Interpreter: Ms. Mariam Mgusi**

**Location: L[redacted] – M[redacted] area**

**Transcribed by: Hayley McParland**

H[redacted] and M[redacted] have been living in M[redacted] for [redacted] years with their [redacted] children, farming Mpunga (Rice), Mtama (Millet), Mnazi (Coconut), Ufuta (beans), Mhindi (Maize), Mgomba/Ndizi (Plantain/Banana), Papai (Papaya), Uswele, Tomato, Viazi Vitamu (Sweet Potato), Maboga (Pumpkin), Fiwi (bean) and Bamia (Okra). The family weaves rope from a fibrous palm like plant outside the house.

Appendix 9: Plant Use and Trade at Kilwa Kisiwani as Recorded Archaeologically and in Historical Sources

Appendix 9 Table 1 Plant use and trade at Kilwa Kisiwani as recorded archaeologically and in historical sources

**Table 1 Plant Use and Trade at Kilwa Kisiwani as recorded archaeologically and in historical sources.**

| Plant | | | Source(s) | Reference |
|---|---|---|---|---|
| **Family** | **Scientific Name** | **Vernacular Name** | | |
| Arecaceae | Cocos nucifera | Coconut | Prior; Dallons; | Freeman-Grenville 1962, 198; 206 |
| Fabaceae | Indigofera tinctoria | Indigo | Crassons de Medeuil | Freeman-Grenville 1962, 196 |
| Fabaceae | Tamarindus indica | Tamarind | Prior | Freeman-Grenville 1962, 207 |
| Lythraceae | Punica | granatum | Vasco da Gama | Freeman-Grenville 1962, 66 |
| Malvaceae | Gossypium sp. | Cotton | Crassons de Medeuil | Freeman-Grenville 1962, 196 |
| Moraceae | Ficus sp. | Fig | Bocarro; Vasco Da Gama | Freeman-Grenville 1962, 66; 166 |
| Musaceae | Musa sp. | Banana | Ibn Battuta; Prior | Freeman-Grenville 1962, 31; 207 |
| Musaceae | Musa × paradisiaca | Plantain | Prior | Freeman-Grenville 1962, 206 |
| Myrtaceae | Syzygium aromaticum | Cloves | Dallons | Freeman-Grenville 1962, 199 |
| Poaceae | Oryza sp. | Rice | Ibn Battuta; Prior; Dallons; Crassons de Medeuil; Bocarro | Freeman-Grenville 1962, 166; 198; 206 |
| Poaceae | Saccharum officinarum | Sugar Cane | Crassons de Medeuil; Vasco | Freeman-Grenville 1962, 66, 199 |
| Poaceae | Sorghum bicolor | Sorghum | Kilwa Kisiwani | Chittick 1974, 52; 437 |
| Poaceae | Various | Bamboo | Prior | Freeman-Grenville 1962, 202-212 |
| Poaceae | Various | Millet | Dallons; Crassons de Medeuil; Bocarro | Freeman-Grenville 1962, 196; 198 |
| Rutaceae | Citrus x limon | Lemon | Vasco da Gama | Freeman-Grenville 1962, 66 |
| Rutaceae | Citrus medica | Citron | Vasco da Gama | Freeman-Grenville 1962, 66 |
| Rutaceae | Citrus × sinensis | Orange | Vasco da Gama | Freeman-Grenville 1962, 66 |
| Various | Various | Mangrove | Ibn Battuta; Crassons de Medeuil | Freeman-Grenville 1962, 196 |

Appendix 10: Plant Use and Trade in the Swahili World as Recorded Archaeologically and in Historical Sources

**Appendix 10 Table 2 Plant Use and Trade in the Swahili World as recorded archaeologically and in historical sources.**

| Plant | | | Source(s) | Reference |
|---|---|---|---|---|
| Family | Scientific Name | Vernacular Name | | |
| Amaranthaceae | Amaranthus sp. | Amaranth | Pemba Island | Walshaw 2005, 125 |
| Apocynaceae | Acokanthera oppositifolia | Bushman Poison Bush (Msunguti) | History of Former Times in | Freeman-Grenville 1962, 238-241 |
| Arecaceae | Cocos nucifera | Coconut | Pemba Island; Songo Mnara; | Freeman-Grenville 1962, 198; Walshaw |
| Arecaceae | Elaeis sp. | Oil Palm | Pemba Island; Songo Mnara | Walshaw 2005, 165; Walshaw 2018; |
| Arecaceae | Various | Palm | Pemba Island; Monclaro; João | Freeman-Grenville 1962, 138-143; 146- |
| Arecaceae | Calamus sp. | Rattan Palm | Cosmas Indicopleustes | Freeman-Grenville 1962, 4-8 |
| Arecaceae | Areca catechu | Areca Palm | Monclaro | Freeman-Grenville 1962, 138-144 |
| Arecaceae | Phoenix dactylifera | Date | Marco Polo; St. Francis Xavier | Freeman-Grenville 1962, 25-26; 135-137 |
| Bursuraceae | Boswellia sp. | Frankincense | Cosmas Indicopleustes; | Freeman-Grenville 1962, 5-8; 241-297 |
| Caryophyllaceae | Various | Pink | Pemba Island; Songo Mnara | Walshaw 2005, 165; Walshaw |
| Caryophyllaceae | cf. Silene sp. | Catchfly | Songo Mnara | Walshaw Unpublished Data |
| Casuarinaceae | Casuarina sp. | Casuarina | History of Former Times in | Freeman-Grenville 1962, 238-241 |
| Chenopodiaceae | Various | Goosefoot | Pemba Island | Walshaw 2005, 165 |
| Commelinaceae | Tradescantia sp. | Spiderwort | Songo Mnara | Walshaw Unpublished Data |
| Convolvulaceae | Convolvulus sp. | Bindweed | Songo Mnara | Walshaw Unpublished Data |
| Cucurbitaceae | Various | Squash/Gourd | Pemba Island | Walshaw 2005, 136 |
| Dioscoreaceae | Dioscorea sp. | Yam | Barbosa; Monclaro; Prior | Freeman-Grenville 1962; 127-134; 138- |
| Euphorbiaceae | Various | Spurge | Pemba Island | Walshaw 2005, 98 |
| Fabaceae | Vigna sp. | Bean | Pemba Island; Songo Mnara | Walshaw 2005; Walshaw 2018 |
| Fabaceae | Various | Legume | Pemba Island; Songo Mnara; History of Sudi | Freeman-Grenville 1962, 230-233; Walshaw 2005, 122; |
| Fabaceae | Macrotyloma sp. | Bean | Pemba Island | Walshaw 2005, 274 |
| Fabaceae | Vigna radiata | Mung Bean | Pemba Island | Walshaw 2005, 161 |
| Fabaceae | Pisum sp. | Pea | Songo Mnara; Pemba Island; | Freeman-Grenville 1962; Walshaw |
| Fabaceae | Vicia faba | Fava Bean | Songo Mnara | Walshaw Unpublished Data |
| Fabaceae | cf. Vicia sp. | Bean | Songo Mnara | Walshaw 2018 |
| Fabaceae | Indigofera tinctoria | Indigo | Crassons de Medeuil | Freeman-Grenville 1962, 192-198 |
| Fabaceae | Tamarindus indica | Tamarind | Prior | Freeman-Grenville 1962, 202-212 |
| Lauraceae | Cinnamomum sp. | Cinnamon | Periplus | Freeman-Grenville 1962, 1-2 |
| Lauraceae | Cinnamomum cassia | Cassia | Cosmas Indicopleustes | Freeman-Grenville 1962, 3-4 |
| Lauraceae | Cinnamomum camphora | Camphor | Al-Idrisi | Freeman-Grenville 1962, 19-20 |
| Malvaceae | Gossypium sp. | Cotton | Pemba Island; Songo Mnara; Crassons de Medeuil | Freeman-Grenville 1962, 192-197; Walshaw 2005, 98; Walshaw Unpublished Data |

**Appendix 10 Table 2 Plant Use and Trade in the Swahili World as recorded archaeologically and in historical sources.**

| Plant | | | Source(s) | Reference |
|---|---|---|---|---|
| **Family** | **Scientific Name** | **Vernacular Name** | | |
| Malvaceae | Sida sp. | Sida | Pemba Island | Walshaw 2005, 277 |
| Malvaceae | cf. Adansonia sp. | cf. Baobab | Songo Mnara | Walshaw 2018 |
| Molluginaceae | Mollugo sp. | cf. Carpetweed | Pemba Island | Walshaw 2005 |
| Moraceae | Ficus sp. | Fig | Pemba Island; Barbosa; Bocarro | Freeman-Grenville 1962, 127-134; 165-168; Walshaw 2005, 136 |
| Musaceae | Musa sp. | Banana | Al Mas'udi; Al-Idrisi; Ibn Battuta; Al-Mahasin; Prior | Freeman-Grenville 1962 (14-17; 19-20; 33; 202-212 |
| Musaceae | Musa × paradisiaca | Plantain | Prior | Freeman-Grenville 1962, 202-212 |
| Myrtaceae | Syzygium aromaticum | Cloves | Dallons | Freeman-Grenville 1962, 198-201 |
| Papaveraceae | Argemone sp. | Prickly Poppy | Pemba Island | Walshaw 2005, 268 |
| Papaveraceae | Papaver sp. | Poppy | Pemba Island | Walshaw 2005, 182 |
| Pedaliaceae | Sesamum indicum | Sesame | Pemba Island; Periplus; History of Sudi; Ancient History of Dar es | Freeman-Grenville 1962, 1-2; 230-232; 233-237; Walshaw 2005, 124 |
| Piperaceae | Piper betle | Betel | Monclaro | Freeman-Grenville 1962; 138-143 |
| Poaceae | Various | Grass | Pemba Island; Songo Mnara | Walshaw 2005; Walshaw2018 |
| Poaceae | Eleusine coracana | Finger Millet | Pemba Island | Walshaw 2005, 159 |
| Poaceae | Pennisetum glaucum | Pearl Millet | Pemba Island; Songo Mnara; History of Sudi | Freeman-Grenville 1962, 230-232; Walshaw 2005, 111; Walshaw Unpublished Data |
| Poaceae | Sorghum bicolor | Sorghum | Pemba Island; Songo Mnara; Kilwa Kisiwani | Chittick 1974, 52; 437; Walshaw 2005, 159 ; Walshaw 2018 |
| Poaceae | Triticum sp. | Wheat | Periplus; Barbosa | Freeman-Grenville 1962, 1-3; 127-134 |
| Poaceae | Oryza sp. | Rice | Pemba Island; Songo Mnara; Periplus; Al-Idrisi; Marco Polo; Ibn Battuta; Barbosa; João dos Santos; de Santon Bernadino; Bocarro; Crassons de Medeuil; Dallons; Prior; History of Mombassa; History of Lindi; History of Sudi; Ancient History of Dar es Salaam | Freeman-Grenville 1962, 198; Walshaw 2005; Walshaw 2018 |
| Poaceae | Digitaria sp. | Crabgrass | Pemba Island; Songo Mnara | Walshaw 2005, 161; Walshaw Unpublished Data |
| Poaceae | Various | Millet | Pemba Island; Songo Mnara; Al Mas'udi; Barbosa; de Santon Bernadino; Crassons de Medeuil; Dallons; History of Lindi; History of Sudi; Ancient History of Dar es Salaam; The History of Former Times in Bagamoyo; The History of Pate | Freeman-Grenville 1962; Walshaw 2005, 173; Walshaw 2018 |

**Appendix 10 Table 2 Plant Use and Trade in the Swahili World as recorded archaeologically and in historical sources.**

| Plant | | | Source(s) | Reference |
|---|---|---|---|---|
| **Family** | **Scientific Name** | **Vernacular Name** | | |
| Poaceae | Saccharum officinarum | Sugar Cane | Al-Idrisi; Barbosa; de Santo Bernadino; Crassons de Medeuil | Freeman-Grenville 1962, 19-20; 127-134; 155-164; 192-197 |
| Poaceae | Various | Bamboo | Prior | Freeman-Grenville 1962, 202-212 |
| Polygonaceae | Rumex sp. | Dock | Pemba Island | Walshaw 2005, 98 |
| Polygonaceae | Various | Knotweed | Pemba Island | Walshaw 2005, 98 |
| Polygonaceae | Polygonum sp. | Knotweed | Songo Mnara | Walshaw Unpublished Data |
| Portulacaceae | Various | Purslane | Pemba Island | Walshaw 2005, 98 |
| Portulacaceae | cf. Portulaca sp. | Purslane | Songo Mnara | Walshaw Unpublished Data |
| Ranunculaceae | Various | Buttercup/Crowfoot | Pemba Island | Walshaw 2005, 165 |
| Rosaceae | Rubus sp. | Rubus | Pemba Island | Walshaw 2005, 141 |
| Rutaceae | Citrus x Limon | Lemon | Barbosa; de Santo Bernadino | Freeman-Grenville 1962, 127-134; 155-164 |
| Rutaceae | Citrus × sinensis | Orange | Barbosa; Monclaro; de | Freeman-Grenville 1962, 127-134; 138- |
| Rutaceae | Citrus x latifolia | Lime | Barbosa | Freeman-Grenville 1962, 127-134 |
| Rutaceae | Citrus medica | Citron | Barbosa; de Santon Bernadino | Freeman-Grenville 1962, 127-134; 155-164 |
| Various | Various | Mangrove | Monclaro; Crassons de Medeuil; The History of Pate | Freeman-Grenville 1962, 138-143; 192-197; 241-296 |

Appendix: 11 Indian Ocean Trade in Plant Materials and Plant Use as Recorded Archaeologically and in Historical Sources

**Appendix 11 Table 6 Indian Ocean trade in plant materials and plant use as recorded archaeologically and in historical sources, in order as encountered in the referenced text**

| Plant | | Source(s) | Reference | Plant | | Source(s) | Reference |
|---|---|---|---|---|---|---|---|
| Scientific Name | Vernacular Name | | | Scientific Name | Vernacular Name | | |
| Hordeum vulgare | Barley | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 | Hyphaenae thebaica | Dom | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Triticum Durum | Durum Wheat | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243; Goitein & Friedman 2011 | Vitis vinifera | Grape | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243; Goitein & Friedman 2011 |
| Oryza Sativa | Asian Rice | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 | Olea europaea | Olive | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Triticum Dioccum | Emmer | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 | Cordia myxa | Sebesten | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Sorghum bicolor | Sorghum | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243; Goitein & Friedman 2011 | Ficus carica | Fig | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Pennisetum glaucum | Pearl Millet | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 | Citrullus lanatus | Watermelon | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Lens culinaris | Lentil | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 | Citrullus colocynthis | Colocynth | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Lupinus albus | Termis Bean | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 | Cucumber/Melon | Cucumis sp. | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Pisum sativum | Pea | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 | Ziziphus spina-christi | Christ's Thorn | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Lathyrus cicera/sativus | Vetch | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 | Punica Granatum | Pomegranate | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Vicia faba | Fava Bean | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 | Capparis spinosa | Caper | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Cicer arientinum | Chickpea | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 | Malus sylvestris | Apple | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Vigna radiata | Mung Bean | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 | Prunus persica | Peach | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Vigna unguiculata | Black Eyed Bean | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 | Prunus domestica | Plum | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Phoenix dactylifera | Date | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243; Goitein & Friedman 2011 | Prunus cf. cerasifera | Myrobalan Plum | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |

**Appendix 11 Table 6 Indian Ocean trade in plant materials and plant use as recorded archaeologically and in historical sources, in order as encountered in the referenced text**

| Plant | | Source(s) | Reference |
|---|---|---|---|
| Scientific Name | Vernacular Name | | |
| Ceratonia siliqua | Carob | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Citrus cf. medica | Citron | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Citrus cf. aurantifolia | Lime | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Rhus coriaria | Sumac | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Prunus mahaleb | Mahaleb Cherry | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Musa sp. | Banana | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Balanites aegyptiaca | Sugardate | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Corylus avellana | Hazelnut | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Juglans regia | Walnut | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243; Goitein & Friedman 2011 |
| Prunus amygdalus | Almond | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Cocos nucifera | Coconut | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243; Goitein & Friedman 2011 |
| Pinus pinea | Pine Nut | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Pistacia vera | Pistachio | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Carthamus tinctorius | Safflower | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Sesamum indicum | Sesame | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Linum usitassimum | Linseed | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Moringa peregrina | Bentree | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Cannabis sativa | Hemp | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Papaver somniferum | Poppy Seed | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Carthamus tinctorius | Black Mustard | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Corianderum sativum | Coriander | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Foeniculum vulgare | Fennel | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Piper nigrum | Black Pepper | Quseir al-Qadim Cairo Geniza | van der Veen et al. 2011. pp. 242-243; Goitein & Friedman 2011 |
| Cuminum cyminum | Cumin | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Nigella sativa | Black Cumin | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Trigonella foenum-graecum | Fenugreek | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Anethum graveolens | Dill | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Pimpinella anisum | Aniseed | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Laurus nobilis | Bay leaf | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Tamarindus indica | Tamarind | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |

**Appendix 11 Table 6 Indian Ocean trade in plant materials and plant use as recorded archaeologically and in historical sources, in order as encountered in the referenced text**

| Plant | | Source(s) | Reference |
|---|---|---|---|
| Scientific Name | Vernacular Name | | |
| Carum carvi | Caraway | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Tetradium ruticarpum | Fagara | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Elataria cardamomum | Cardamom | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243; Goitein & Friedman 2011 |
| Zingiber officinale | Ginger | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243; Goitein & Friedman 2011 |
| Curcuma sp. | Turmeric | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Areca catechu | Betel nut | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Terminalia chebu | Black Myrobalan | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Allium cepa | Onion | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Allium sativum | Garlic | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Brassica sp. | Cabbage/Turnip | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Beta vulgaris | Beet | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Lepidum sativum | Cress | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Lagenaria sicerar | Bottlegourd | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Lactuca sativa | Lettuce | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Cichorium endiva/intybus | Endive/Chicory | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |

| Plant | | Source(s) | Reference |
|---|---|---|---|
| Scientific Name | Vernacular Name | | |
| Portulaca oleracea | Purslane | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Solanum melongena | Aubergine | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Saccharum officinale cf. | Sugarcane | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243; Goitein & Friedman 2011 |
| Colocasia esculenta | Taro | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Gossypium sp. | Cotton | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Avicennia marina | White Mangrove | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Acacia sp. | Acacia | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Acacia nilotica | Nile Acacia | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Tamarix sp. | Tamarisk | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Myrtle communis | Myrtle | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Rosa sp. | Rose | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243; Goitein & Friedman 2011 |
| Salvadora persica | Toothbrush Bush | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Bolboschoenus maritima | Sea Clubrush | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Bambusae cf. | Bamboo | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |
| Prunus armeniaca | Apricot | Quseir al-Qadim | van der Veen et al. 2011. pp. 242-243 |

**Appendix 11 Table 6 Indian Ocean trade in plant materials and plant use as recorded archaeologically and in historical sources, in order as encountered in the referenced text**

| Plant | | Source(s) | Reference |
|---|---|---|---|
| **Scientific Name** | **Vernacular Name** | | |
| Indigofera tinctoria cf. | Indigo | Cairo Geniza | Goitein & Friedman 2011 pp. 184 |
| Styrax officinalis | Storax (liquid and dry) | Cairo Geniza | Goitein & Friedman 2011 pp. 172; 187 |
| Thymus vulgaris | Thyme | Cairo Geniza | Goitein & Friedman 2011 pp. 171 |
| Paliurus spina-christi | Christ's Thorn | Cairo Geniza | Goitein & Friedman 2011 pp. 256 |
| Costus sp. | Costus | Cairo Geniza | Goitein & Friedman 2011 pp. 256 |
| Cinnamomum sp. | Cinnamon | Cairo Geniza | Goitein & Friedman 2011 pp. 261-262 |
| Rheum rhabarbarum cf. | Rhubarb | Cairo Geniza | Goitein & Friedman 2011 pp. 261-262 |
| Caesalpinia sappan cf. | Sappanwood (Brazilwood) | Cairo Geniza | Goitein & Friedman 2011 pp. 261-262 |
| Syzygium aromaticum | Cloves | Cairo Geniza | Goitein & Friedman 2011 pp. 285 |
| Cinnamomum camphora cf. | Camphor Laurel | Cairo Geniza | Goitein & Friedman 2011 pp. 291 |
| Nardostachys jatamansi cf. | Spikenard | Cairo Geniza | Goitein & Friedman 2011 |
| Piper betle | Betel | Cairo Geniza | Goitein & Friedman 2011 pp. 313 |
| Piper cubeba | Cubeb | Cairo Geniza | Goitein & Friedman 2011 |
| Mangifera indica cf. | Mango (preserved) | Cairo Geniza | Goitein & Friedman 2011 pp. 317 |
| Tectona grandis | Teak | Cairo Geniza | Goitein & Friedman 2011 pp. 347 |

Appendix 12: Context Information for Trench 32 with Sample Number

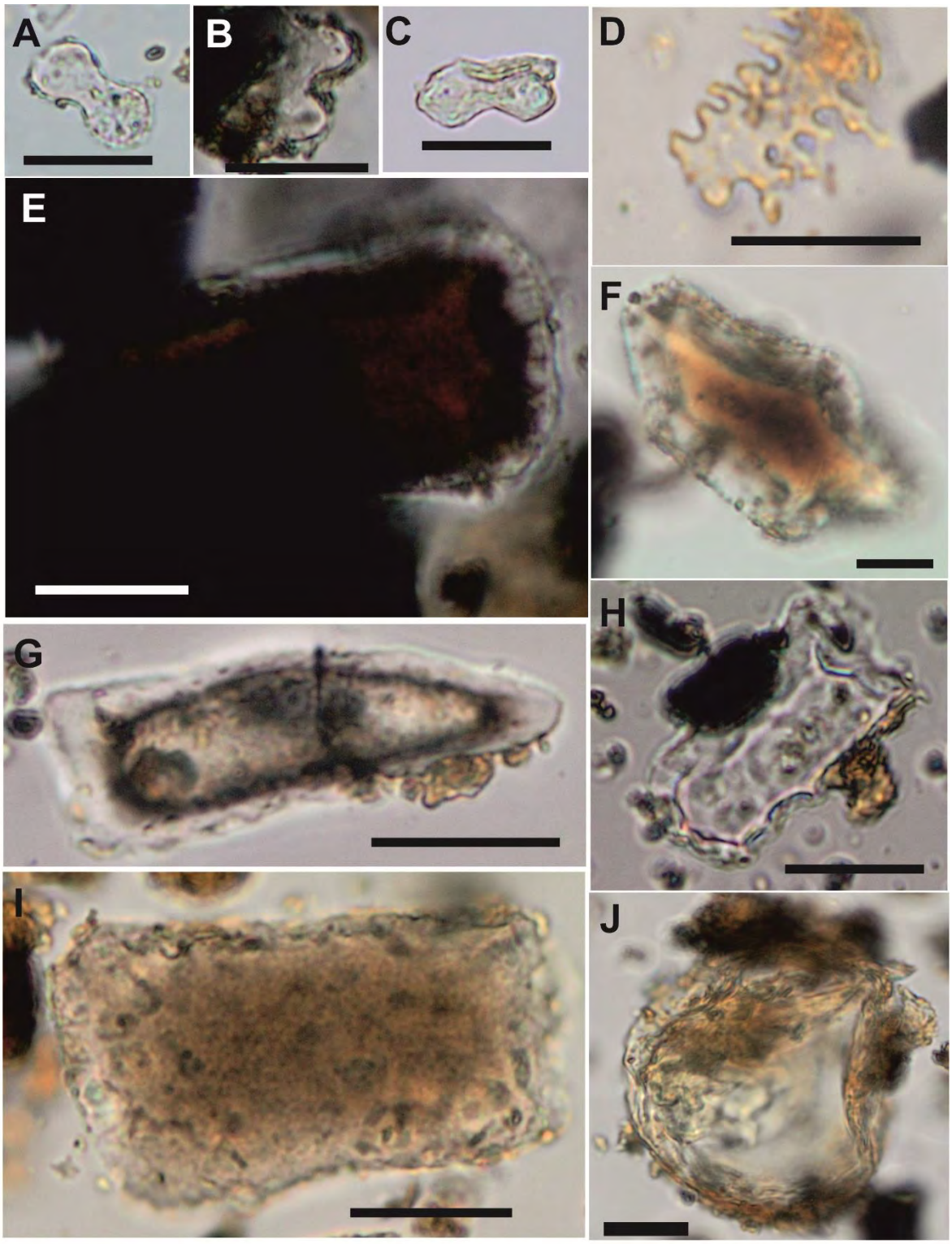
Appendix 10: Context information for Trench 32 – cross referenced with sample number.

| Sample numbers | Context number | Type | Soil description |
|---|---|---|---|
| GT149, GT151, GT176, GT178, GT180, GT182, GT184, GT186, GT201, GT203, GT205, GT207, GT209, GT211 | 32032 | Layer | Loose 5YR 8/4 (pink) sand with shells, occasional large daub fragments and small pottery sherds |
| GT24, GT47, GT69, GT71, GT102, GT133, GT135 | 32033 | Layer | Loose 10YR 4/3 (brown) sandy silt with occasional coral pebbles and occasional daub fragments |
| GT242, GT250 | 32035 | Deposit | Loose 7.5YR 6/4 (light brown) coral rubble with rare small daub fragments |
| GT43, GT96, GT129, | 32041 | Wall | Dense 10R 2.5/6 (dark red) daub fragments with rare coral pebbles |
| GT234, GT254, GT258, GT263, GT267 | 32045 | Layer | Very loose 2.5Y 7/4 (pink yellow) sand with occasional small daub fragments |
| GT14, GT16, GT18, GT39, GT41, GT61, GT63, GT94, GT125, GT127 | 32047 | Layer | Dense 2.5YR 4/8 (red) silt with pottery sherds and coral pebbles |
| GT88, GT90, GT92, GT121, GT123 | 32048 | Layer | Dense 5YR 2.5/4 (dark reddish brown) silt with pottery sherds |
| GT238 | 32049 | Wall | Dense 10R 3/8 (dark red) silt with abundant daub and rare pottery sherds. Vertical impressions into the upper edge of this deposit |
| GT20, GT22, GT45, GT65, GT67, GT98, GT100, GT131, GT155, GT157, GT159 | 32050 | Layer | Relatively compact 7.5YR 4/6 (strong brown) silty sand with small shell fragments |

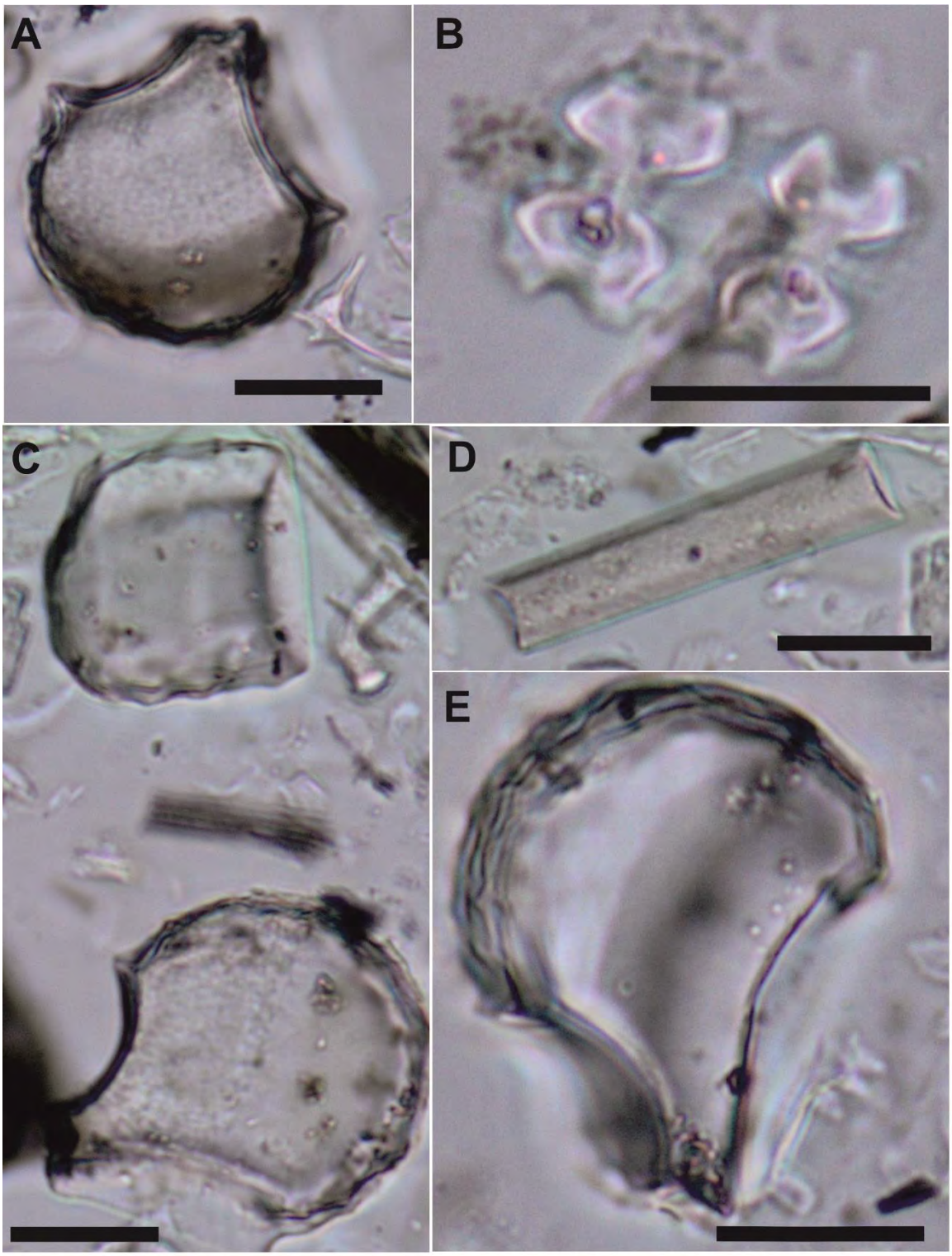
Appendix 13 Open Area Samples

| | | | Monocotyledons | | | | | | | | | | | Dicotyledons | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Number | Area | Phytoliths Present | Leaf Elements | | | | Inflorescence Elements | Other | Total Poaceae | Arecaceae Echinate Sphere | Blocky | cf. Cyperaceae achene | Total Non-Grass Monocot | Wood/Leaf Elements | Vessel Tracheid Single Cell | cf. Vessel Tracheid (Incomplete) | Vessel Tracheid Multi-Cell | cf. Hair Cell | Total Dicotyledon | Epidermal Multi-Cell | Unidentified | Total Phytolith Count |
| | | | Poaceae Bilobate | Poaceae Bulliform | Poaceae Smooth Elongate | Poaceae cf. Elongate | Poaceae Rondel | Poaceae Hair Cell | | | | | | Globular Smooth | | | | | | | | |
| SOA GT 191 | Southern Open Area | Yes | 1 | 1 | 4 | 0 | 0 | 0 | 6 | 0 | 0 | 1 | 1 | 1 | 9 | 0 | 1 | 1 | 12 | 0 | 1 | 12 |
| SOA GT 87 | Southern Open Area | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 3 | 0 | 1 | 4 |
| SOA GT 89 | Southern Open Area | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 0 | 2 | 0 | 35 | 1 | 0 | 36 |
| SOA GT 183 | Southern Open Area | Yes | 0 | 0 | 3 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 63 | 0 | 12 | 1 | 76 | 0 | 1 | 80 |
| SOA GT 184 | Southern Open Area | Yes | 0 | 0 | 0 | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 3 | 0 | 0 | 6 |
| SOA GT 149 | Southern Open Area | Yes | 1 | 1 | 7 | 1 | 0 | 0 | 10 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 |
| SOA GT 185 | Southern Open Area | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 0 | 2 | 0 | 20 | 0 | 0 | 20 |
| SOA GT 186 | Southern Open Area | Yes | 0 | 0 | 10 | 0 | 0 | 0 | 10 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 12 |
| SOA GT 187 | Southern Open Area | Yes | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 9 | 0 | 12 | 2 | 0 | 15 |
| SOA GT 314 | Southern Open Area | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 4 | 0 | 7 | 0 | 0 | 7 |
| NOA GT 484 | Northern Open Area | Yes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 3 | 2 | 0 | 5 |
| NOA GT 488 | Northern Open Area | Yes | 1 | 2 | 0 | 1 | 0 | 1 | 5 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 6 |
| NOA GT 483 | Northern Open Area | Yes | 0 | 2 | 4 | 1 | 0 | 2 | 9 | 1 | 2 | 0 | 3 | 0 | 5 | 0 | 0 | 0 | 5 | 2 | 0 | 19 |
| NOA GT 480 | Northern Open Area | Yes | 0 | 2 | 5 | 2 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 1 | 80 | 0 | 21 | 0 | 102 | 6 | 0 | 117 |

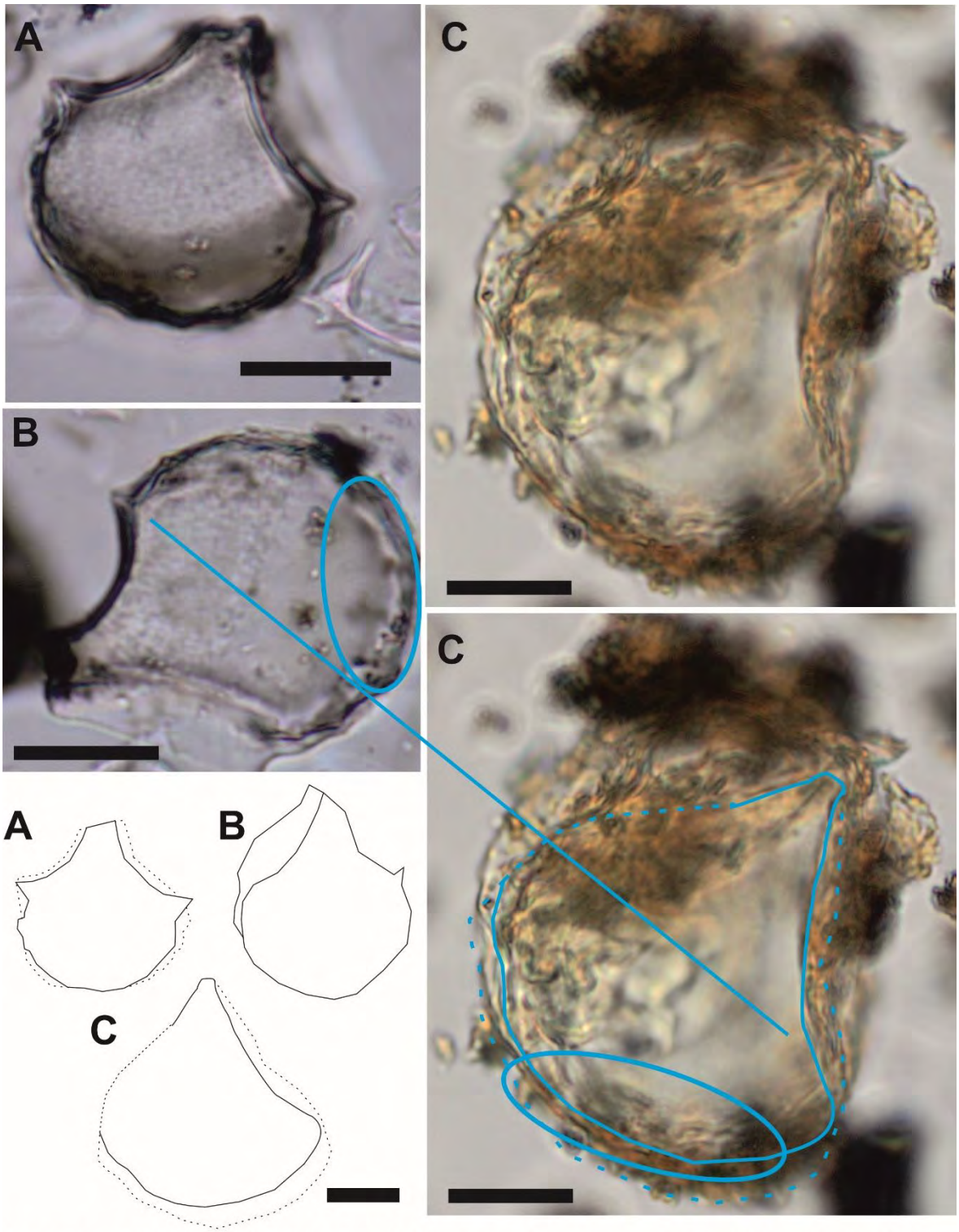
Appendix 14: Microscopy Images of Phytoliths




A-C: Images of Poaceae bilobate phytoliths from Trench 32; D: Incomplete Poaceae dendritic phytolith from the inflorescence, SM32 GT61; E-I: Bulliform cell phytoliths from Trench 32; J: Rice-type paralellepipedal 'fan shaped' bulliform from Trench 32. Scale bar: 20µm.

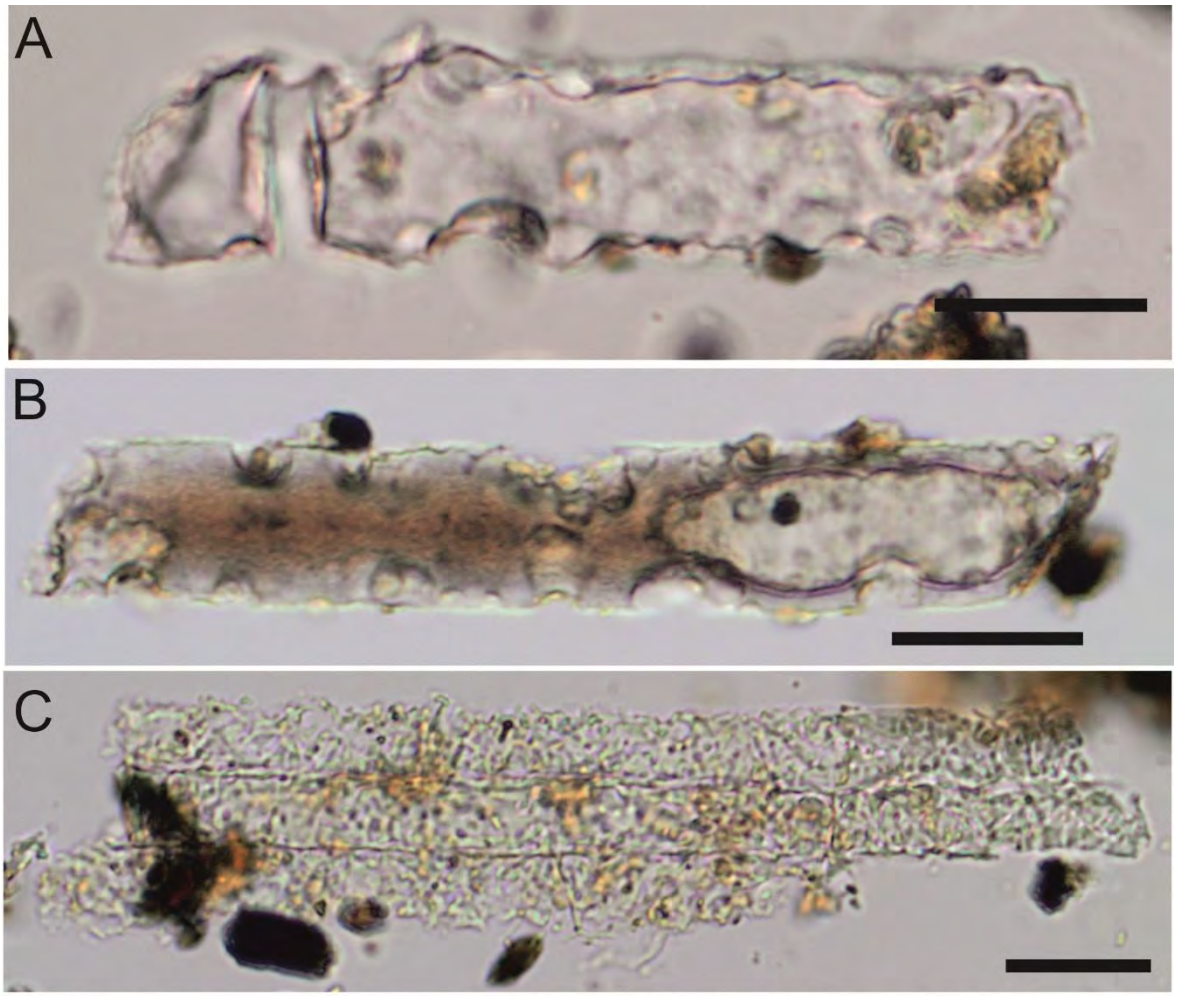



Oryza sativa phytoliths extracted from reference material by dry ashing, without prior sonication, obtained from Madaweni rice fields on Songo Mnara. From top left: A. Rice paralellepipedal 'fan shaped' bullifrom from the grain husk; B. Scooped bilobate phytoliths from the husk element; C. Paralellepipedal 'fan shaped' bulliforms viewed from different perspectives extracted from the leaf; D. Psilate elongate extracted from the leaf; E. Paralellepipedal 'fan shaped' bulliform from the leaf element. Scale bar: 20µm.




Images A and B: Photographs of domesticated Oryza sp. reference collection phytoliths, extracted from material recovered from Songo Mnara, with accompanying outline sketch of the main morphological features.

Image C: Image of an Oryza sp. phytolith from Trench 32. The upper image is a photograph of the morphotype, whilst the lower image features an overlaid outline highlighting the morphology of the morphotype and highlighting the scalloped edges, compared to the reference material. An outline sketch is prepared for comparison to the left of the image.




A & B: Images of smooth elongate morphotypes identified from Trench 32 samples. Image C: A smooth elongate multicell from Trench 32, Sample 184. Varying levels of preservation and dissolution are observed. Image A. features mechanical breakage; Image B. overall good preservation for this environment, but with some dissolution; Image C. is poorly preserved and any diagnostic decorative features will have been lost as only the outline of the morphotype is preserved.