MILJÖARKEOLOGISKA LABORATORIET

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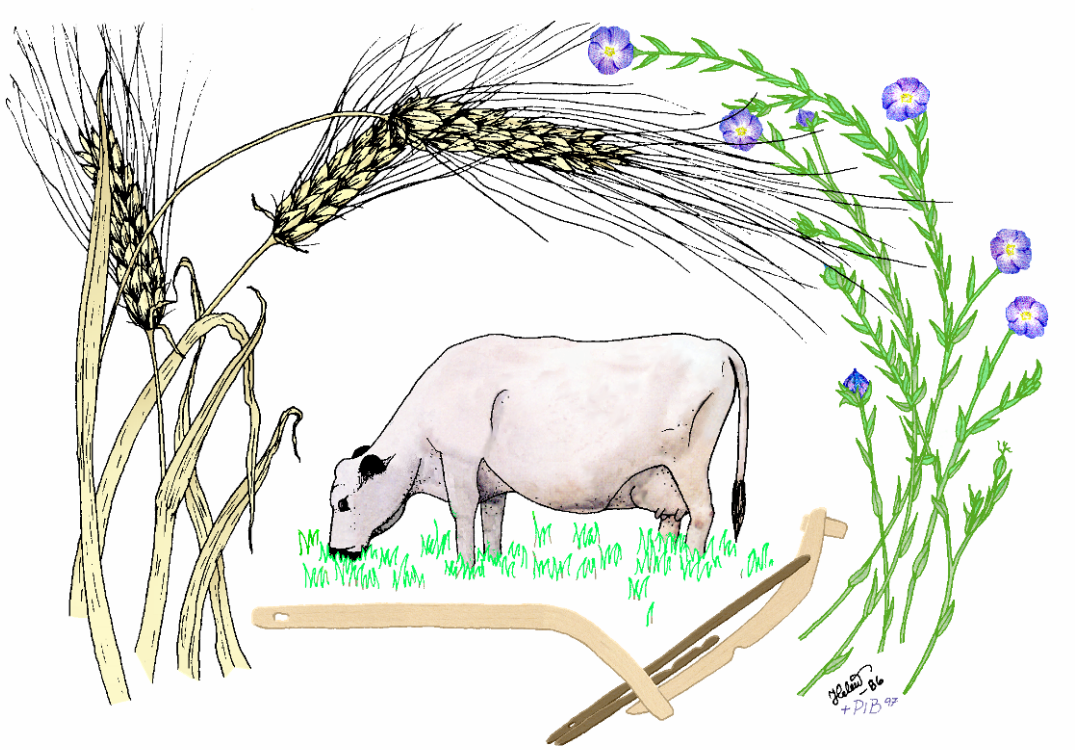

Soil chemical and magnetic susceptibility analyses on samples from Sebbetåa 1, KulturminneID 221251, Kristiansand kommune, Agder fylke, Norway.

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INSTITUTIONEN FÖR IDÉ – OCH SAMHÄLLSSTUDIER

UMEÅ UNIVERSITET

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Introduction

In connection with the improvement of road fv. 356 over the Stokkeland bridge and the erosion control of the river Søgne, Kulturhistorisk museum conducted archaeological field work in 2019. The site Sebbetåa (Fig. 1) was one of several sites that was investigated. All samples have been provided by Axel Mjærum and Jo-Simon Frøshaug Stokke, Kulturhistorisk museum, Universitetet i Oslo.

Figure 1. Site location, southwest of Kristiansand, Norway.

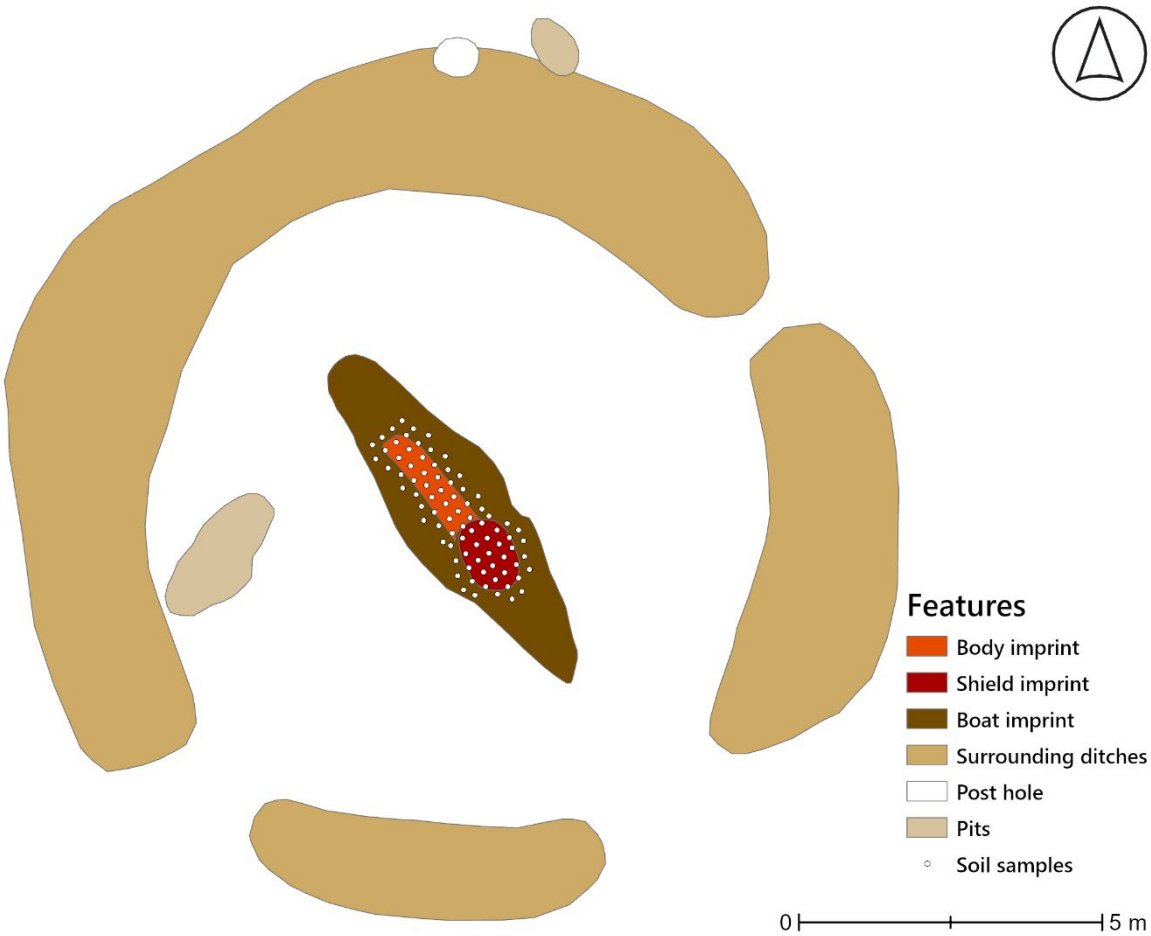

Figure 2. Plan of the mound (C62273) with various features: surrounding ditches (No. *fotgröft*, Sw. *gravränna*) with pits and a post hole, an imprint of a boat (A850) with imprints of a shield and a body.

Sample treatment

Geochemistry

Prior to all analyses all samples were dried at 30°C. Samples were then passed through a 1.25 mm sieve and any presence of material of cultural significance noted (such as bone, charred material, ceramics etc.). The chemical methods employed here are the same as those used in Swedish soil chemical studies following the methodological approach of Engelmark and Linderholm (1996 and 2008). The parameters analysed and abbreviations used are explained in table 1.

Table 1. Geoarchaeological methods and abbreviations as used in this report.

Abbreviation	Method	Description
MS_{lf}	Magnetic Susceptibility	Magnetic susceptibility measured on 10g of soil, with a Bartington MS3 system with an MS2B probe (Dearing 1994). Data are reported as SI-units per ten grams of soil, (corresponding to X_{lf}, 10^{-8} m^3 kg^{-1}) (Thompson & Oldfield 1986).
MS550	Magnetic Susceptibility after burning at 550ºC	Magnetic susceptibility after 550° C ignition (units as above)
LOI (%)	Loss On Ignition	Soil organic matter, determined by loss on ignition at 550° C, in percent (Carter, 1993).
Cit-P	Inorganic phosphate content (mg P/kg dry matter, ppm)	Extraction with 2% citric acid (corresponding to the Arrhenius method (Arrhenius 1934))
Cit-POI	Total phosphate (mg P/kg dry matter, ppm) (inorganic & organic)	Extraction with 2% citric acid on ignited soil (Engelmark & Linderholm 2008)
P quota	**Cit-POI /Cit-P**	Ratio of inorganic & organic to inorganic phosphate

These methods have been developed and adapted for soil prospection and the bulk analysis of occupation soils and features. Analysed parameters comprise organic matter (loss on ignition [LOI, and pH], Carter 1993), phosphate (inorganic [Cit-P]) (Engelmark & Linderholm 2008, Linderholm 2007), magnetic susceptibility (MS-χ_{lf} MS-χ_{hf}), and MS550-χ_{lf} (Crowther 1993, Linderholm 2007, Engelmark & Linderholm 2008). These analyses provide information on various aspects concerning phosphate, iron, red-ox potential and other magnetic components and total organic matter in soils and sediments, and their relationship to phosphate.

Results

All results from the various analyses are presented in Appendix A, table 2.

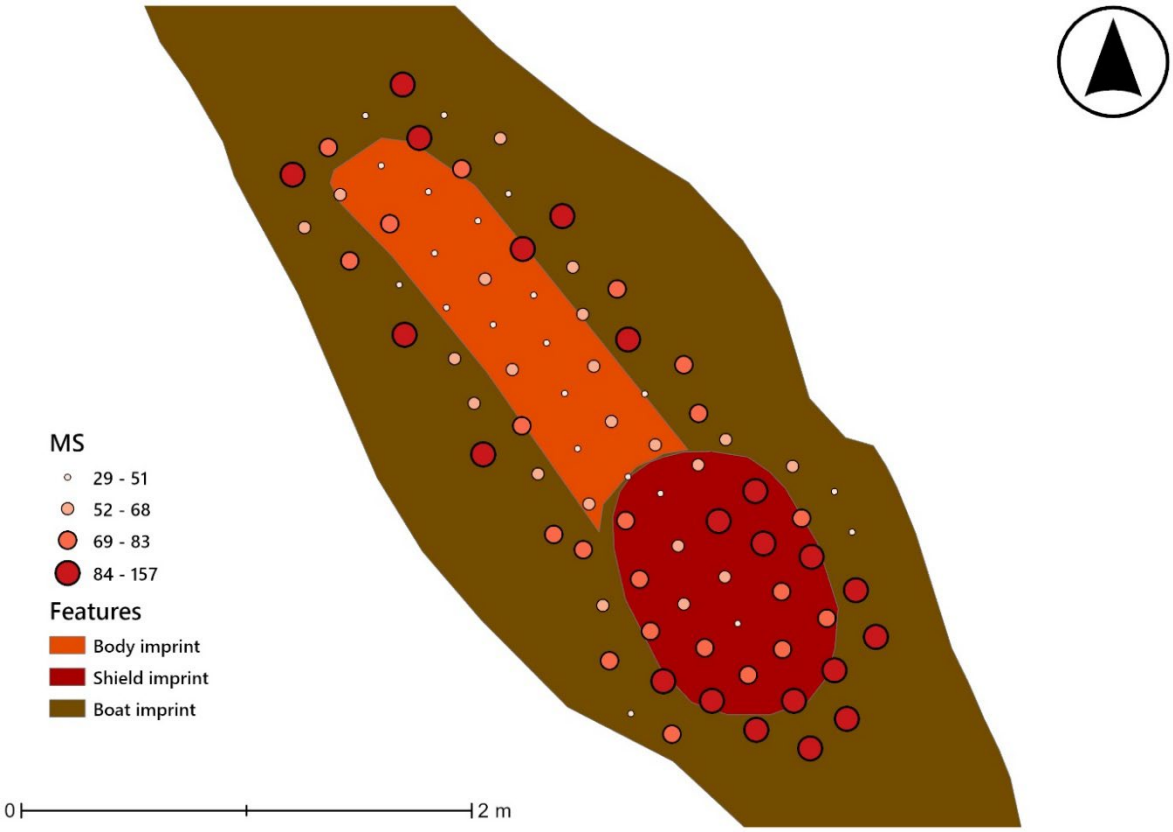

Figure 3. Spatial distribution of MS.

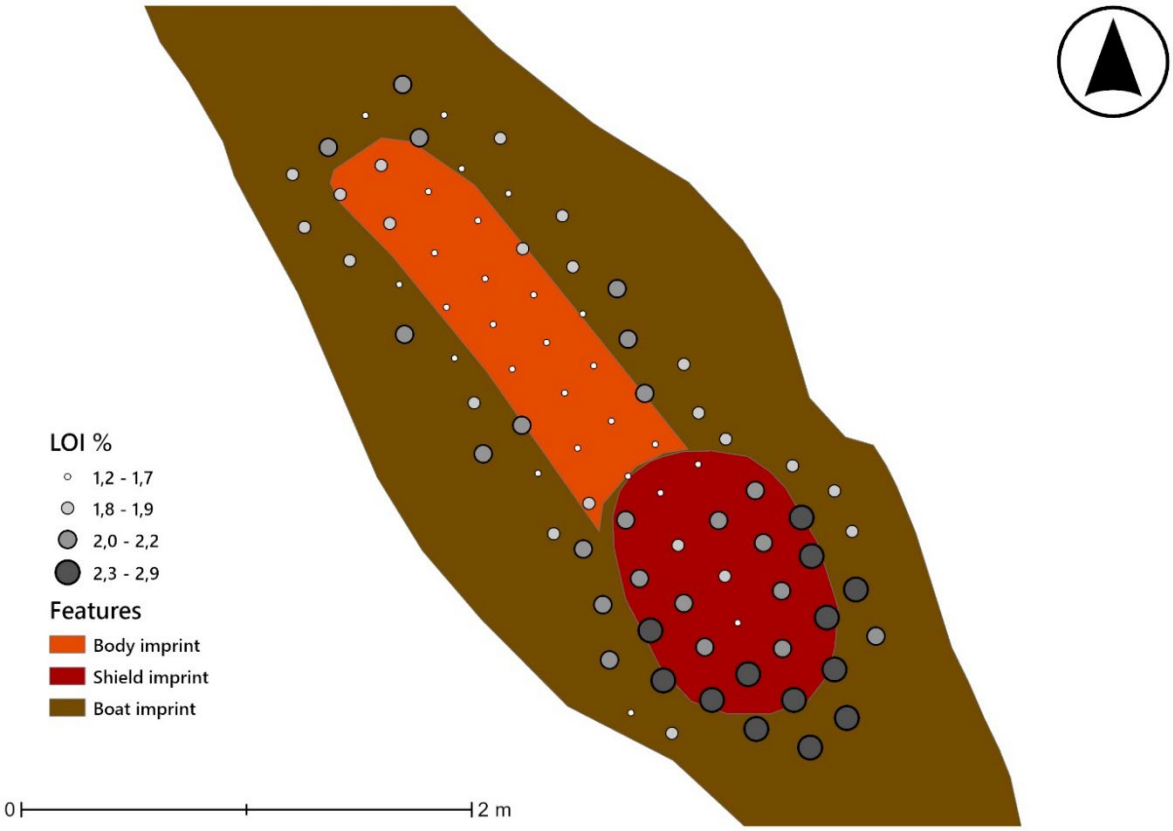

Figure 4. Spatial distribution of LOI.

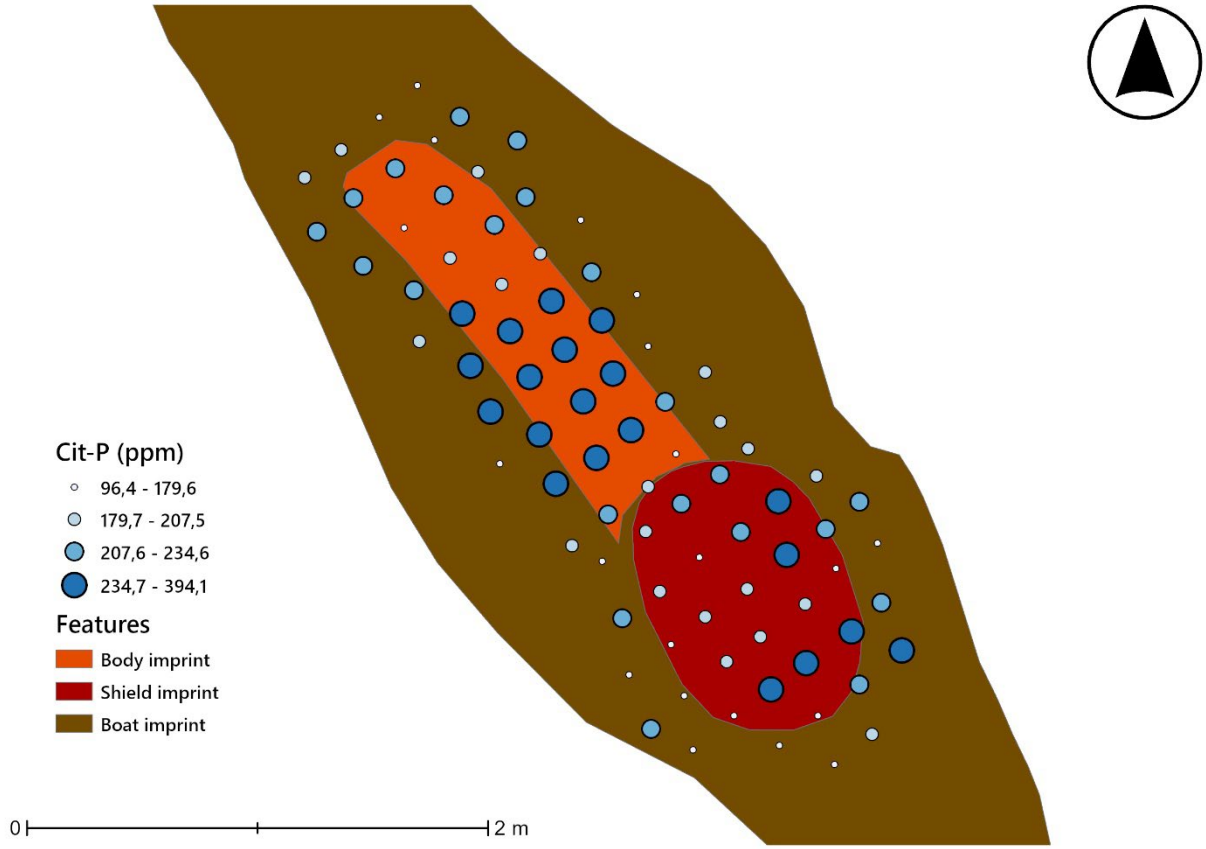

Figure 5. Spatial distribution of Cit-P.

Discussion

Without information on sampling and soil formation it is more difficult to interpret the results, as parts of the sampled area might have had more of the illuviation horizon present, post-excavation.

Samples collected from the shield area generally have a higher MS and LOI. This is likely a result of the deposition of materials, specifically wood (organic) and iron rivets (magnetic), once constituting the shield.

Regarding Cit-P the analytical results evidently show a primary burial, corresponding to the suggested imprint of a body. However, a secondary burial could perhaps have been placed in the southeast area, by the shield imprint. This is speculative, but there are examples of dogs and horses being buried together with the inhumed individual.

References

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Appendix A

Table 2. Results from the various soil analyses

MALNo	FieldNo	MS	MS550	CitP (ppm)	CitPOI (ppm)	PQuota	LOI	MSQ
19_0056_001	1464	92	156	198,8	280,8	1,41	2,9	1,69
19_0056_002	1465	85	140	173,1	226,7	1,31	2,3	1,66
19_0056_003	1473	88	108	269,0	310,0	1,15	2,1	1,22
19_0056_004	1474	85	119	217,6	236,3	1,09	2,5	1,40
19_0056_005	1475	87	110	170,9	221,1	1,29	2,3	1,27
19_0056_006	1476	84	166	178,8	203,2	1,14	2,6	1,97
19_0056_007	1481	92	103	234,6	272,1	1,16	2,3	1,12
19_0056_008	1482	78	127	394,1	274,2	0,70	2,3	1,62
19_0056_009	1483	71	114	252,4	245,9	0,97	2,2	1,62
19_0056_010	1484	76	107	249,0	251,6	1,01	2,4	1,41
19_0056_011	1485	85	134	150,9	215,8	1,43	2,5	1,57
19_0056_012	1486	82	81	108,1	151,7	1,40	1,9	0,99
19_0056_013	1490	51	57	176,6	201,9	1,14	1,9	1,12
19_0056_014	1491	85	128	178,8	257,2	1,44	2,5	1,51
19_0056_015	1492	71	116	182,7	216,3	1,18	2,2	1,63
19_0056_016	1493	48	48	200,1	221,5	1,11	1,7	1,00
19_0056_017	1494	73	74	202,7	223,2	1,10	2,1	1,01
19_0056_018	1495	86	138	96,4	168,7	1,75	2,5	1,61
19_0056_019	1496	29	28	208,4	225,0	1,08	1,4	0,94
19_0056_020	1499	36	34	212,8	248,1	1,17	1,8	0,95
19_0056_021	1500	82	129	214,5	244,2	1,14	2,8	1,58
19_0056_022	1501	84	100	262,0	238,9	0,91	2,1	1,19
19_0056_023	1502	61	84	204,5	225,8	1,10	1,9	1,37
19_0056_024	1504	71	97	167,9	233,7	1,39	2,5	1,36
19_0056_025	1505	78	91	108,1	168,3	1,56	2,2	1,16
19_0056_026	1503	61	76	195,8	235,4	1,20	2,2	1,25
19_0056_027	1510	56	56	207,5	261,2	1,26	1,8	0,99
19_0056_028	1511	86	110	236,3	264,2	1,12	2,2	1,29
19_0056_029	1512	53	57	169,6	211,5	1,25	1,9	1,09
19_0056_030	1513	73	114	182,7	228,5	1,25	2,2	1,55
19_0056_031	1514	66	71	209,3	246,3	1,18	2,0	1,07
19_0056_032	1520	58	56	194,9	226,3	1,16	1,9	0,97
19_0056_033	1521	55	53	208,0	238,1	1,14	1,7	0,96
19_0056_034	1522	37	37	216,7	204,9	0,95	1,3	0,99
19_0056_035	1523	71	88	203,2	208,0	1,02	2,1	1,23
19_0056_036	1524	69	65	175,7	227,2	1,29	2,0	0,93
19_0056_037	1525	98	112	230,6	240,2	1,04	2,1	1,14
19_0056_038	1532	69	69	205,8	248,1	1,21	1,9	0,99
19_0056_039	1533	55	48	171,8	200,6	1,17	1,4	0,86
19_0056_040	1534	44	40	184,9	201,4	1,09	1,4	0,91
19_0056_041	1535	68	58	234,6	278,6	1,19	1,9	0,86

19_0056_042	1536	78	69	187,0	235,4	1,26	1,9	0,89
19_0056_043	1543	68	69	188,8	255,1	1,35	1,9	1,01
19_0056_044	1544	50	48	218,0	275,6	1,26	2,1	0,96
19_0056_045	1545	63	56	269,9	275,1	1,02	1,7	0,89
19_0056_046	1546	47	41	299,5	317,0	1,06	1,7	0,87
19_0056_047	1547	55	47	306,1	310,4	1,01	1,7	0,85
19_0056_048	1554	109	111	146,5	197,9	1,35	2,0	1,01
19_0056_049	1555	54	46	310,9	355,3	1,14	1,7	0,85
19_0056_050	1556	46	41	271,6	338,3	1,25	1,7	0,89
19_0056_051	1557	79	73	238,9	337,0	1,41	2,0	0,92
19_0056_052	1558	109	109	147,4	240,2	1,63	2,1	1,00
19_0056_053	1565	79	78	174,0	222,8	1,28	2,0	0,99
19_0056_054	1566	59	51	319,2	345,7	1,08	1,7	0,86
19_0056_055	1567	49	43	319,2	334,0	1,05	1,7	0,88
19_0056_056	1568	56	44	325,7	356,2	1,09	1,7	0,78
19_0056_057	1569	59	53	313,5	315,2	1,01	1,8	0,90
19_0056_058	1637	57	70	220,2	240,7	1,09	1,8	1,24
19_0056_059	1639	41	36	330,9	336,6	1,02	1,7	0,88
19_0056_060	1640	52	47	317,0	307,8	0,97	1,7	0,90
19_0056_061	1647	88	88	186,6	263,8	1,41	1,9	0,99
19_0056_062	1648	53	53	186,2	218,9	1,18	1,6	1,00
19_0056_063	1649	29	27	237,6	241,1	1,01	1,2	0,92
19_0056_064	1651	86	77	202,3	285,6	1,41	2,0	0,90
19_0056_065	1658	44	41	226,3	257,2	1,14	1,6	0,94
19_0056_066	1659	31	29	218,0	215,8	0,99	1,2	0,93
19_0056_067	1660	38	37	198,4	213,6	1,08	1,3	0,97
19_0056_068	1661	41	37	229,8	249,4	1,09	1,3	0,92
19_0056_069	1668	68	64	213,6	300,0	1,40	1,8	0,95
19_0056_070	1669	69	65	190,1	229,8	1,21	1,7	0,94
19_0056_071	1670	34	32	216,7	203,6	0,94	1,2	0,96
19_0056_072	1671	71	68	179,6	194,5	1,08	1,8	0,95
19_0056_073	1672	70	65	215,4	236,7	1,10	1,9	0,93
19_0056_074	1679	45	43	214,5	256,8	1,20	1,7	0,94
19_0056_075	1680	107	82	104,6	202,3	1,93	2,0	0,76
19_0056_076	1681	42	47	214,1	205,8	0,96	1,8	1,13
19_0056_077	1682	60	53	214,5	263,3	1,23	1,9	0,88
19_0056_078	1683	56	49	224,5	274,2	1,22	1,8	0,88
19_0056_079	1690	157	151	106,8	211,5	1,98	2,1	0,96
19_0056_080	1691	34	44	171,8	205,4	1,20	1,5	1,30
19_0056_081	1692	83	79	196,6	233,7	1,19	2,0	0,94
19_0056_082	1693	89	83	191,4	279,0	1,46	1,9	0,94
19_0056_083	1962	104	96	120,3	188,4	1,57	1,8	0,93
19_0056_084	16378	38	34	316,1	285,6	0,90	1,5	0,89

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