APPENDIX 7

Metal Detection Methods and Results at 49-SIT-963

by

Daniel R. Thompson

METAL DETECTION METHODS AND RESULTS

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Metal detection was the primary tool used in SIT-963 project surveys. A brief 2012 reconnaissance identified metallic artifacts and shallow archaeological deposits, requisites for an effective metal detector program. The primary research goal of 2015-2016 was to survey high potential areas and use resulting spatial data to guide excavation priorities. Metal detection is widely recognized for its ability to delineate activity areas within briefly-occupied battlefields, survivors camps, and historic sites lacking surface features (Connor and Scott 1998; Nash 2004; Powis 2012; Wettstaed 2012). The project area proved an excellent candidate for this type of survey.

Equipment and Staff Qualifications

Terrestrial surveys were conducted using Fischer CZ-21 and Whites M-6 VLF metal detectors. Both units employed 10.5-inch and 9.5-inch search coils during general surveys. A 4-inch x 6-inch accessory coil was selectively used for pinpointing small objects within excavation units, bedrock fissures, and obstructed areas. Collectively this equipment provided robust depth capability, sensitivity, and the ability to classify metallic signatures prior to sampling.

Surveys of 2012 were completed by Bob Medinger and J. David McMahan. Detection in 2015 and 2016 was directed by Daniel R. Thompson with the assistance of Gleb Mikhalev. Field methods followed protocols defined by the Advanced Metal Detecting for the Archaeologist (AMDA) program, James Madison Montpelier Foundation Archaeology Foundation, and seminal works on the subject (Reeves 2013; Scott et al. 1989, 2012; Sivilich and Stone 2013).

Sampling Methods

Investigations employed two survey methods. *Selective surveys* were designed to gather locational data over broad areas in the project vicinity. This judgmental approach involved scanning single-lane transects over landforms suitable for past habitation. Upland slopes in excess of 10 degrees and the intertidal zone were largely excluded from this effort.

Gridded surveys involved systematic detection with the goal of locating 100-percent of metallic objects within a measured sample area, or block. Each block was outlined with temporary boundary pins and scanned along parallel transects or lanes measuring roughly three feet wide. Overlapping sweeps within and between lanes ensured thorough coverage. This method was used to survey the Locus 1 Survivors Terrace, and two subsample blocks (*MD Sample Area 1*, *MD Sample Area 2*) of the Locus 3 Kitchen Terrace.

Field Operation

Prior to surveys loose vegetation, branches, and deadfall were removed to maximize coil coverage and penetration. Detectors were operated in all-metal mode during initial sweeps.[1] Following pinpointing each metal detector (MD) point was evaluated using discrimination settings to classify the type of metal present. Discrimination values fell within three basic conductive ranges; low conductive (ferrous/iron), mid-conductive (lead), and high-conductive (cuprous/bronze/brass). Locates were marked with a non-conductive pin flag and assigned a unique field identification number.

Conductivity data as well as location, depth, and estimated object size were recorded in a field log. Locates were mapped in their X/Y position by total station and tied to a permanent site datum. A handheld Garmin GPS was used to map isolates. Following mapping, these data were reviewed to prioritize individual artifacts or clusters for excavation.

The volcanic geomorphology of Kruzov Island proved a challenge to field surveys. Magnetized basaltic flows, particularly in the intertidal zone, produced regular falsing or chatter on bedrock surfaces. Terraces underlain by sand deposits encountered "hot rock" anomalies. Frequent threshold and ground balance adjustments were required to null out this background interference.[2] Even with impediments small objects were typically recovered at depths upwards of 20-30cm below surface (BS). Axe-size items were detectable at nearly 0.6 meters BS.

Artifact Recovery

All MD locates were excavated by trowel in units measuring 25cm x 25cm or larger depending on object size. Recordation included artifact description, depth below surface, and stratigraphic association(s). Metal detection proved a valuable aide to excavation. Units were rescanned as excavators progressed below the depth of initial surveys. Additional locates were marked with temporary pins to assist recovery. Scans of backdirt piles yielded small artifacts such as lead birdshot and copper fragments smaller than 1/4-inch screen mesh.

Survey Results

Surveys yielded 146 metallic locates (Figure 1). A gridded survey of Locus 1 identified 64 MD points. One-hundred percent of these were excavated. Two gridded blocks within Locus 3 (*MD Sample Area 1, MD Sample Area 2*) identified a total of 73 MD points. Twelve or 16.4% of these were recovered to establish a basic chronology of the landform. Point distributions are shown in Figure 2 and Figure 3. A summary table of MD points is provided in Table 1.

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[1] The use of discrimination can significantly decrease the depth capabilities of VLF metal detectors.

[2] An on-site "test garden" was established in sterile sediments to improve detector capabilities under differing conditions. This process involved evaluation of ground balance and sensitivity adjustments on hot rocks and metallic samples buried at pre-measured depths.

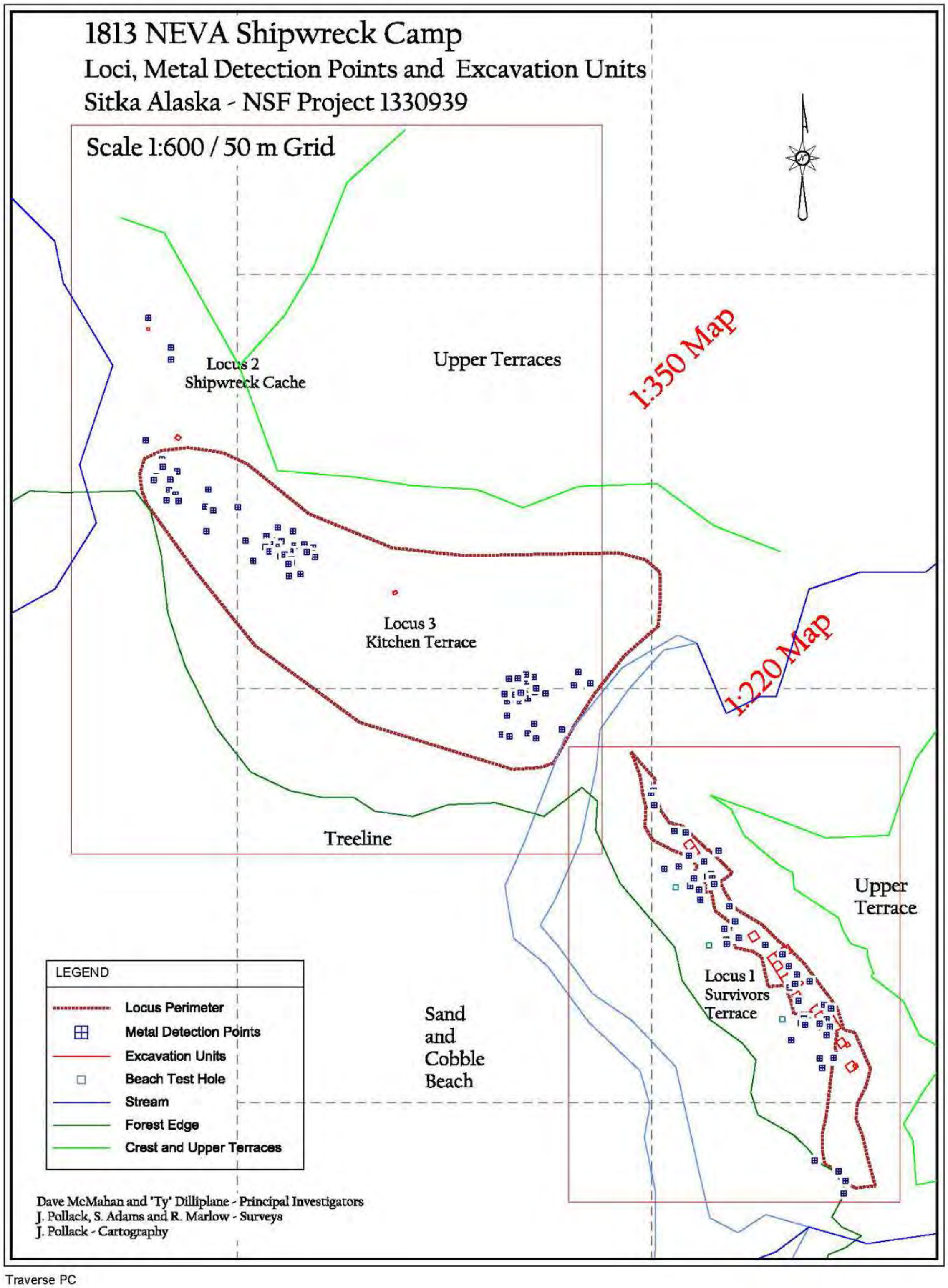


Figure 1. Map of the project area showing general distribution of MD points in all loci (South Block to North Cove).

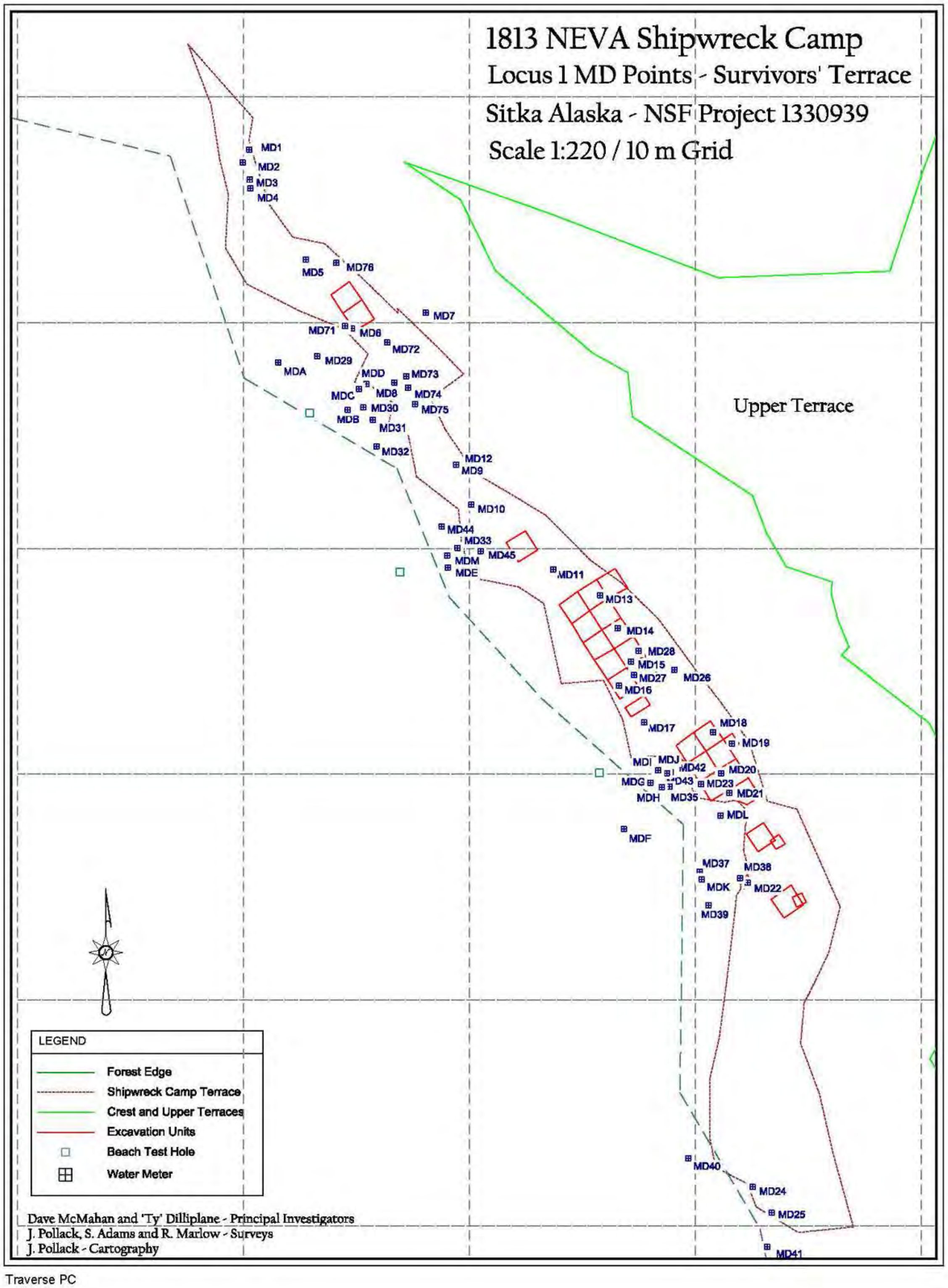
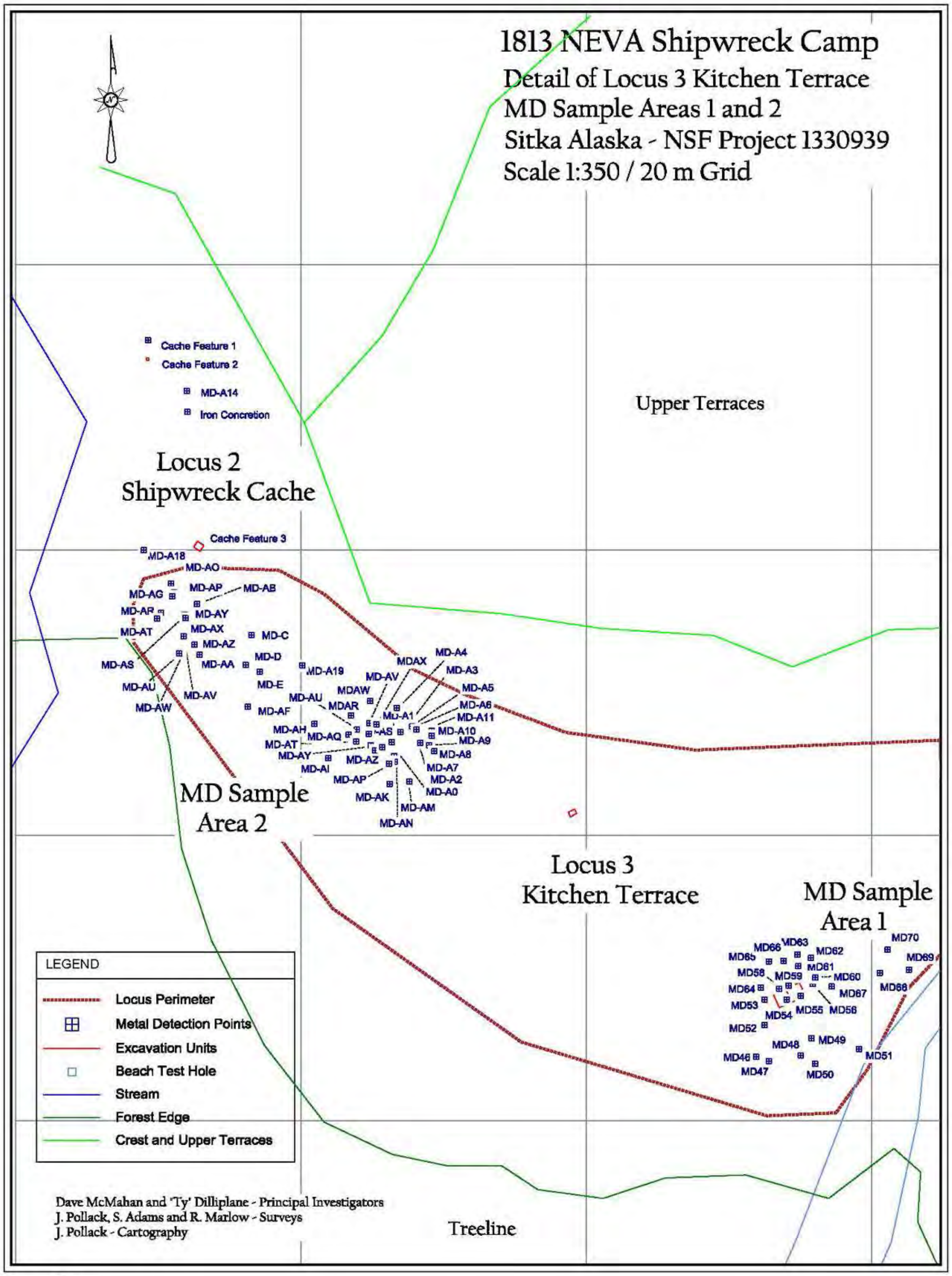


Figure 2. Distribution of metal detector points on the Survivor Terrace.



Traverse PC

Figure 3. Distribution of metal detector points in the "Kitchen Terrace" area. Excavated MD points are listed in Table 1.

Significant numbers of metallic targets clustered within the Locus 1 "Survivors Terrace" and Locus 3 "Kitchen Terrace". Selective surveys along the coast yielded the Locus 2 "Shipwreck Cache", an unparalleled collection of materials salvaged from the NEVA wreck site in 1813. Targets were found to correlate with subsurface hearths, middens, and rich archaeological deposits. Artifact distributions indicate that historic use was localized to a core area at the head of the bay.

Recovered objects were primarily associated with 19th century activity, specifically the ca. 1813 NEVA shipwreck period (*Component 1*), Baranov's salvage after February 1813, and a ca. 1840-1890 (*Component 2*) reoccupation (see "Analysis of the SIT-963 Artifact Assemblage" in the body of the report). Notably few 20th century artifacts were present, reflecting the area's fundamental inaccessibility or possible cultural factors.

Data Gaps and Future Research

Future MD surveys of SIT-963 will likely yield significant new data. Gridded surveys totaled less than five acres, a fraction of the total potential site area. Preliminary survey of the Kitchen Terrace identified dense clusters of metallic objects, most of which remain unexcavated. This landform contains widespread deposits of a mid-late 19th century Tlingit campsite.

Coastal erosion of the Survivors Terrace is an ongoing problem and site visits should employ metal detection to record newly-displaced artifacts.[3] Although gridded surveys were completed in this area, there is evidence of deeper cultural deposits. An intact grave feature, containing one of NEVA's lost passengers or crew, is nearly undercut by erosion.[4] Remains of this individual, as well as any associated funerary goods, will be lost in the next handful of years. Additional graves in this location are possible. These could be defined by ground penetrating radar (GPR) or Pulse Induction (PI) equipment. PI systems provide better penetration and are more stable in mineralized soils than VLF detectors (Scott 2010).

At the very close of 2016 a wrought iron drift pin (UA2016-063-092) was discovered on an intertidal reef northwest of Locus 3. This artifact, as well as heavy cargo of the Locus 2 Shipwreck Cache confirms that wreckage accumulated in this area. Gridded MD surveys of the this reef may yield the lion's share of NEVA's remains. Isostatic rebound has made this once submerged ocean floor accessible at low tide. Additional salvage caches along the coast are probable but will require adjusting search criteria to include steep topography and uplands excluded from the current effort.

Illegal metal detecting is not an existential threat and the project area should be vigorously monitored to assess site condition. Locational data gathered during surveys can be used as a benchmark to assess whether metallic objects have been disturbed or removed. It is the

[3] The eroding scarp adjacent to the Survivors Terrace was surveyed by metal detector in both 2015 and 2016. Thirteen newly-displaced artifacts were identified in 2016, including a bayonet scabbard crucial to analysis.
[4] Excavation of this grave was suspended after field confirmation. Only the very top of this lumber-lined coffin was exposed and documented.

professional opinion of the author that SIT-963 is uniquely vulnerable to metal detector collecting. Rumors of treasure and public knowledge of current discoveries will unquestionably attract illegal activity to this remote and unmonitored location.

Table 1. Summary of SIT-963 Metal Detector (MD) Locates.

MD No.	LOCATION	ACCESSION No.	OBJECT
MD-1	Locus 1-Survivors Terrace	UA2015-237-162	Cartridge, brass
MD-2	Locus 1-Survivors Terrace	UA2015-237-157	Modern bullet jacket
MD-3	Locus 1-Survivors Terrace	UA2015-237-279	Brad, copper and wood
MD-4	Locus 1-Survivors Terrace	UA2015-237-156	Modern bullet jacket
MD-5	Locus 1-Survivors Terrace	UA2015-237-100	Sheet copper
MD-6	Locus 1-Survivors Terrace	UA2015-237-226	Iron concretions
MD-7	Locus 1-Survivors Terrace	UA2015-237-265	Axe, iron
MD-8	Locus 1-Survivors Terrace	UA2015-237-177	Nail, iron
MD-9	Locus 1-Survivors Terrace	UA2015-237-73	Sheet copper
MD-10	Locus 1-Survivors Terrace	UA2015-237-272	Nail, iron
MD-11	Locus 1-Survivors Terrace	UA2015-237-141	Lead
MD-12	Locus 1-Survivors Terrace	UA2015-237-236	Multiple, iron
MD-13	Locus 1-Survivors Terrace	UA2015-237-101	Sheet copper
MD-14	Locus 1-Survivors Terrace	UA2015-237-188	Lead
MD-15	Locus 1-Survivors Terrace	UA2015-237-263	Chisel
MD-16	Locus 1-Survivors Terrace	UA2015-237-186	Sheet copper
MD-17	Locus 1-Survivors Terrace	UA2015-237-182	Spike, iron
MD-18	Locus 1-Survivors Terrace	Not excavated	Not excavated
MD-19	Locus 1-Survivors Terrace	UA2015-237-286	Sheet copper
MD-20	Locus 1-Survivors Terrace	UA2015-237-229	hardware pin/nail, iron
MD-21	Locus 1-Survivors Terrace	UA2015-237-270	Splitting wedge, iron
MD-22	Locus 1-Survivors Terrace	UA2015-237-90-- UA2015-237-95, UA2015-237-278	Multiple, sheet copper, strap guide
MD-23	Locus 1-Survivors Terrace	UA2015-237-169	Nail, iron
MD-24	Locus 1-Survivors Terrace	UA2015-237-187	Sheet copper
MD-25	Locus 1-Survivors Terrace	UA2015-237-166	Nail, iron, modern
MD-26	Locus 1-Survivors Terrace	UA2015-237-164	Modern bullet jacket
MD-27	Locus 1-Survivors Terrace	UA2015-237-153	Round shot, pistol, lead
MD-28	Locus 1-Survivors Terrace	UA2015-237-140	Lead
MD-29	Locus 1-Survivors Terrace	UA2015-237-180	Spike, iron
MD-30	Locus 1-Survivors Terrace	UA2015-237-161	Modern bullet jacket
MD-31	Locus 1-Survivors Terrace	UA2015-237-139	Lead, multiple
MD-32	Locus 1-Survivors Terrace	UA2015-237-147	Round shot, musket, lead
MD-33	Locus 1-Survivors Terrace	UA2015-237-98	Nail, copper
MD-34	Locus 1-Survivors Terrace	UA2015-237-142	Round shot, pistol, lead
MD-35	Locus 1-Survivors Terrace	UA2015-237-74	Nail, copper
MD-36	Locus 1-Survivors Terrace	UA2015-237-181	Spike, iron
MD-37	Locus 1-Survivors Terrace	UA2015-237-172	Sheet copper
MD-38	Locus 1-Survivors Terrace	UA2015-237-70	Sheet copper
MD-39	Locus 1-Survivors Terrace	UA2015-237-77	Nail, copper
MD-40	Locus 1-Survivors Terrace	UA2015-237-165	Modern bullet jacket

MD-41	Locus 1-Survivors Terrace	UA2015-237-160	Modern bullet jacket
MD-42	Locus 1-Survivors Terrace	UA2015-237-158	Modern bullet jacket
MD-43	Locus 1-Survivors Terrace	UA2015-237-071	Copper
MD-44	Locus 1-Survivors Terrace	UA2015-237-145	Round shot, pistol, lead
MD-45	Locus 1-Survivors Terrace	UA2015-237-155	Modern bullet jacket
MD-46	Locus 3-Kitchen Terrace-MD Sample Area 1	UA2015-237-233	Spoon bowl, iron
MD-47	Locus 3-Kitchen Terrace-MD Sample Area 1	UA2015-237-175	Nail, iron
MD-48	Locus 3-Kitchen Terrace-MD Sample Area 1	Not excavated	Not excavated
MD-49	Locus 3-Kitchen Terrace-MD Sample Area 1	Not excavated	Not excavated
MD-50	Locus 3-Kitchen Terrace-MD Sample Area 1	Not excavated	Not excavated
MD-51	Locus 3-Kitchen Terrace-MD Sample Area 1	Not excavated	Not excavated
MD-52	Locus 3-Kitchen Terrace-MD Sample Area 1	Not excavated	Not excavated
MD-53	Locus 3-Kitchen Terrace-MD Sample Area 1	UA2015-237-230	Pulley sheave
MD-54	Locus 3-Kitchen Terrace-MD Sample Area 1	Not excavated	Not excavated
MD-55	Locus 3-Kitchen Terrace-MD Sample Area 1	UA2015-237-266	Kettle, iron
MD-56	Locus 3-Kitchen Terrace-MD Sample Area 1	Not excavated	Not excavated
MD-57	Locus 3-Kitchen Terrace-MD Sample Area 1	Not excavated	Not excavated
MD-58	Locus 3-Kitchen Terrace-MD Sample Area 1	Not excavated	Not excavated
MD-59	Locus 3-Kitchen Terrace-MD Sample Area 1	UA2015-237-232	Iron concretion
MD-60	Locus 3-Kitchen Terrace-MD Sample Area 1	Not excavated	Not excavated
MD-61	Locus 3-Kitchen Terrace-MD Sample Area 1	Not excavated	Not excavated
MD-62	Locus 3-Kitchen Terrace-MD Sample Area 1	Not excavated	Not excavated
MD-63	Locus 3-Kitchen Terrace-MD Sample Area 1	Not excavated	Not excavated
MD-64	Locus 3-Kitchen Terrace-MD Sample Area 1	Not excavated	Not excavated
MD-65	Locus 3-Kitchen Terrace-MD Sample Area 1	UA2015-237-99	Kettle lug, copper
MD-66	Locus 3-Kitchen Terrace-MD Sample Area 1	UA2015-237-138	Lead
MD-67	Locus 3-Kitchen Terrace-MD Sample Area 1	UA2015-237-256	Plane blade/chisel, iron
MD-68	Locus 3-Kitchen Terrace-	UA2015-237-267--	Sheet iron, multiple

	MD Sample Area 1	UA2015-237-269	
MD-69	Locus 3-Kitchen Terrace- MD Sample Area 1	UA2015-237-144	Lead
MD-70	Locus 3-Kitchen Terrace- MD Sample Area 1	Not excavated	Not excavated
MD-71	Locus 1-Survivors Terrace	UA2015-237-179	Multiple, iron, lead
MD-72	Locus 1-Survivors Terrace	UA2015-237-264	Multiple, iron, lead
MD-73	Locus 1-Survivors Terrace	UA2015-237-235	Multiple, iron, lead
MD-74	Locus 1-Survivors Terrace	UA2015-237-238	Spike, iron
MD-75	Locus 1-Survivors Terrace	UA2015-237-222	Multiple, iron, lead
MD-76	Locus 1-Survivors Terrace	UA2015-237-84	Copper
MD-A	Locus 1-Survivors Terrace	UA2016-063-010	Nail, iron
MD-B	Locus 1-Survivors Terrace	UA2016-063-012	Lead, birdshot
MD-C	Locus 1-Survivors Terrace	UA2016-063-013	Lead, birdshot
MD-D	Locus 1-Survivors Terrace	UA2016-063-014	Lead, birdshot
MD-E	Locus 1-Survivors Terrace	UA2016-063-026	Bayonet scabbard, bronze
MD-F	Locus 1-Survivors Terrace	UA2016-063-015	Iron concretion
MD-G	Locus 1-Survivors Terrace	UA2016-063-016	Lead
MD-H	Locus 1-Survivors Terrace	UA2016-063-017	Iron concretion
MD-I	Locus 1-Survivors Terrace	UA2016-063-018	Lead, birdshot
MD-J	Locus 1-Survivors Terrace	UA2016-063-019	Lead, birdshot
MD-K	Locus 1-Survivors Terrace	UA2016-063-020	Lead, scrap
MD-L	Locus 1-Survivors Terrace	UA2016-063-021	Lead, birdshot
MD-M	Locus 1-Survivors Terrace	UA2016-063-022	Nail, iron
MD-N	Locus 2-Shipwreck Cache	UA2016-063-073-- UA2016-063-085	Copper hull plates, iron axes, iron ingots
MD-O	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-P	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-Q	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-R	Locus 3-Kitchen Terrace- MD Sample Area 2	UA2016-063-045	.44-40 cartridge, brass
MD-S	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-T	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-U	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-V	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-W	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-X	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-Y	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-Z	Locus 3-Kitchen Terrace-	Not excavated	Not excavated

	MD Sample Area 2		
MD-AA	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AB	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AC	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AD	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AE	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AF	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AG	Locus 2-Shipwreck Cache	UA2016-063-023	Round shot, pistol, lead
MD-AH	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AI	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AJ	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AK	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AL	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AM	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AN	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AO	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AP	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AQ	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AR	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AS	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AT	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AU	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AV	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AW	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AX	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-AY	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated

MD-AZ	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-A1	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-A2	Locus 3-Kitchen Terrace- MD Sample Area 2	UA2016-063-047	45-70 cartridge, brass
MD-A3	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-A4	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-A5	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-A6	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-A7	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-A8	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-A9	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-A10	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-A11	Locus 3-Kitchen Terrace- MD Sample Area 2	Not excavated	Not excavated
MD-A12	Locus 2-Shipwreck Cache	UA2016-063-072, UA2016-063-086-- UA2016-063-090	Iron ingot, multiple iron axes
MD-A13	Locus 2-Shipwreck Cache	UA2016-063-068 UA2016-063-071	Trunnion brackets, axes
MD-A14	Locus 2-Shipwreck Cache	UA2016-063-025	Round shot, musket, lead
MD-A15	Isolate, south of Locus 1	UA2016-063-070	Hardware, modern
MD-A16	Isolate, south of Locus 1	UA2016-063-069	Round shot, musket, lead
MD-A17	Isolate, south of Locus 1	Not collected	Modern fishing float
MD-A18	Locus 2-Shipwreck Cache	UA2016-063-024	Round shot, pistol, copper

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