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Kingston and Arthur's Vale Historic Area (KAVHA)

Archaeological Zoning and Management Plan – Volume 2. Maps and Plans

Prepared for the Department of Infrastructure, Transport, Regional Development and Communications

June 2020 – Final

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Document information

Extent Heritage project no.:	SYD18376
Client:	Department of Infrastructure, Transport, Regional Development and Communications
Project:	Kingston and Arthur's Vale Historic Area (KAVHA) Archaeological Zoning and Management Plan
Site location:	KAVHA, Norfolk Island
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Document control

Version	Internal reviewer	Date	Review type
Draft 01	Ngaire Richards	04/04/2019	Technical
Draft 02	Ngaire Richards	11/06/2019	QA
Final	Anita Yousif	16/07/2019	QA
Final	Anita Yousif	19/03/2020	QA
Final	Graham Wilson Tom Sapienza	22/04/2020	Edit
Updated Final	Tom Sapienza Graham Wilson	30/04/2020	Edits and revisions following restructuring
Final	Will Cox Tom Sapienza	18/06/2020	Formatting

Contents

1. Archaeological potential

The likelihood of survival of potential archaeological fabric from each phase of human occupancy is graded in accordance with the following classifications:

- **Extant**: archaeological remains associated with a particular historical phase or features that survive intact or have been recognised through previous investigations or exposures and have been retained *in situ.*
- **High**: it is likely that archaeological fabric associated with a particular historical phase or features survive intact.
- **Moderate**: it is possible that some archaeological fabric associated with a particular historical phase or features survive, but they may have been subject to some disturbance and some loss of integrity.
- **Low**: it is unlikely that archaeological fabric associated with a particular historical phase or features survive.

Each precinct may contain several different levels of survival that are dependent on the type and durability of the archaeological fabric, and site formation processes that may vary in degree of impact or may be localised impacts. Each precinct has also been assessed on a phase by phase basis so that a single precinct may contain several different potential listings.

The grading of potential provides a general summary for locations within each precinct. There may be specific locations within a precinct where ground disturbance is known to have taken place that may have reduced the potential survival of fabric. Similarly, areas with a high archaeological potential may lie beneath more recent fill or hill-wash.

Note: for those areas in the following figures where the archaeological potential is shown extending seaward beyond the KAVHA boundary the assessed potential beyond the boundary ***only applies to the land above the high-water mark****, regardless of the mapped spatial extents of the archaeological potential areas (see Section 1.9, Volume 1).*

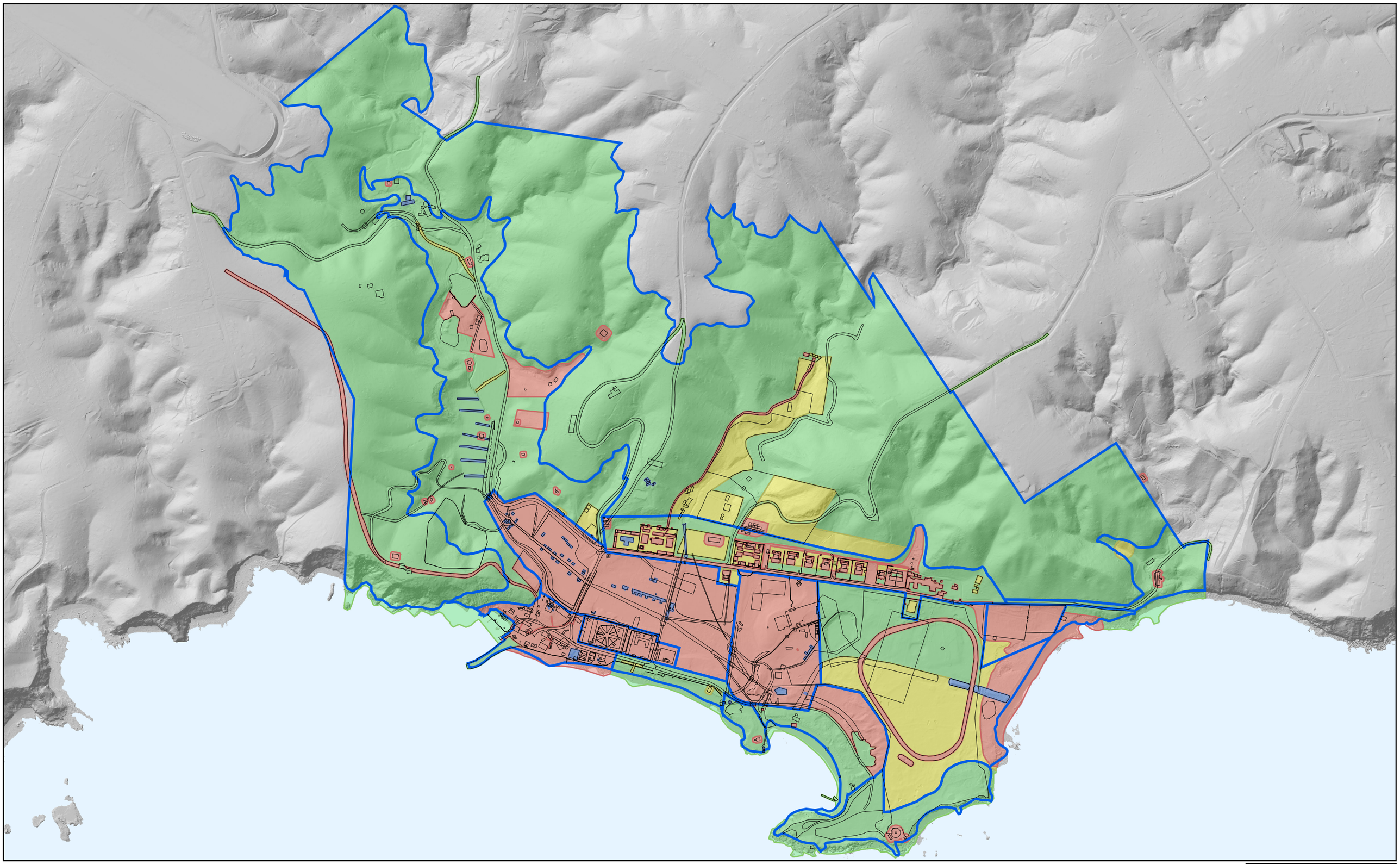


Plate 1. KAVHA Archaeological Potential

All precinct boundaries

Precinct heritage items

Archaeological potential

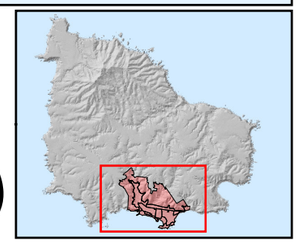
Extant

High

Moderate

Low

0 250 500 750 1,000 Metres



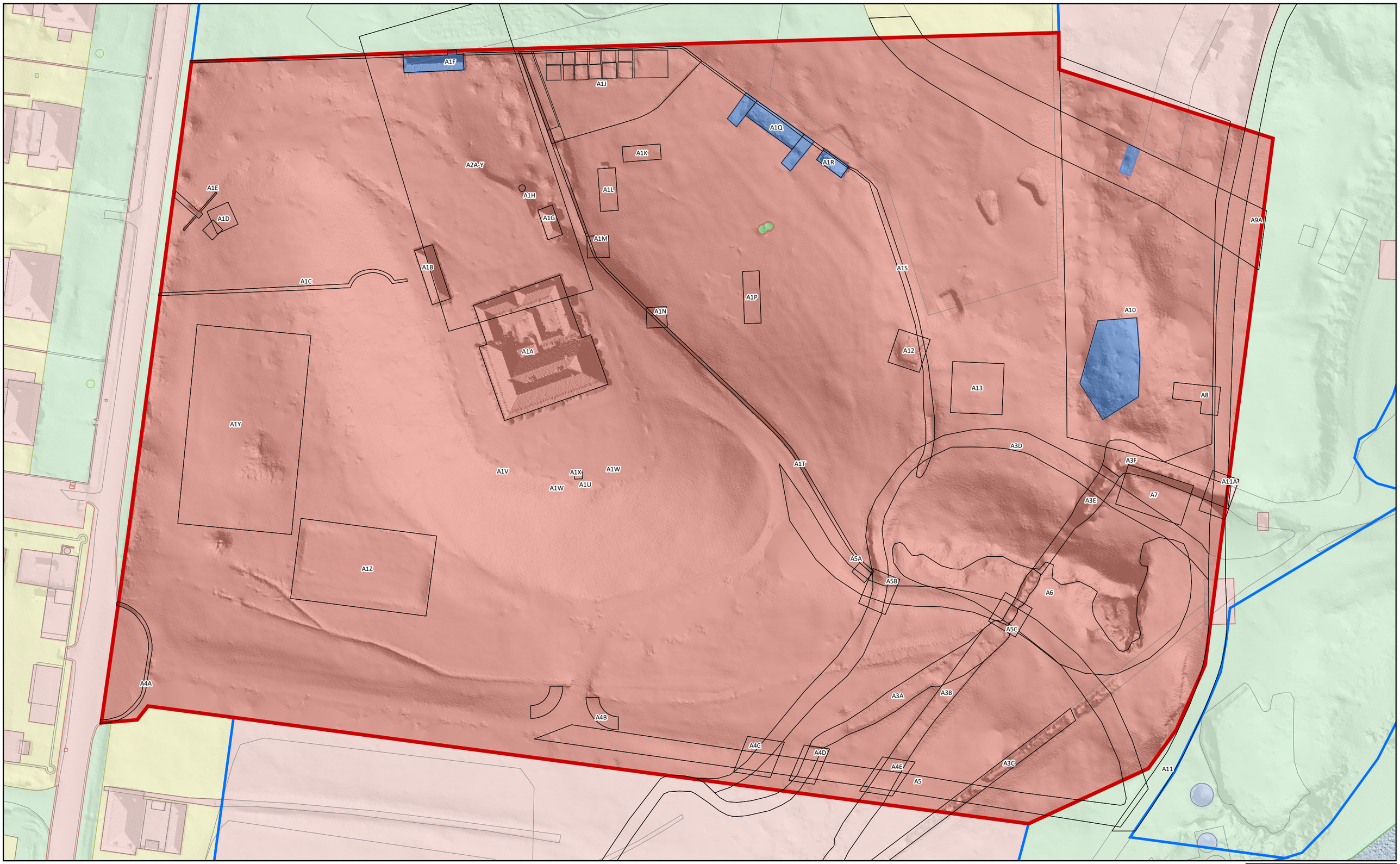


Plate 2. KAVHA Precinct A Archaeological Potential

Precinct A boundaries

All precinct boundaries

Precinct heritage items

Archaeological potential

Extant

High

Moderate

Low

0 50 100 Metres

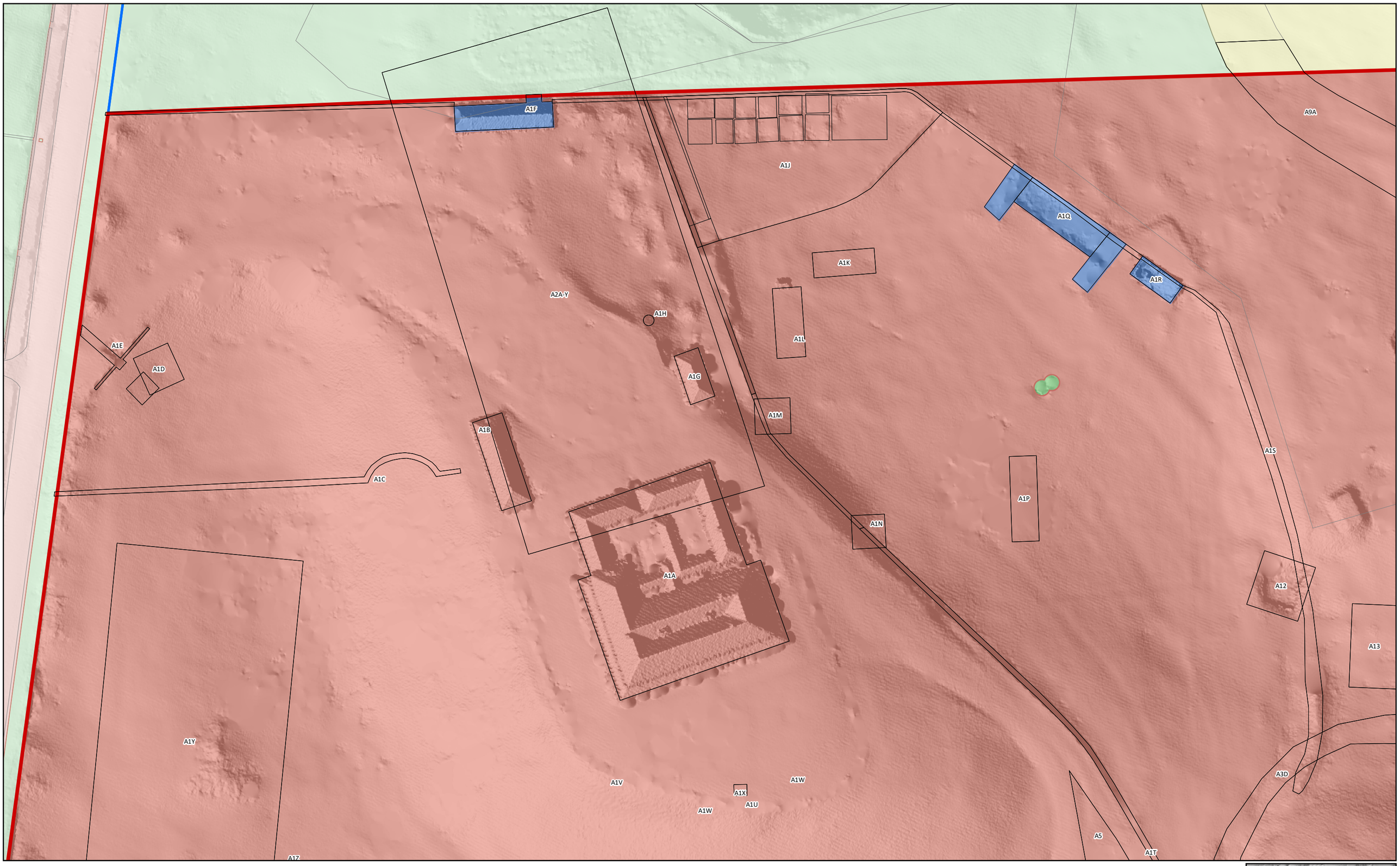


Plate 3. KAVHA Precinct A1 Archaeological Potential [Detail: Government House Complex]

Precinct A boundaries

All precinct boundaries

Precinct heritage items

Archaeological potential

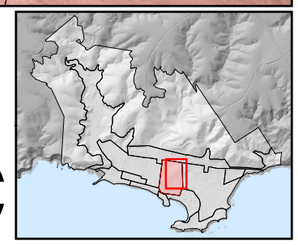
Extant

High

Moderate

Low

0 50 Metres



A3D
A3E
A7
A3F
A10
A9A
A11A
A11
A8

Plate 4. KAVHA Precinct A2 Archaeological Potential [Detail: Polynesian Settlement]

Precinct A boundaries

All precinct boundaries

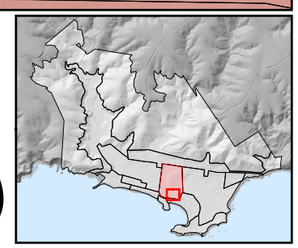
Precinct heritage items

Archaeological potential

Extant

High

0 10 20 30 Metres



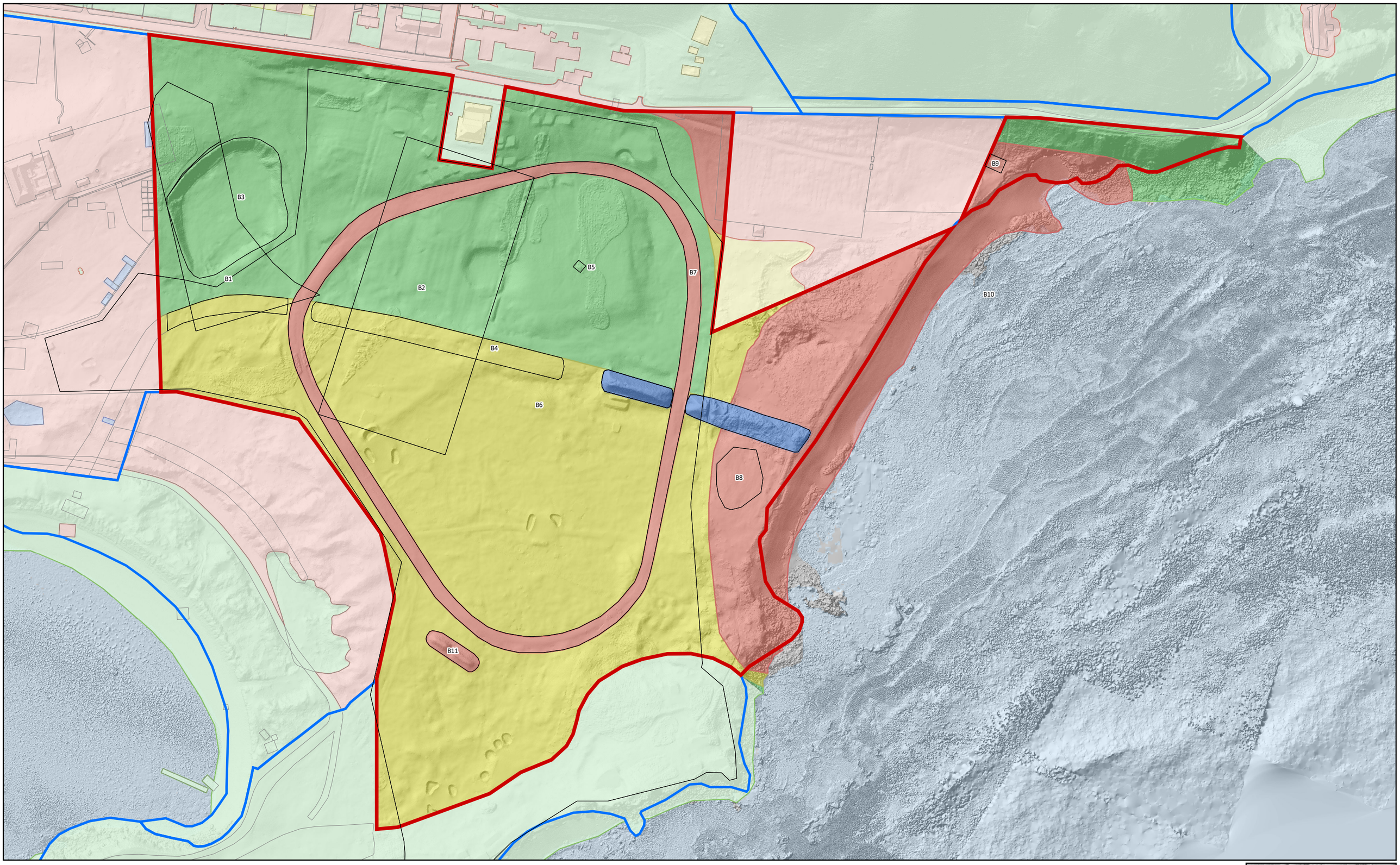


Plate 5. KAVHA Precinct B Archaeological Potential

Precinct B boundaries

All precinct boundaries

Precinct heritage items

Archaeological potential

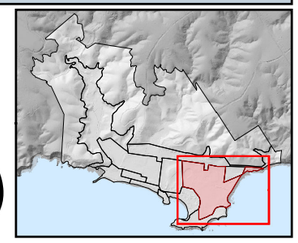
Extant

High

Moderate

Low

0 50 100 150 200 250 Metres



C1A
C1A
C1
C2
C1B
C2A

Plate 6. KAVHA Precinct C Archaeological Potential

Precinct C boundaries

All precinct boundaries

Precinct heritage items

Archaeological potential

High

Low

Moderate

0 50 Metres

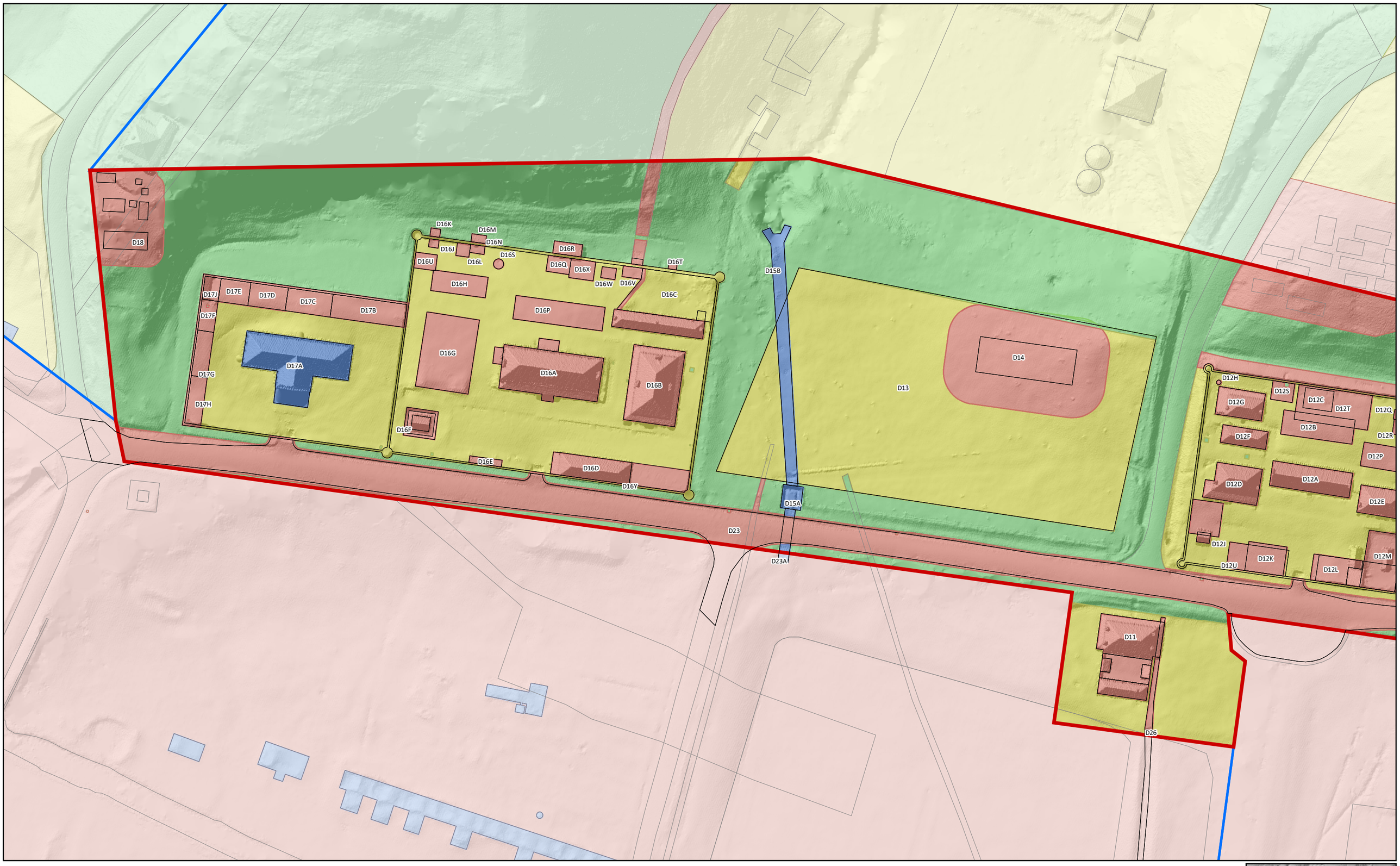


Plate 7. KAVHA Precinct D (west) Archaeological Potential

Precinct D boundaries

All precinct boundaries

Precinct heritage items

Archaeological potential

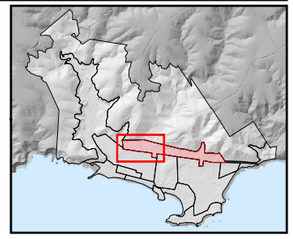
Extant

High

Moderate

Low

0 50 100 Metres



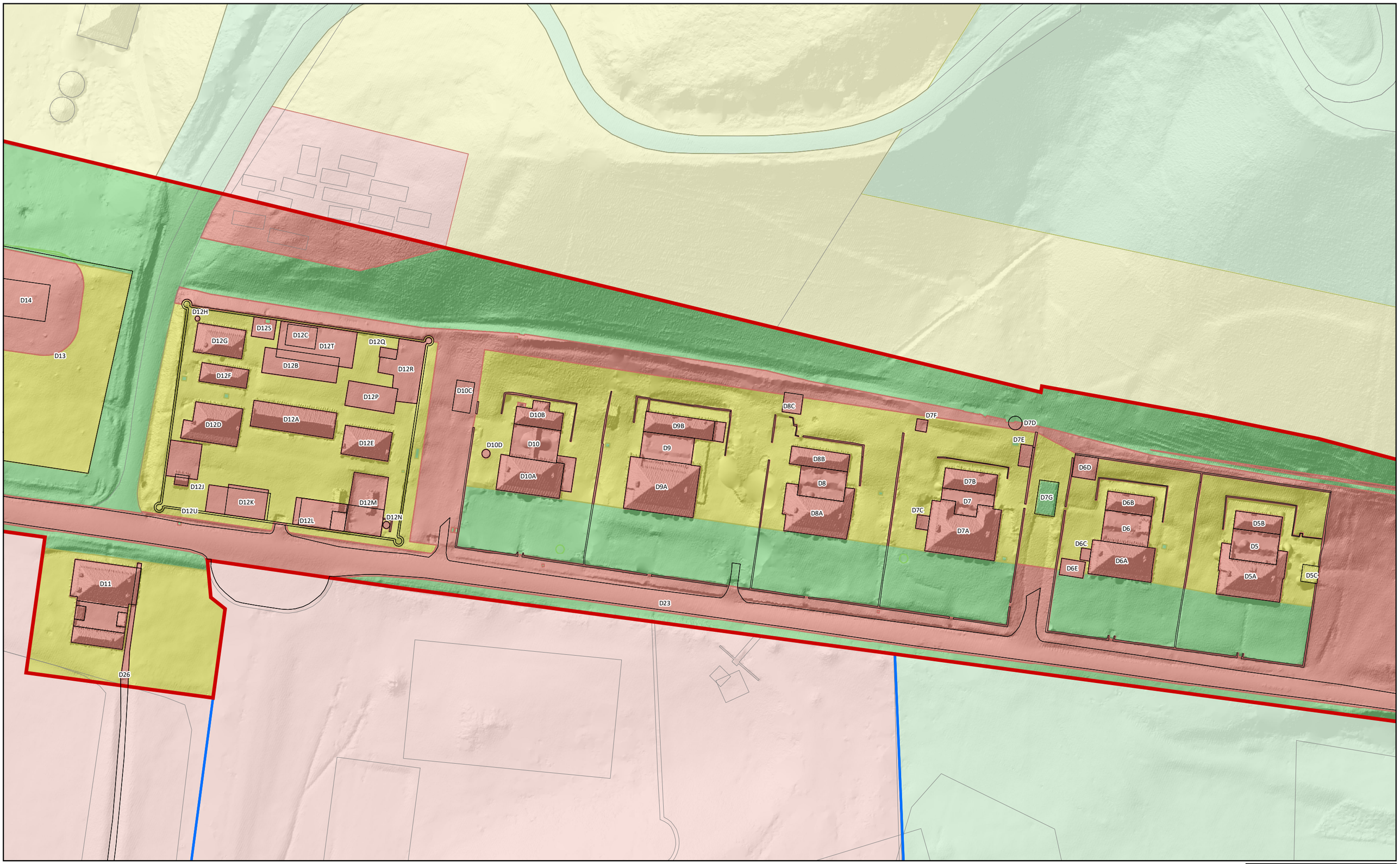


Plate 8. KAVHA Precinct D (centre) Archaeological Potential

Precinct D boundaries

All precinct boundaries

Precinct heritage items

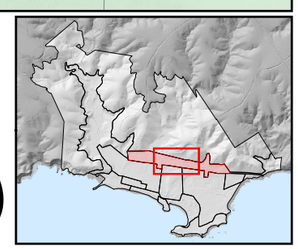
Archaeological potential

High

Low

Moderate

0 50 100 Metres



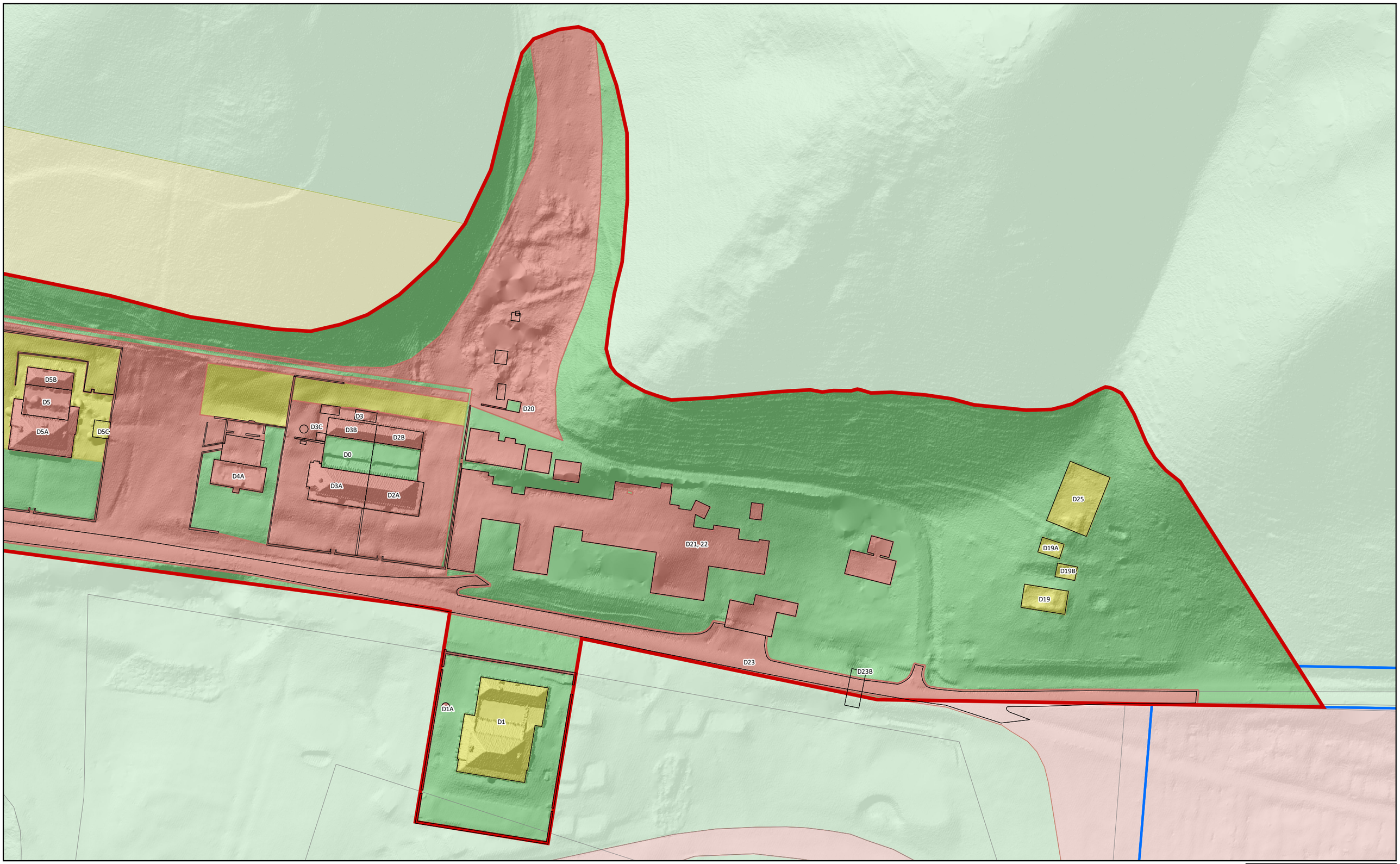


Plate 9. KAVHA Precinct D (east) Archaeological Potential

Precinct D boundaries

All precinct boundaries

Precinct heritage items

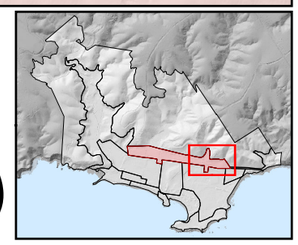
Archaeological potential

High

Low

Moderate

0 50 100 Metres



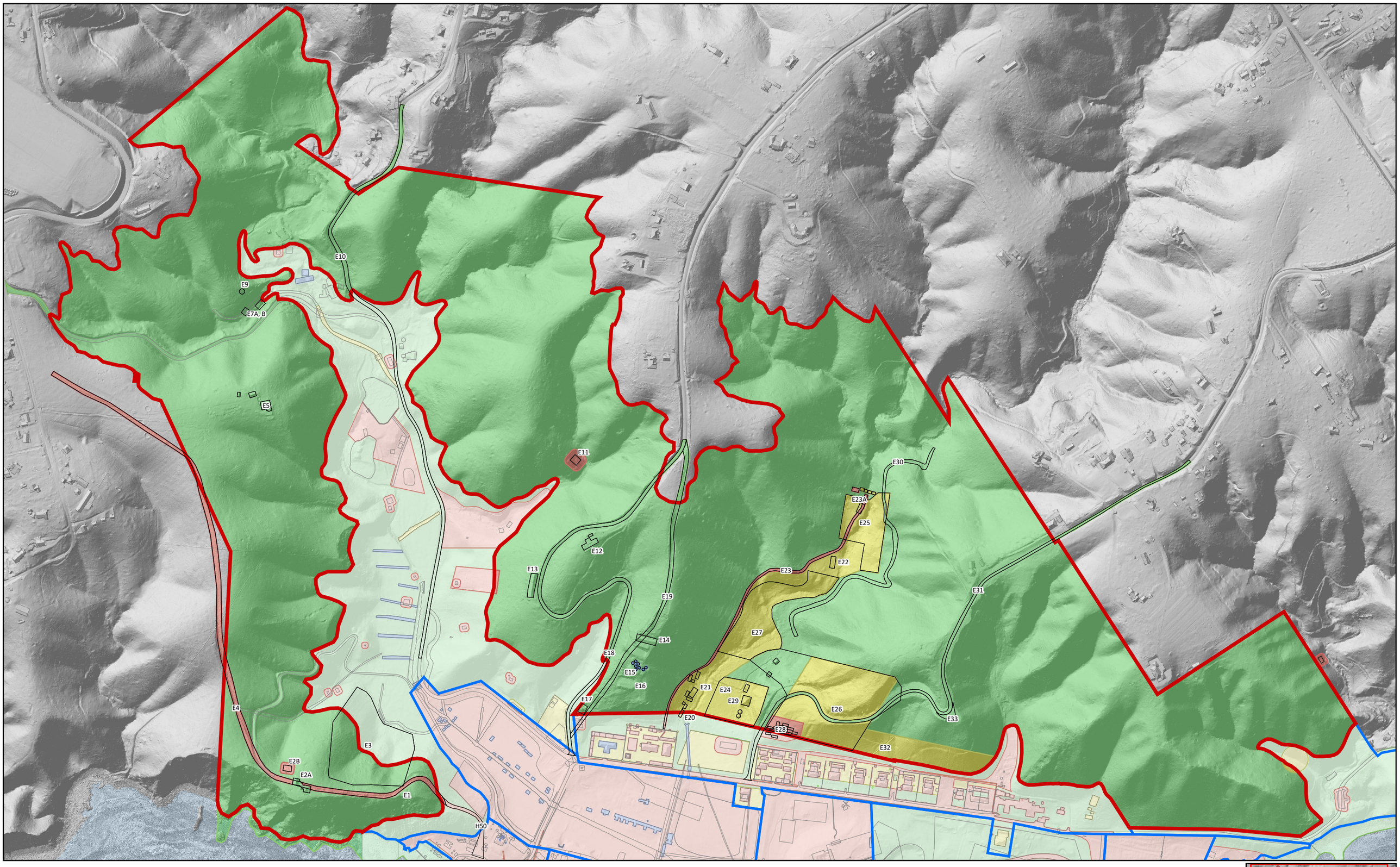


Plate 10. KAVHA Precinct E Archaeological Potential

Precinct E boundaries

All precinct boundaries

Precinct heritage items

Archaeological potential

Extant

High

Moderate

Low

0 250 500 750 Metres

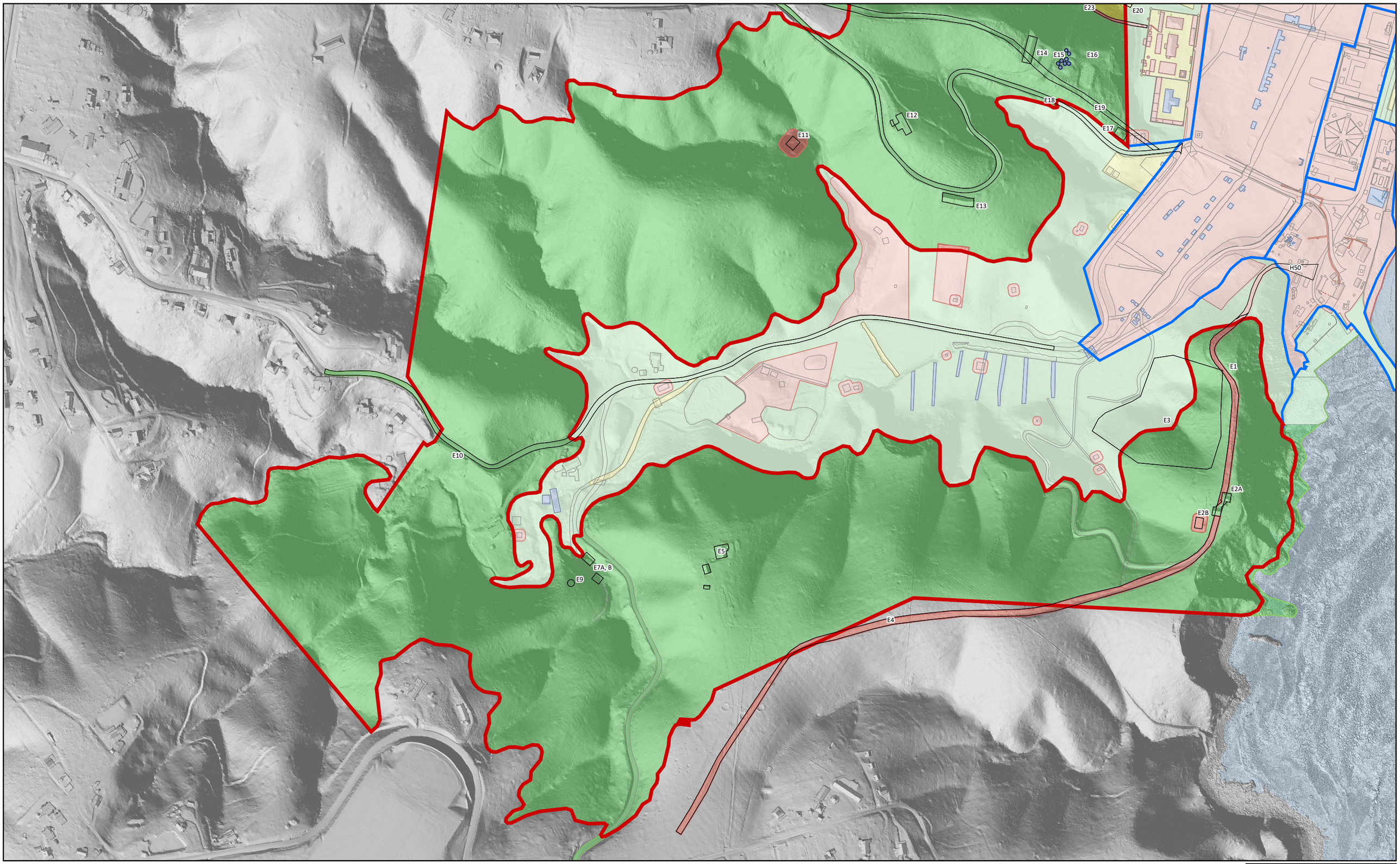


Plate 11. KAVHA Precinct E (west) Archaeological Potential

Precinct E boundaries

All precinct boundaries

Precinct heritage items

Archaeological potential

Extant

High

Moderate

Low

0 250 500 Metres

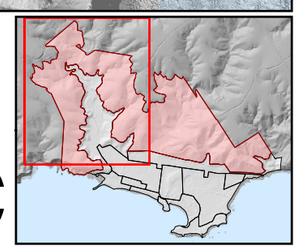


Plate 12. KAVHA Precinct E (south) Archaeological Potential

Precinct E boundaries

All precinct boundaries

Precinct heritage items

Archaeological potential

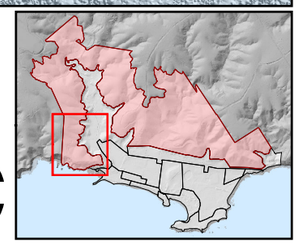
Extant

High

Moderate

Low

0 50 100 150 200 Metres



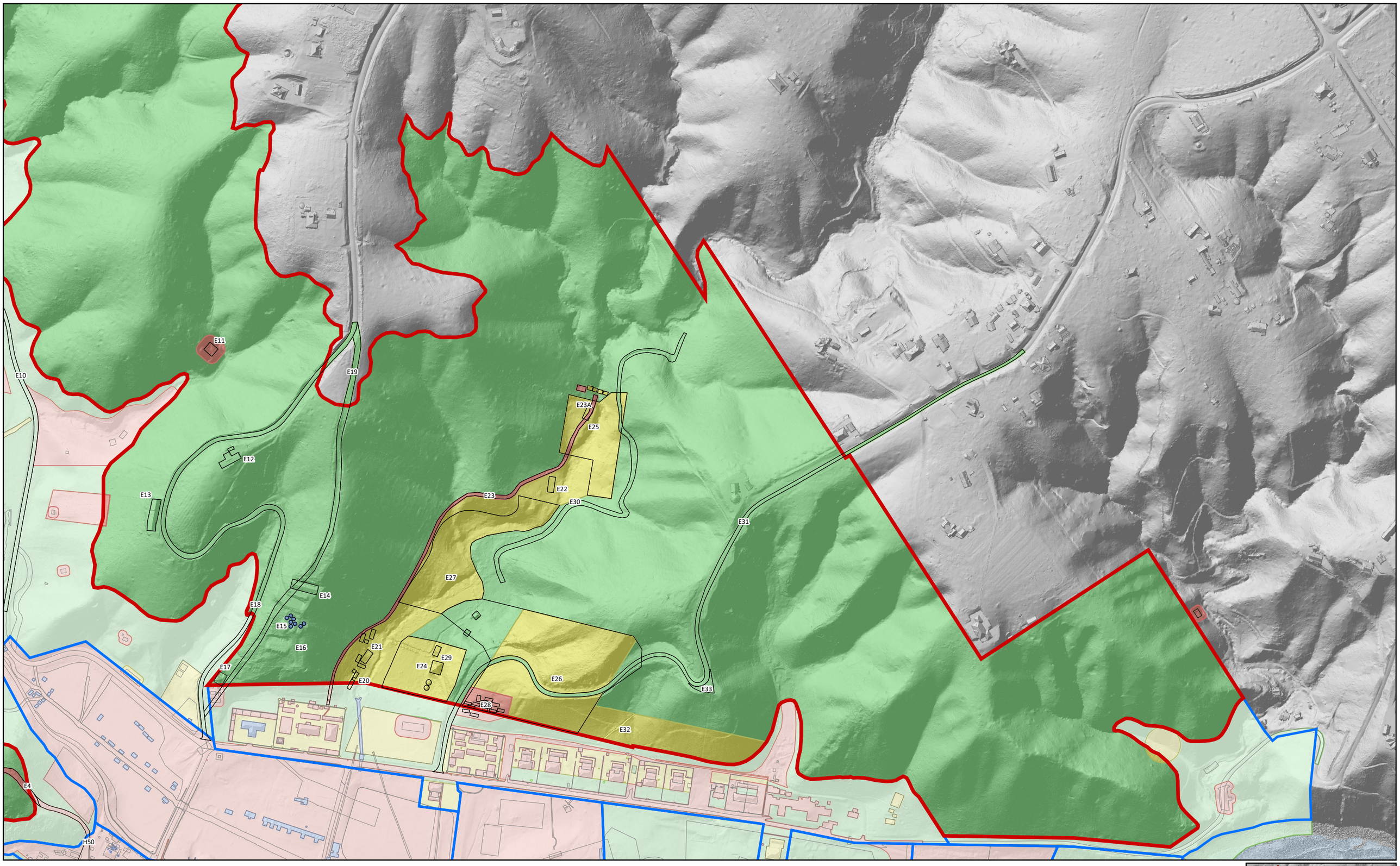


Plate 13. KAVHA Precinct E (east) Archaeological Potential

Precinct E boundaries

All precinct boundaries

Precinct heritage items

Archaeological potential

Extant

High

Moderate

Low

0 250 500 Metres

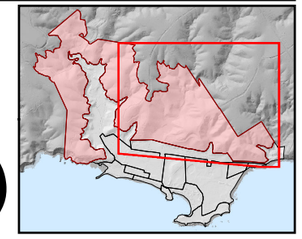


Plate 14. KAVHA Precinct F Archaeological Potential

Precinct F boundaries

All precinct boundaries

Precinct heritage items

Archaeological potential

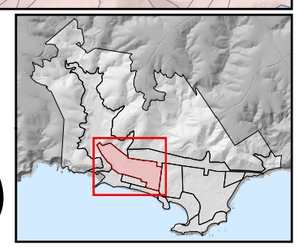
Extant

High

Moderate

Low

0 50 100 150 200 Metres



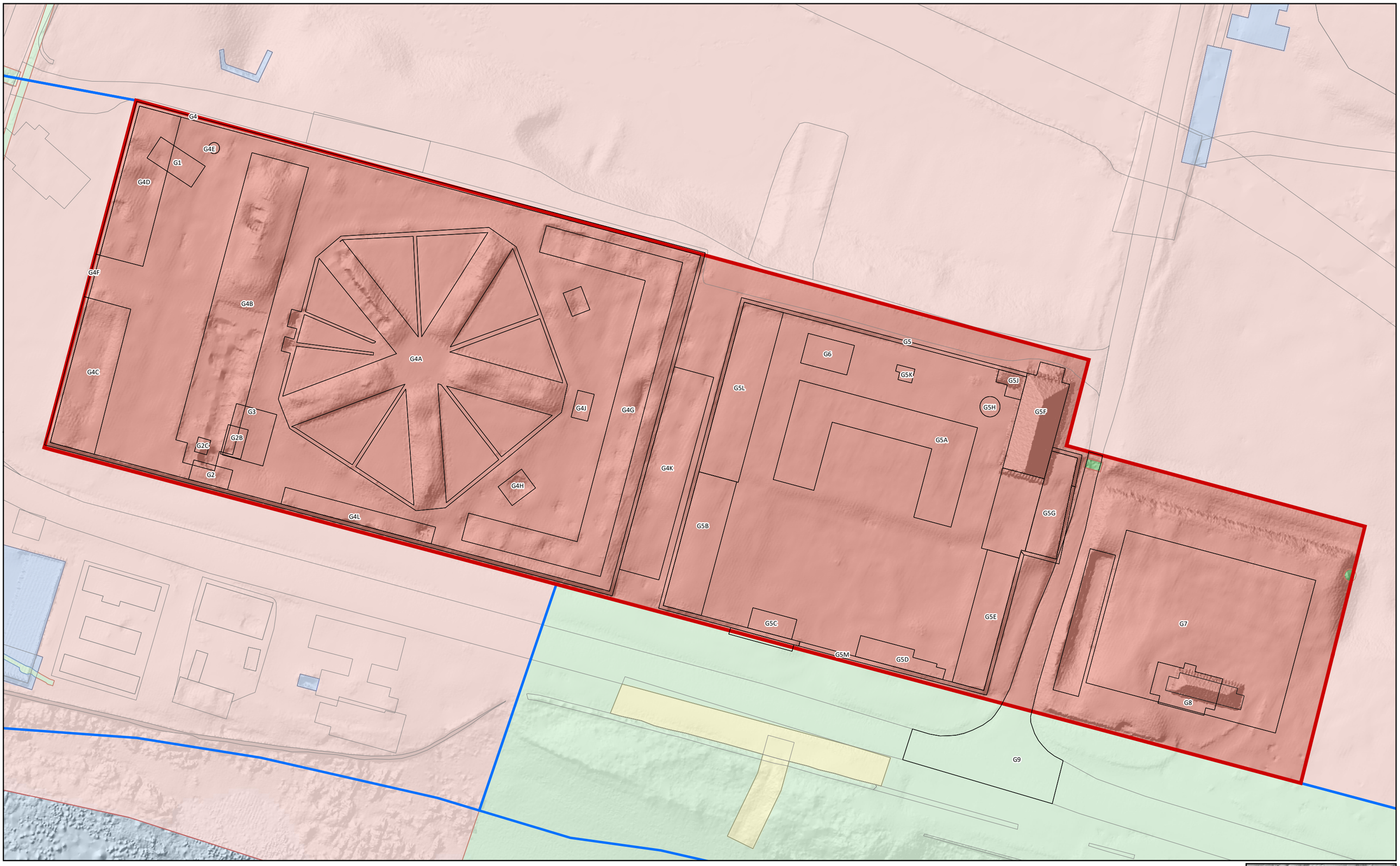


Plate 15. KAVHA Precinct G Archaeological Potential

Precinct G boundaries

All precinct boundaries

Precinct heritage items

Archaeological potential

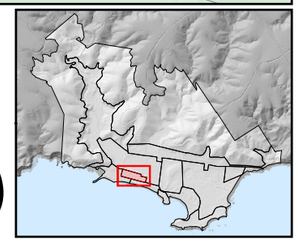
Extant

High

Moderate

Low

0 50 Metres



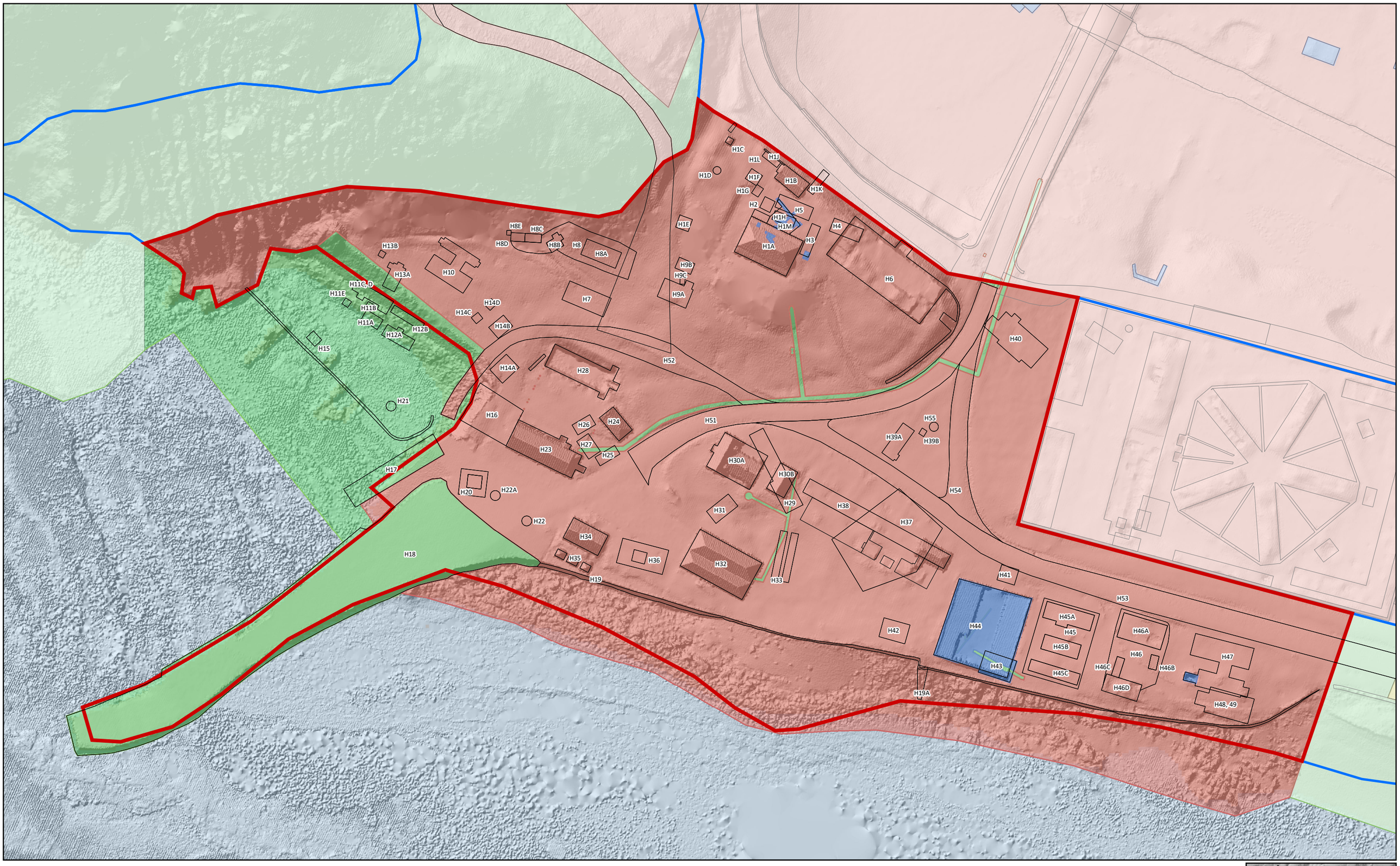


Plate 16. KAVHA Precinct H Archaeological Potential

Precinct H boundaries

All precinct boundaries

Precinct heritage items

Archaeological potential

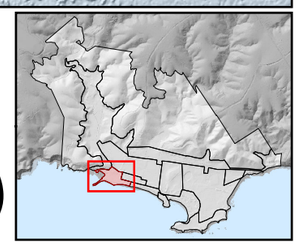
Extant

High

Moderate

Low

0 50 100 Metres



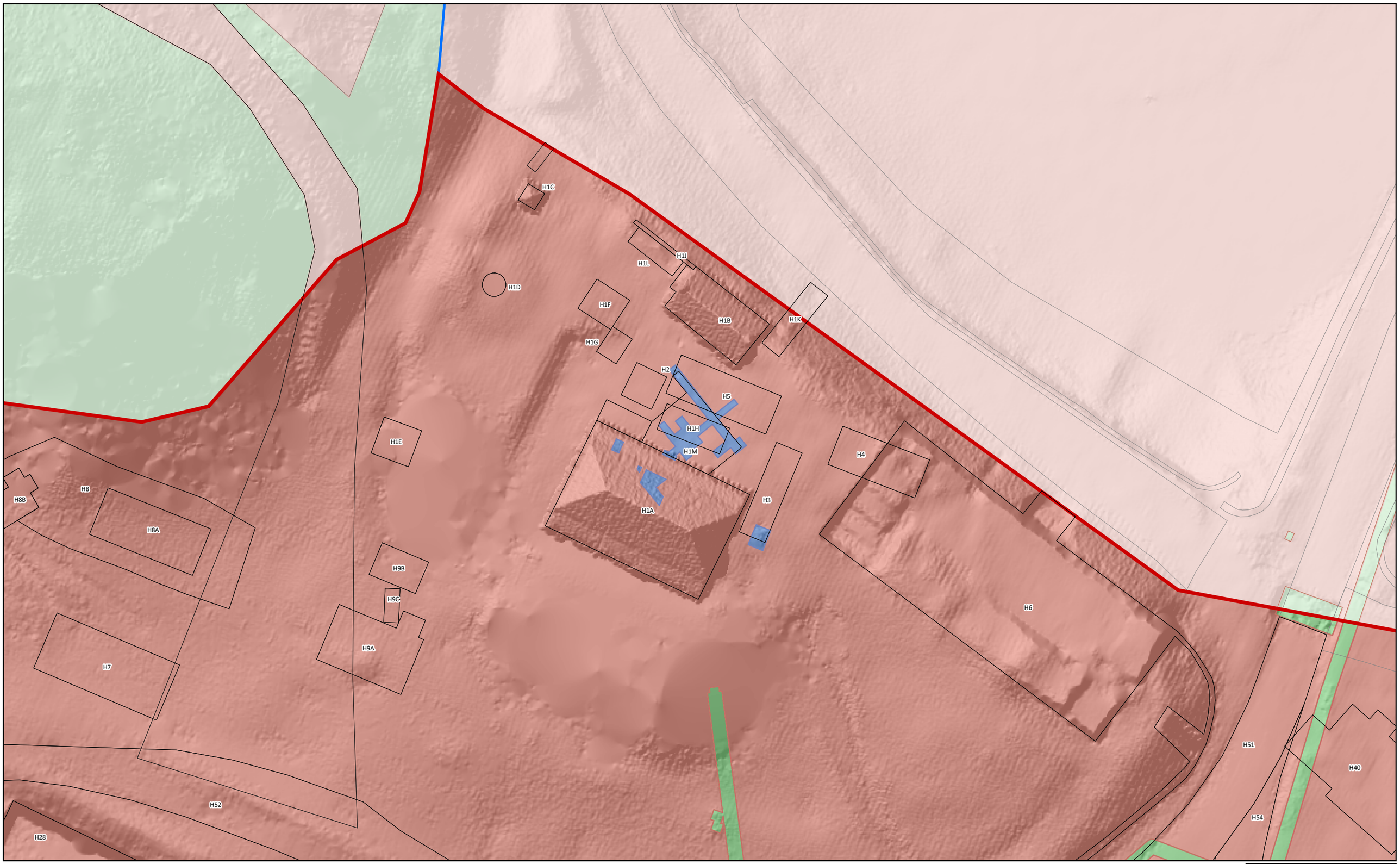


Plate 17. KAVHA Precinct H1 Archaeological Potential [Detail: Surgeon's Quarters, First Government House (site)]

Precinct H boundaries

All precinct boundaries

Precinct heritage items

Archaeological potential

Extant

Low

High

0 10 20 30 40 Metres

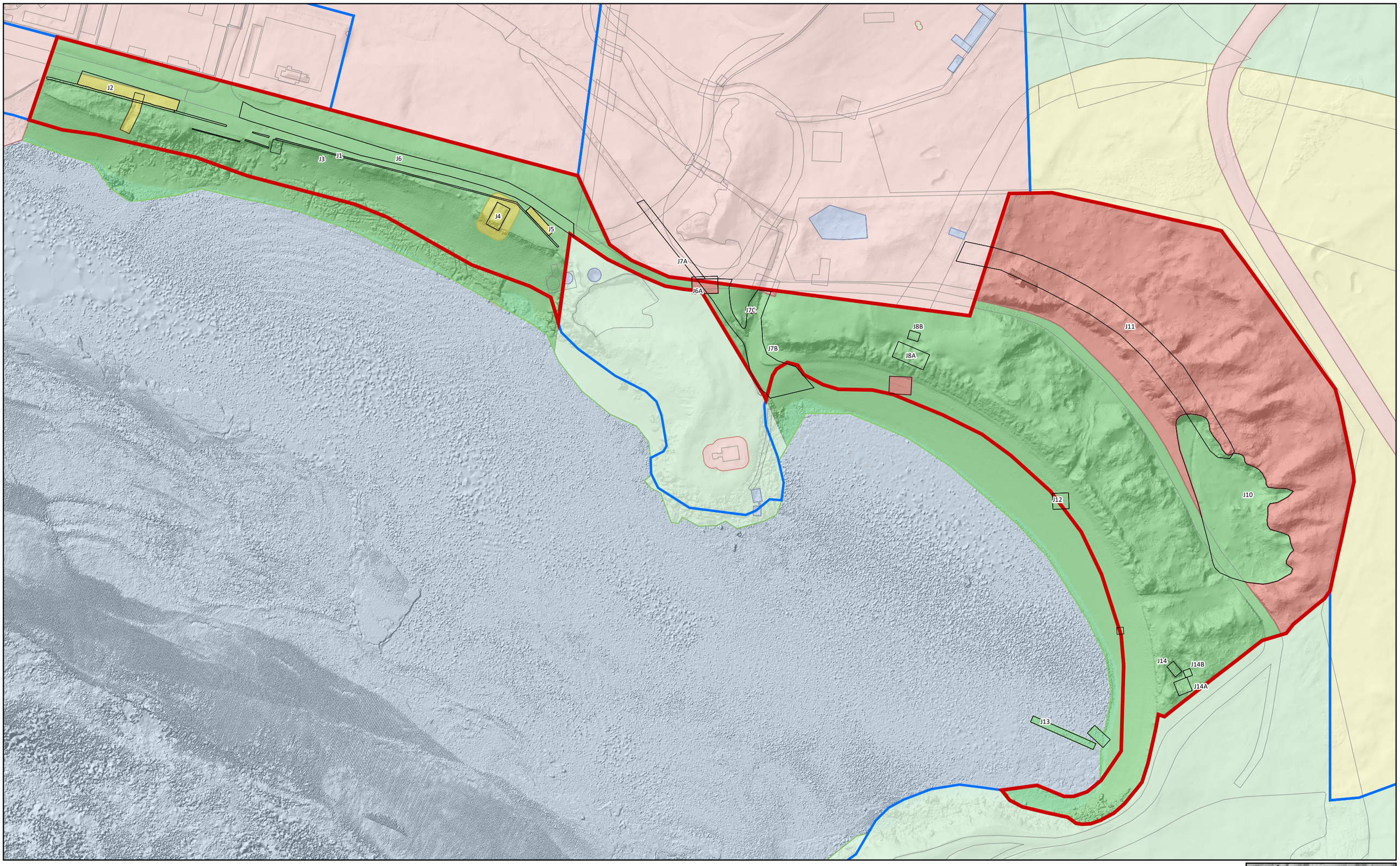


Plate 18. KAVHA Precinct J Archaeological Potential

Precinct J boundaries

All precinct boundaries

Precinct heritage items

Archaeological potential

Extant

High

Moderate

Low

0 50 100 150 200 Metres

K1

K2A

K2B

K2C

K3

Plate 19. KAVHA Precinct K Archaeological Potential

Precinct K boundaries

All precinct boundaries

Precinct heritage items

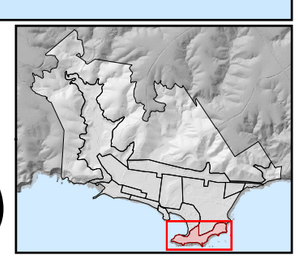
Archaeological potential

High

Low

Moderate

0 50 100 150 Metres



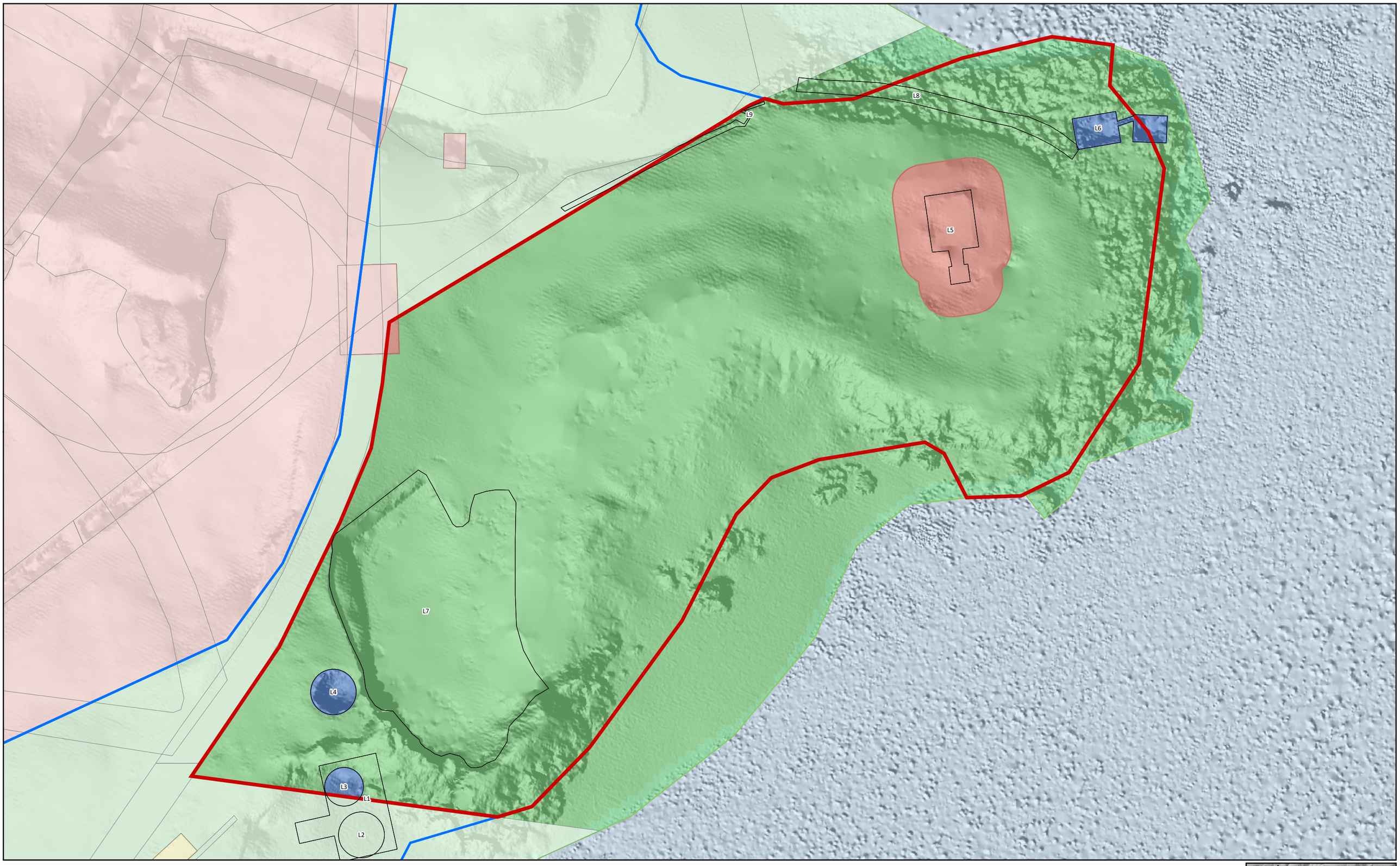


Plate 20. KAVHA Precinct L Archaeological Potential

Precinct L boundaries

All precinct boundaries

Precinct heritage items

Archaeological potential

Extant

High

Moderate

Low

0 50 Metres

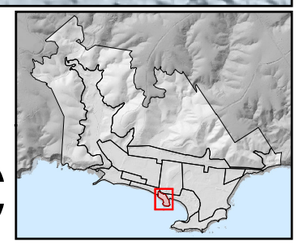


Plate 21. KAVHA Precinct M Archaeological Potential

Precinct M boundaries

All precinct boundaries

Precinct heritage items

Archaeological potential

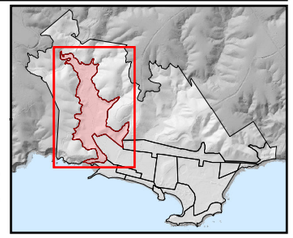
Extant

High

Moderate

Low

0 50 100 150 200 250 300 Metres



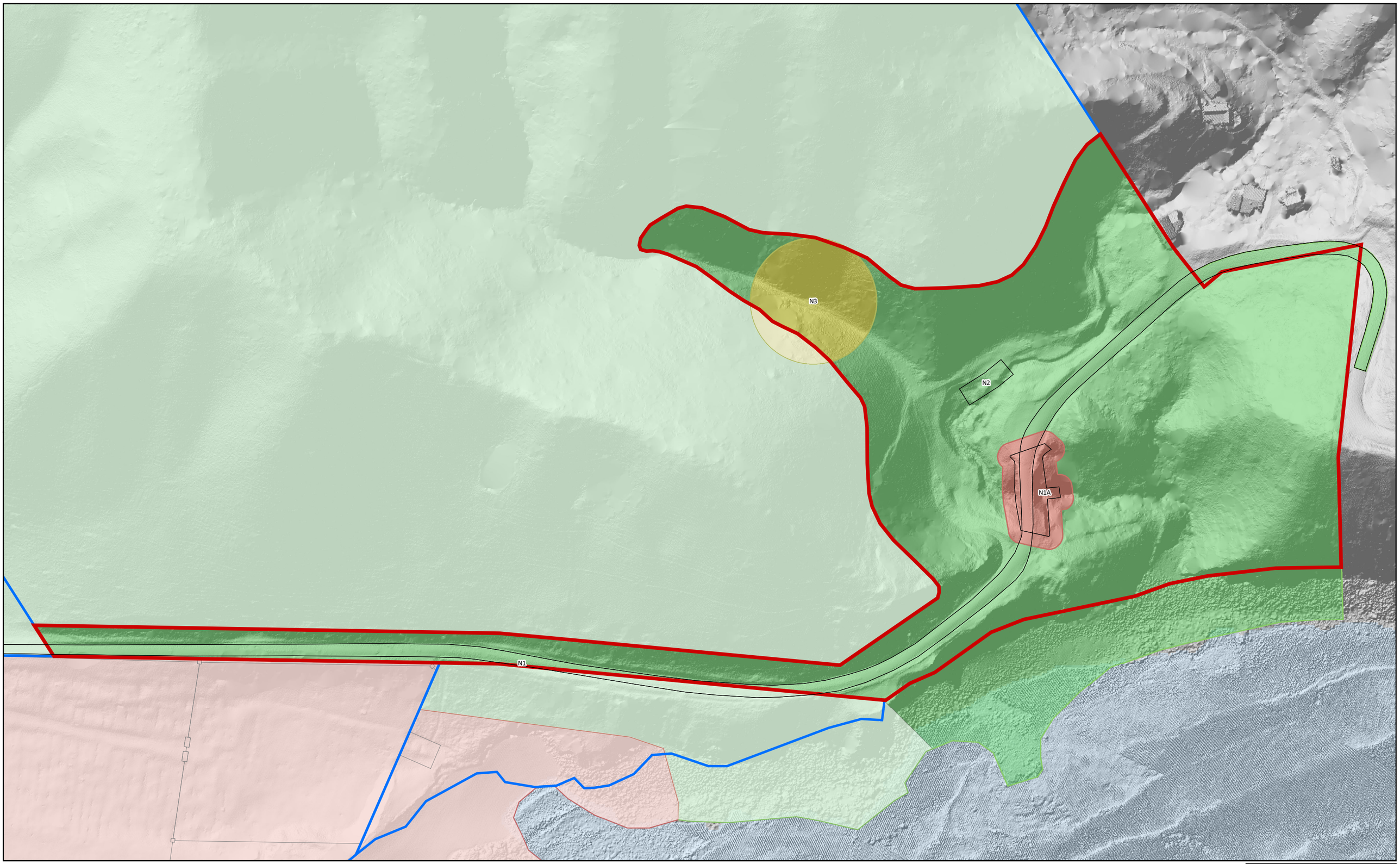


Plate 22. KAVHA Precinct N Archaeological Potential

Precinct N boundaries

All precinct boundaries

Precinct heritage items

Archaeological potential

High

Low

Moderate

0 50 100 150 Metres

2. Archaeological management zones

The archaeological management zones depicted within this report are as follows:

- Zone 1: Identifies areas of high archaeological potential where impact and/or removal is generally unacceptable.
- Zone 2: Identifies locations for the management of archaeological fabric with contributory heritage values, or locations assessed as having moderate archaeological potential.
- Zone 3: Identifies locations for management of archaeological fabric in areas of low archaeological potential.
- Zone 4 is specifically related to the Cemetery reserve and Murderer's Mound.

A full description, including acceptable archaeological investigation methods for each zone, is provided in Section 5.3.1 of Volume 1.

For those areas in the following figures where management zoning is shown extending seaward beyond the KAVHA boundary the zoning beyond the boundary ***only applies to the land above the high-water mark****, regardless of the mapped spatial extents of the archaeological management zones (see Section 1.9, Volume 1).*

Plate 23. KAVHA Archaeological Management Zones

All precinct boundaries

Precinct heritage items

Management zones

Zone 1

Zone 2

Zone 3

Zone 4

0 250 500 750 1,000 Metres

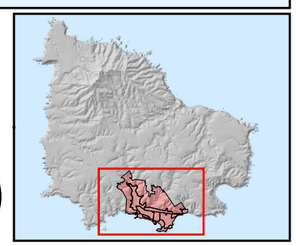


Plate 24. KAVHA Precinct A Archaeological Management Zones

Precinct A boundaries

All precinct boundaries

Precinct heritage items

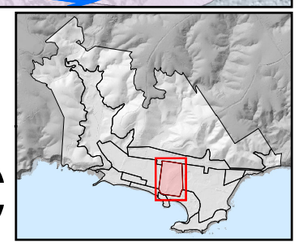
Management zones

Zone 1

Zone 2

Zone 3

0 50 100 Metres



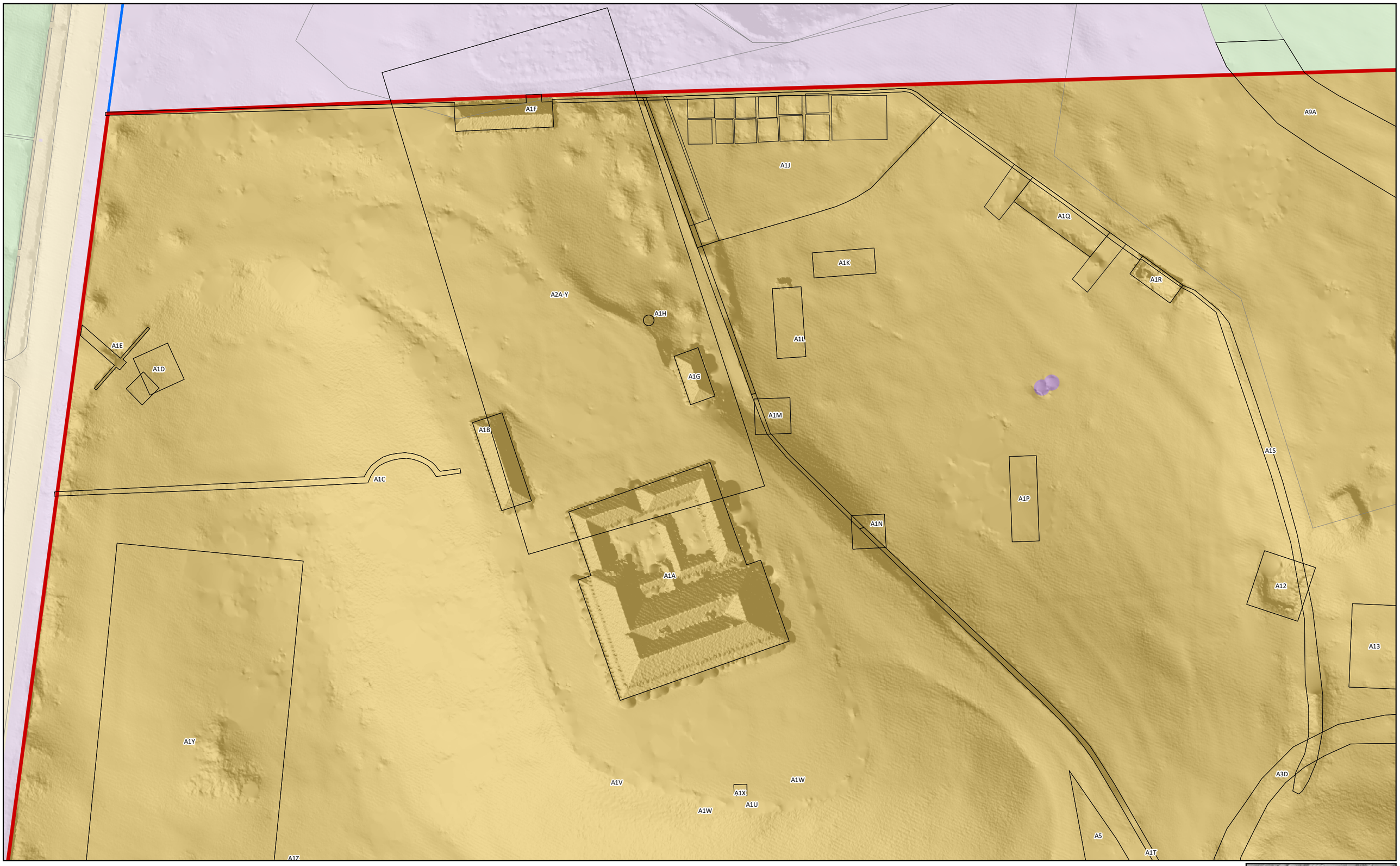


Plate 25. KAVHA Precinct A1 Archaeological Management Zones [Detail: Government House Complex]

Precinct A boundaries

All precinct boundaries

Precinct heritage items

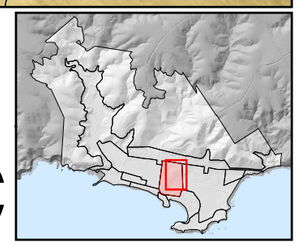
Management zones

Zone 1

Zone 2

Zone 3

0 50 Metres



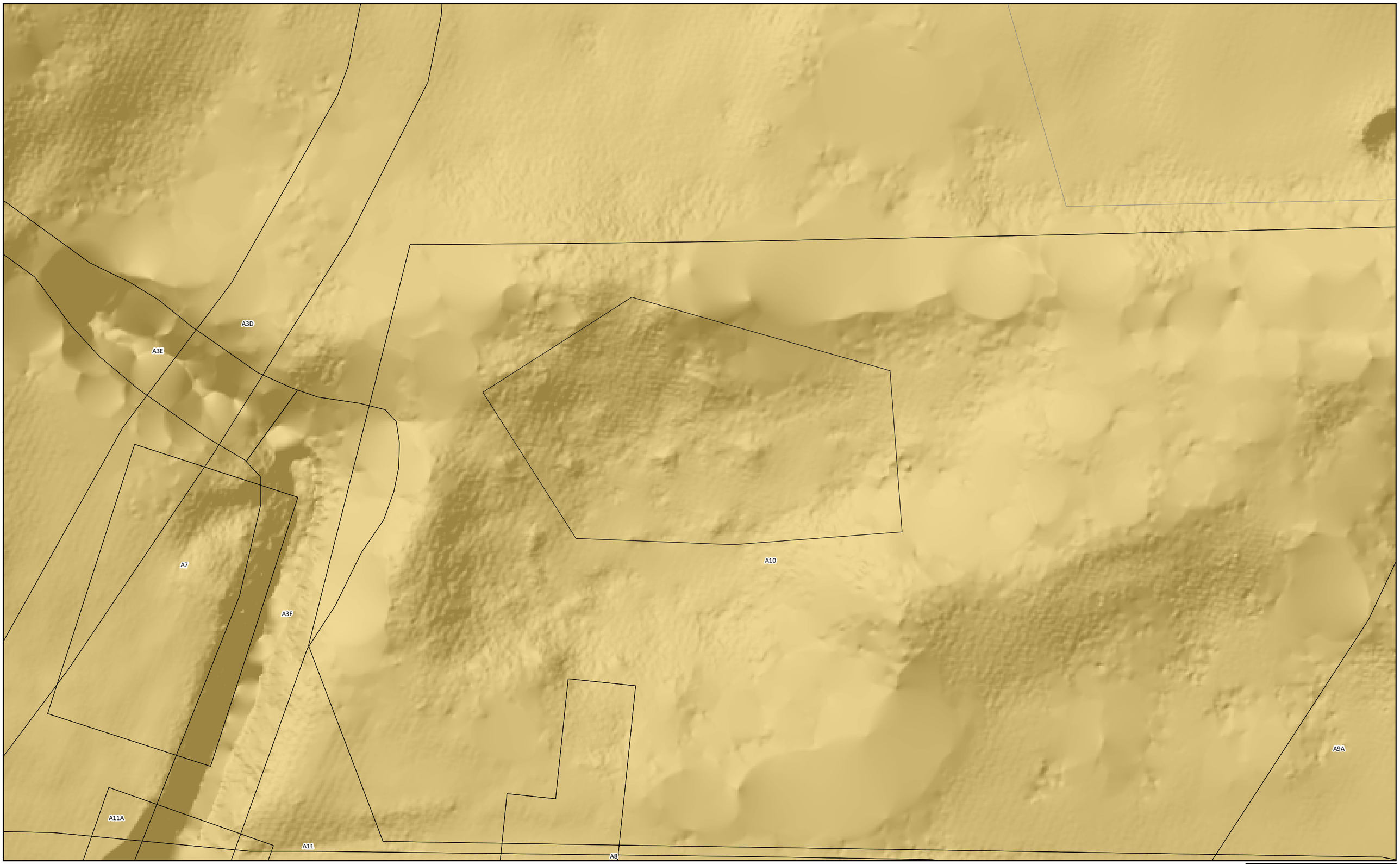


Plate 26. KAVHA Precinct A2 Archaeological Management Zones [Detail: Polynesian Settlement]

Precinct A boundaries

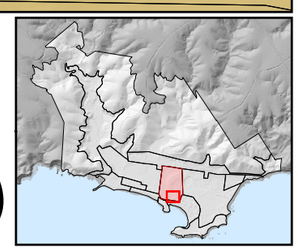
All precinct boundaries

Precinct heritage items

Management zones

Zone 1

0 10 20 30 Metres



B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
B11

Plate 27. KAVHA Precinct B Archaeological Management Zones

Precinct B boundaries

All precinct boundaries

Precinct heritage items

Management zones

Zone 1

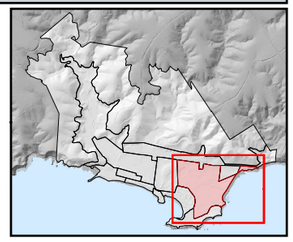
Zone 2

Zone 3

Zone 4

0 50 100 150 200 250

Metres



C2

C1A

C1A

C1

C1B

C2A

Plate 28. KAVHA Precinct C Archaeological Management Zones

Precinct C boundaries

All precinct boundaries

Precinct heritage items

Management zones

Zone 1

Zone 4

Zone 3

0

50

Metres

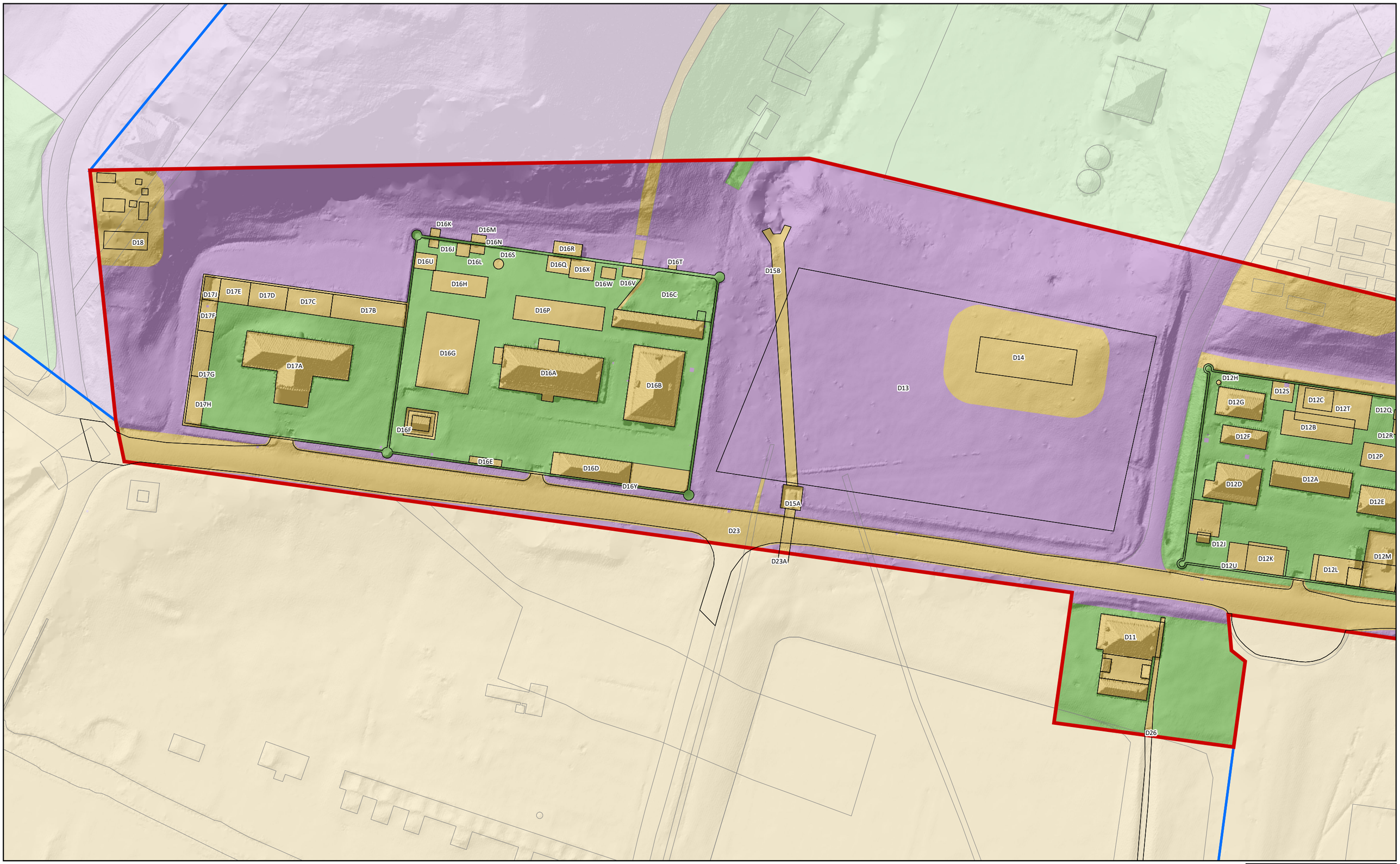


Plate 29. KAVHA Precinct D (west) Archaeological Management Zones

Precinct D boundaries

All precinct boundaries

Precinct heritage items

Management zones

Zone 1

Zone 2

Zone 3

0 50 100 Metres

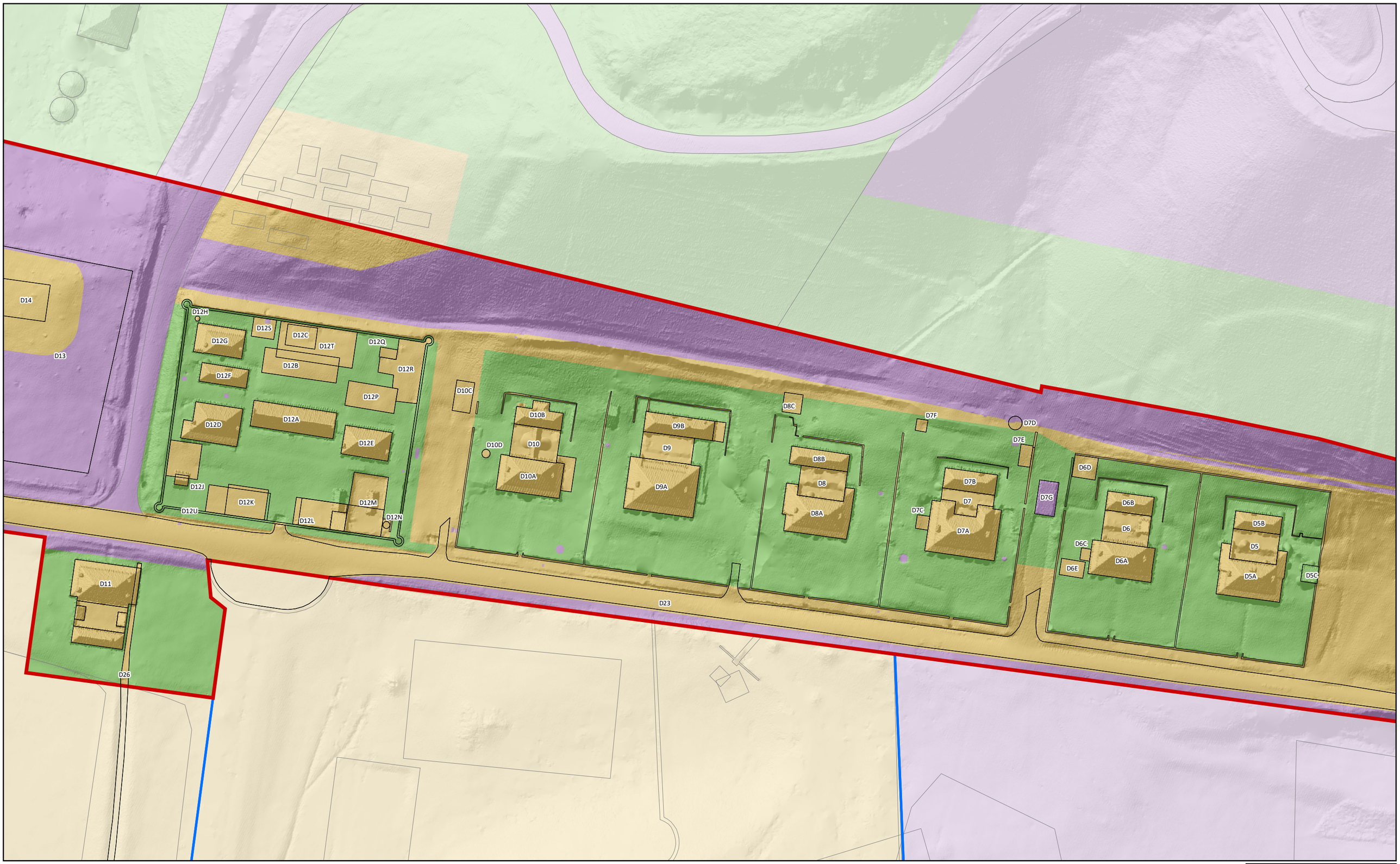


Plate 30. KAVHA Precinct D (centre) Archaeological Management Zones

Precinct D boundaries

All precinct boundaries

Precinct heritage items

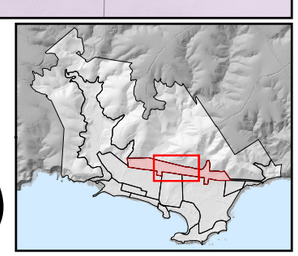
Management zones

Zone 1

Zone 2

Zone 3

0 50 100 Metres



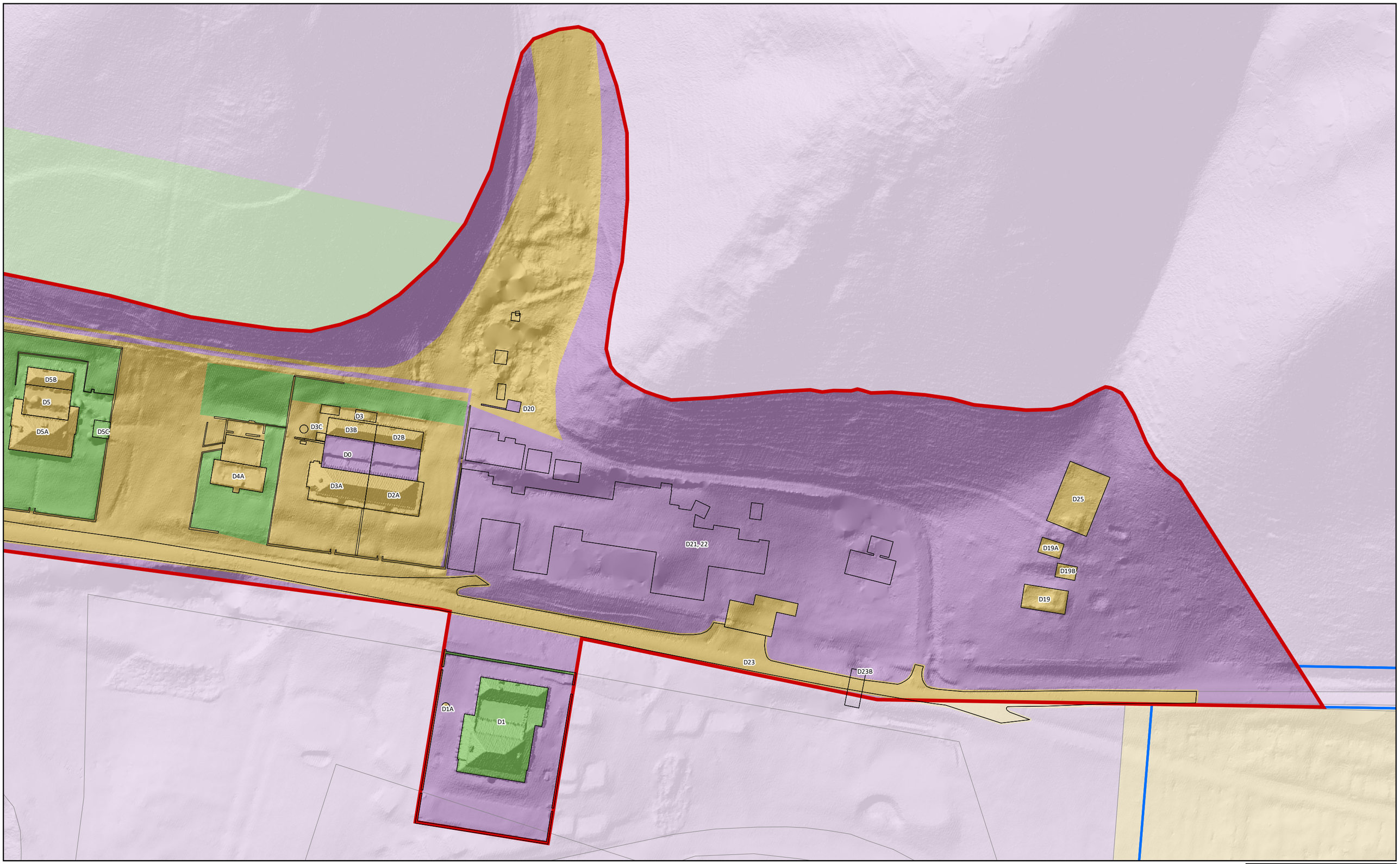


Plate 31. KAVHA Precinct D (east) Archaeological Management Zones

Precinct D boundaries

All precinct boundaries

Precinct heritage items

Management zones

Zone 1

Zone 2

Zone 3

0 50 100 Metres

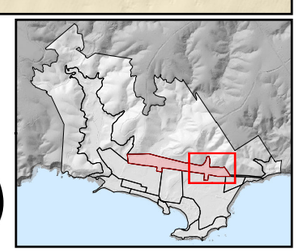


Plate 32. KAVHA Precinct E Archaeological Management Zones

Precinct E boundaries

All precinct boundaries

Precinct heritage items

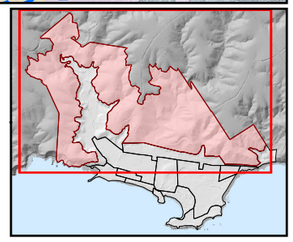
Management zones

Zone 1

Zone 2

Zone 3

0 250 500 750 Metres



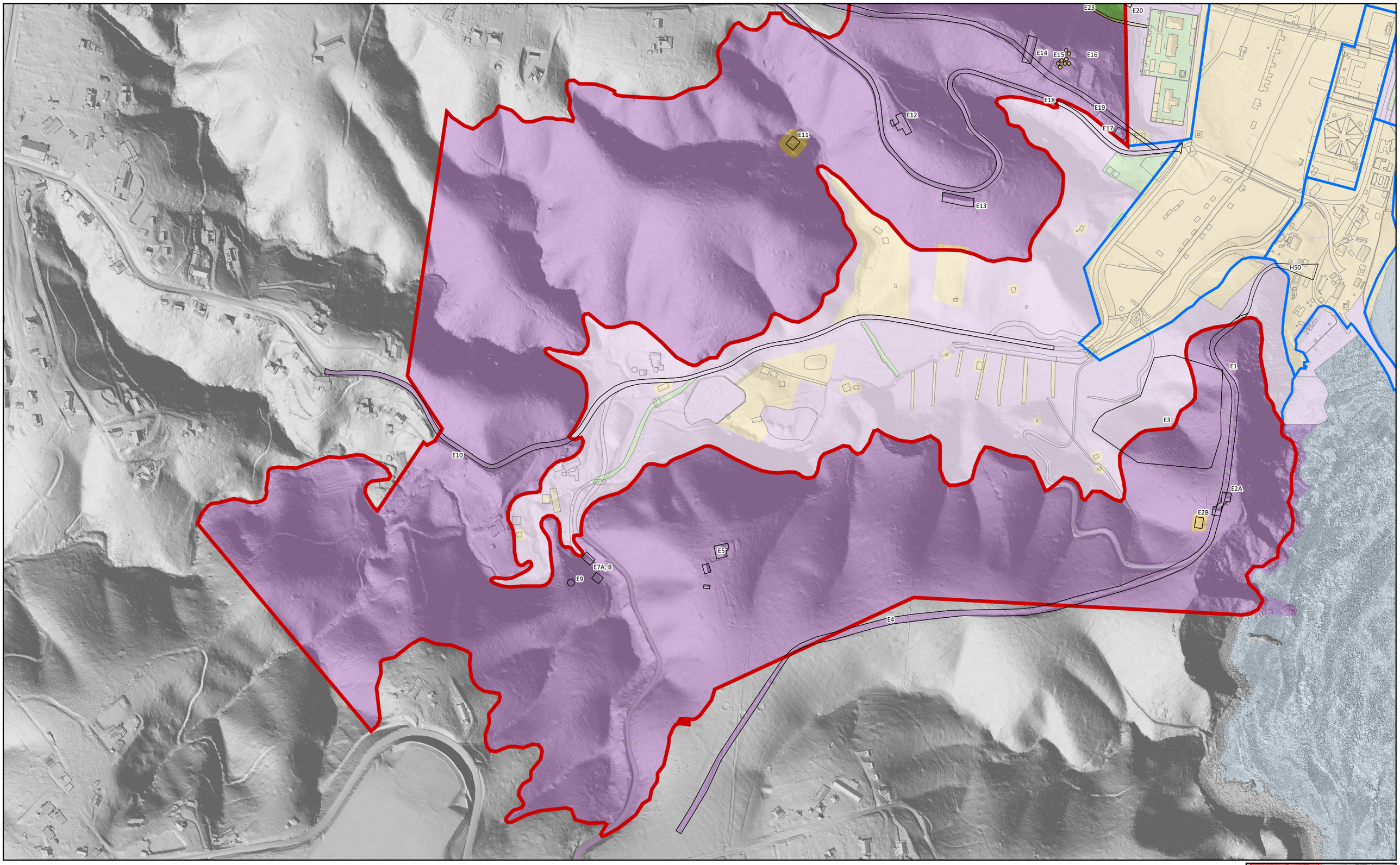


Plate 33. KAVHA Precinct E (west) Archaeological Management Zones

Precinct E boundaries

All precinct boundaries

Precinct heritage items

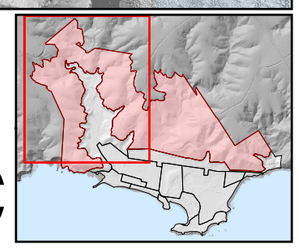
Management zones

Zone 1

Zone 2

Zone 3

0 250 500 Metres



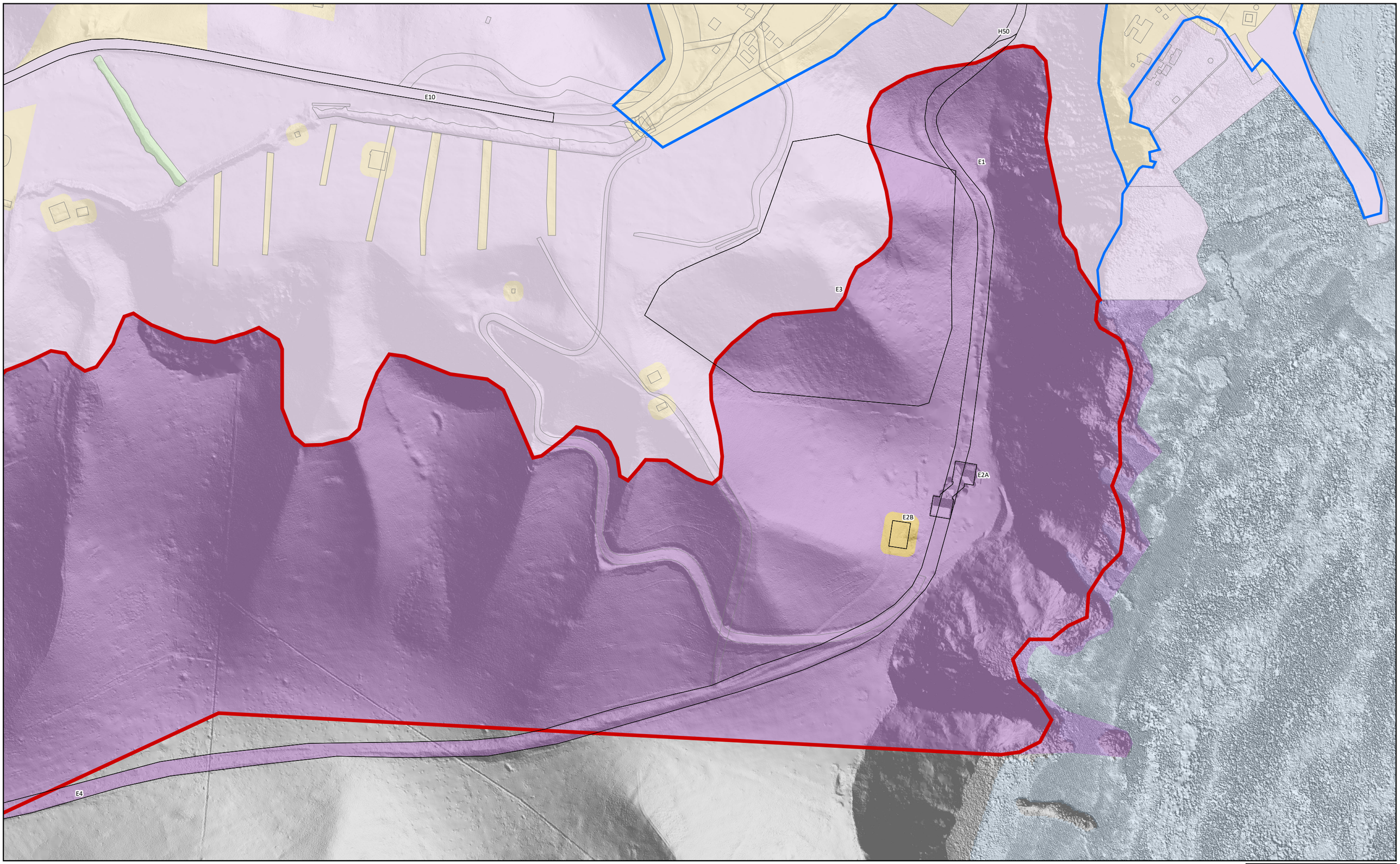


Plate 34. KAVHA Precinct E (south) Archaeological Management Zones

Precinct E boundaries

All precinct boundaries

Precinct heritage items

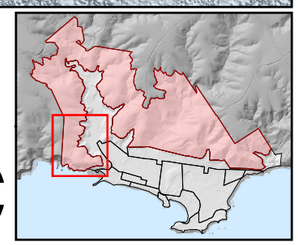
Management zones

Zone 1

Zone 2

Zone 3

0 50 100 150 200 Metres



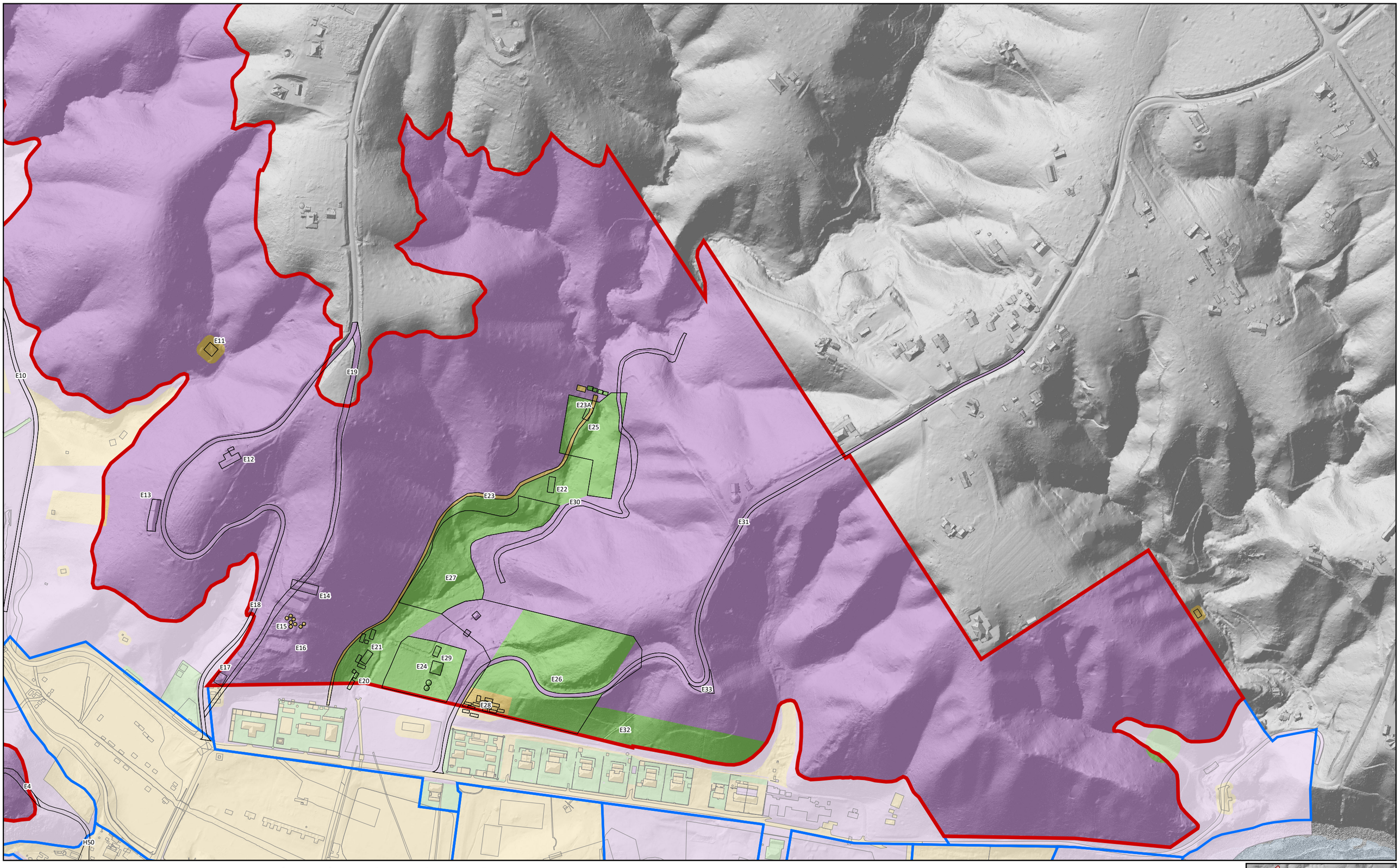


Plate 35. KAVHA Precinct E (east) Archaeological Management Zones

Precinct E boundaries

All precinct boundaries

Precinct heritage items

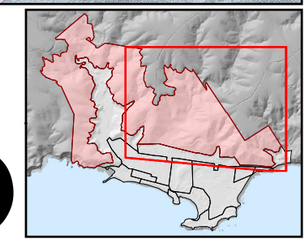
Management zones

Zone 1

Zone 2

Zone 3

0 250 500 Metres



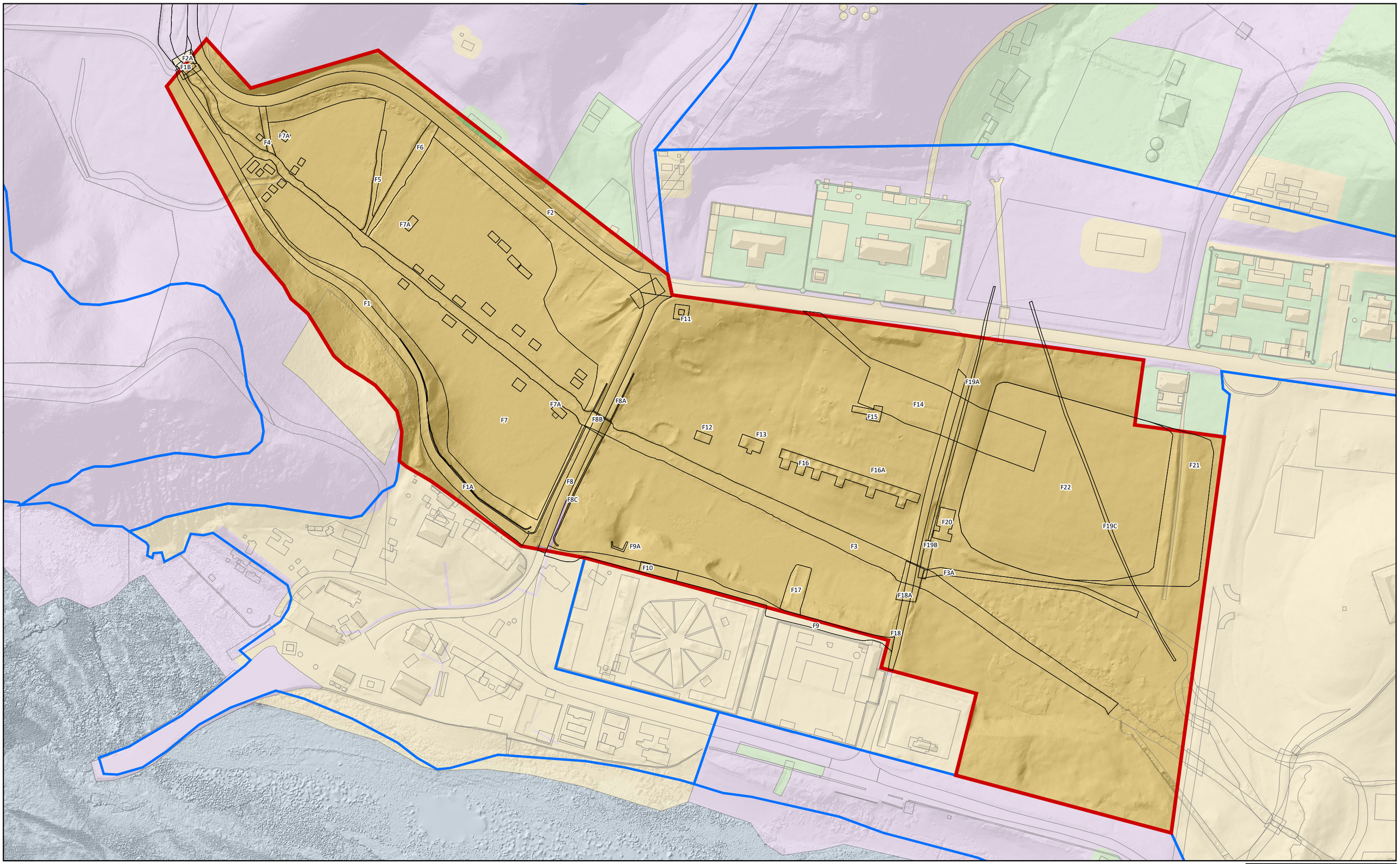


Plate 36. KAVHA Precinct F Archaeological Management Zones

Precinct F boundaries

All precinct boundaries

Precinct heritage items

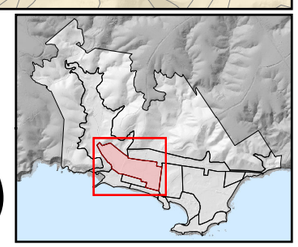
Management zones

Zone 1

Zone 2

Zone 3

0 50 100 150 200 Metres



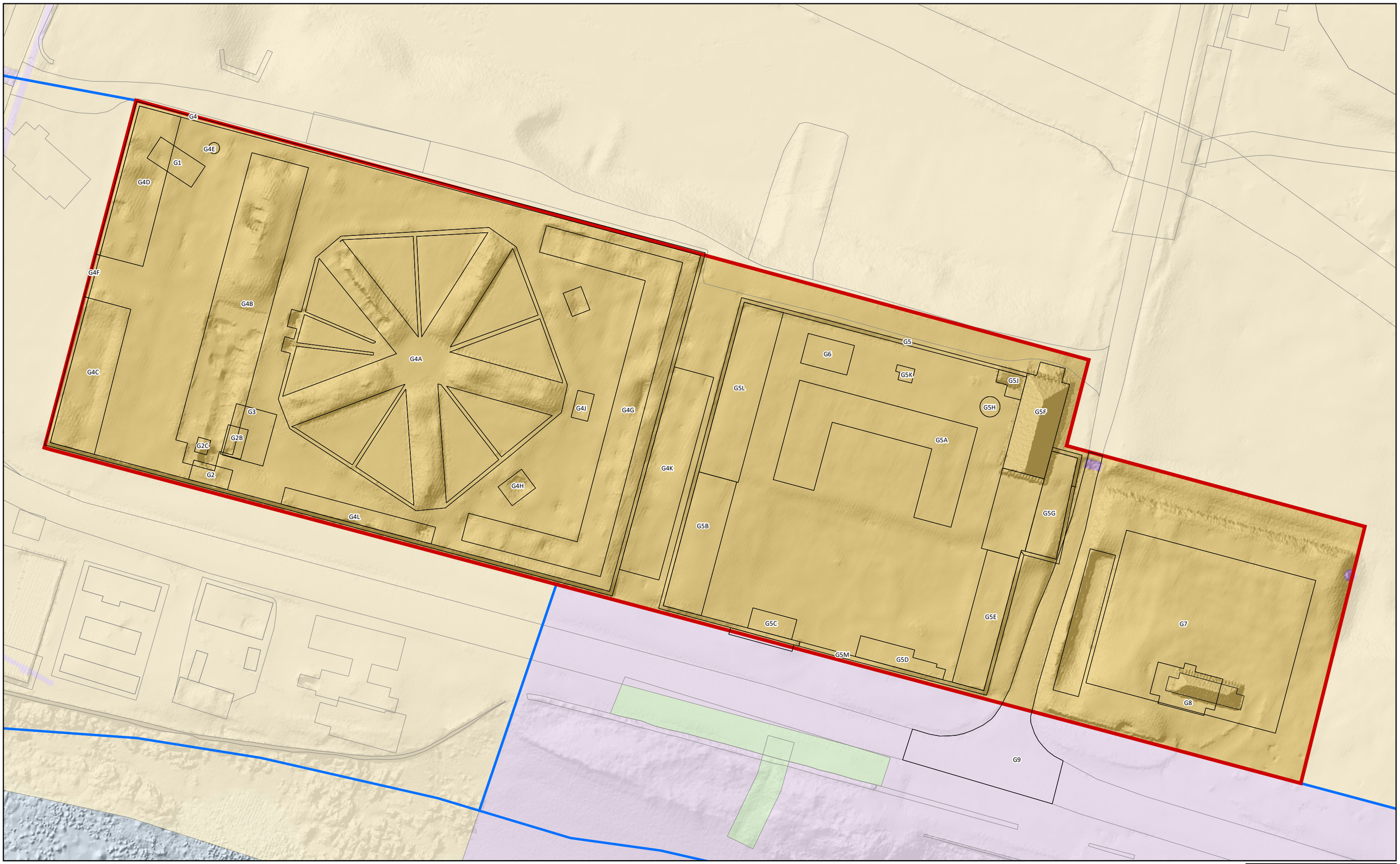


Plate 37. KAVHA Precinct G Archaeological Management Zones

Precinct G boundaries

All precinct boundaries

Precinct heritage items

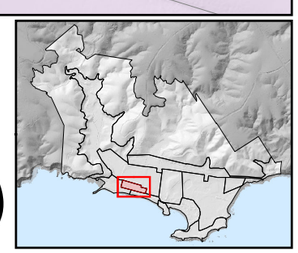
Management zones

Zone 1

Zone 2

Zone 3

0 50 Metres



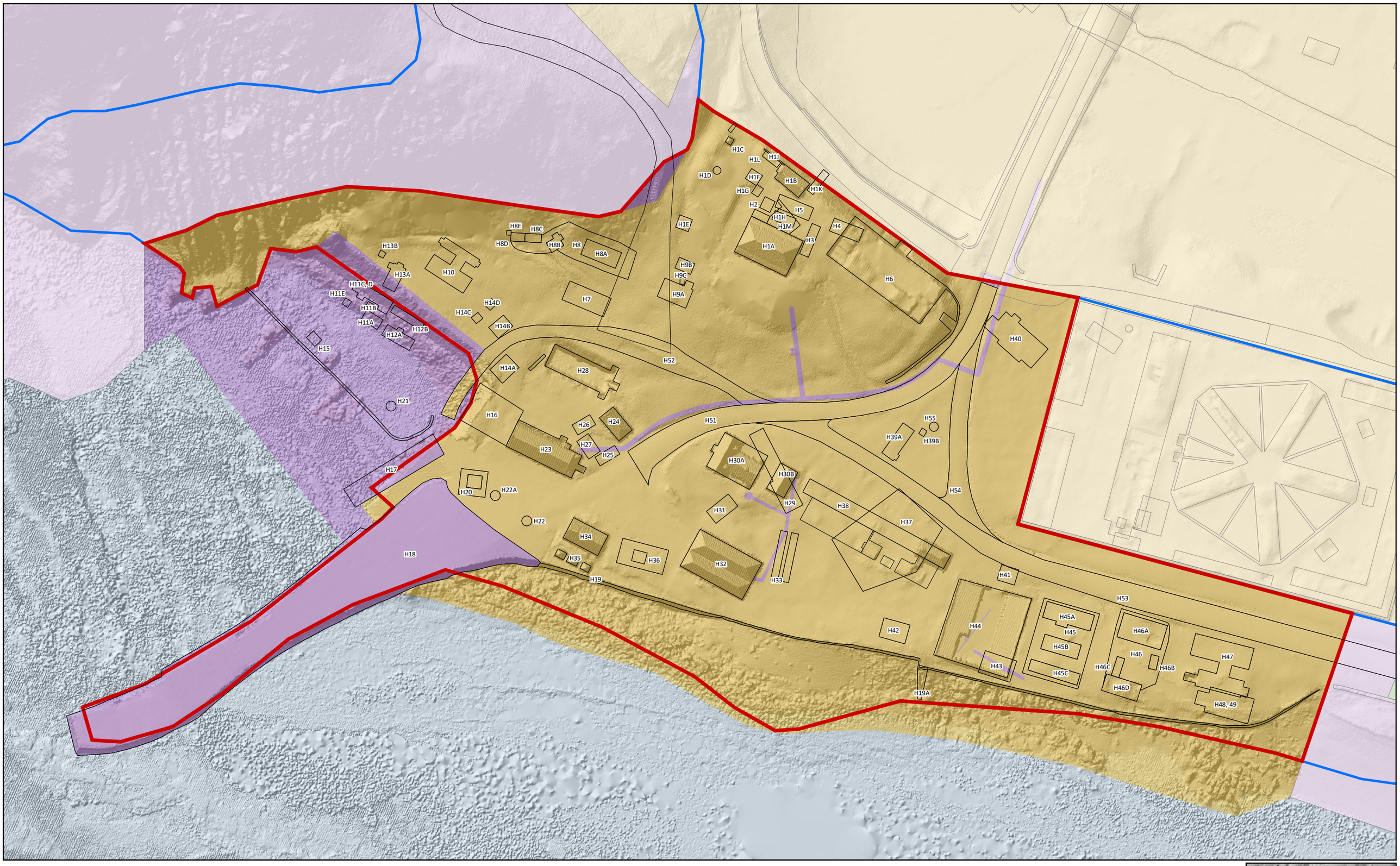


Plate 38. KAVHA Precinct H Archaeological Management Zones

Precinct H boundaries

All precinct boundaries

Precinct heritage items

Management zones

Zone 1

Zone 3

Zone 2

0 50 100 Metres

H1C
H1J
H1L
H1D
H1F
H1B
H1K
H1G
H2
H5
H1H
H1E
H1M
H4
H8
H8B
H1A
H3
H8A
H9B
H9C
H6
H9A
H7
H51
H40
H52
H54
H28

Plate 39. KAVHA Precinct H1 Archaeological Management Zones [Detail: Surgeon's Quarters, First Government House (site)]

Precinct H boundaries

All precinct boundaries

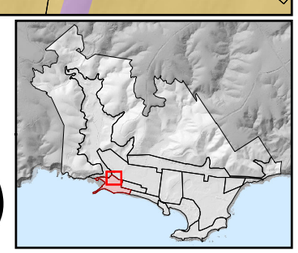
Precinct heritage items

Management zones

Zone 1

Zone 3

0 10 20 30 40 Metres



J2
J3
J1
J6
J4
J5
J7A
J6A
J7C
J7B
J8B
J8A
J11
J10
J12
J14
J14B
J14A
J13

Plate 40. KAVHA Precinct J Archaeological Management Zones

Precinct J boundaries

All precinct boundaries

Precinct heritage items

Management zones

Zone 1

Zone 2

Zone 3

0 50 100 150 200 Metres

K1

K2A

K2B

K2C

K3

Plate 41. KAVHA Precinct K Archaeological Management Zones

Precinct K boundaries

All precinct boundaries

Precinct heritage items

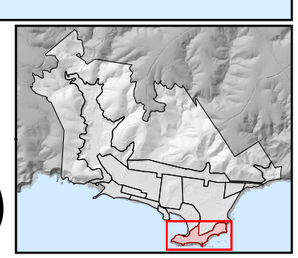
Management zones

Zone 1

Zone 2

Zone 3

0 50 100 150 Metres



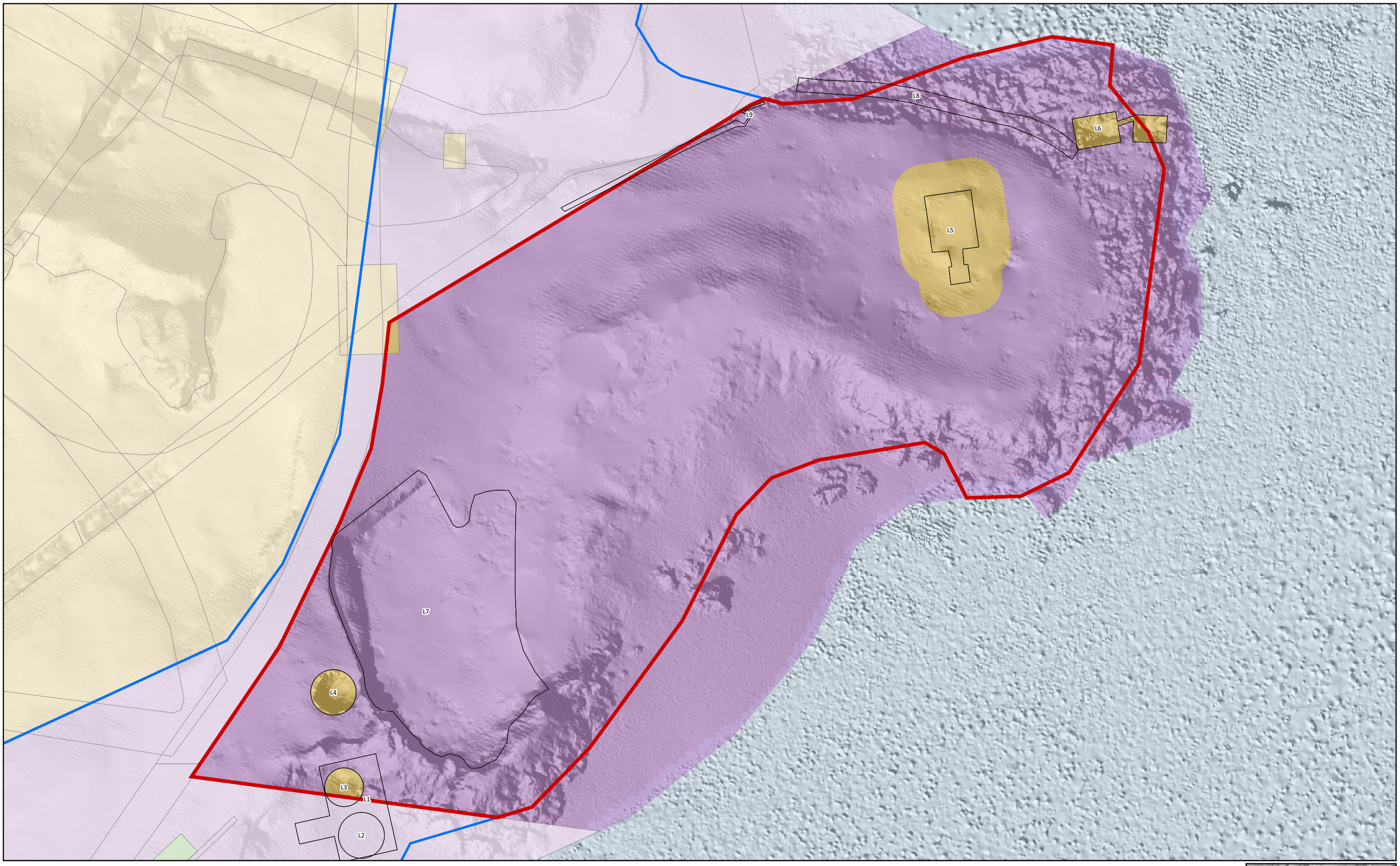


Plate 42. KAVHA Precinct L Archaeological Management Zones

Precinct L boundaries

All precinct boundaries

Precinct heritage items

Management zones

Zone 1

Zone 2

Zone 3

0 50 Metres

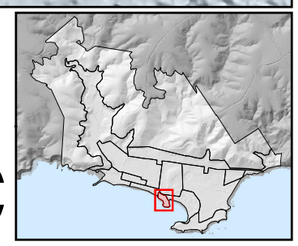


Plate 43. KAVHA Precinct M Archaeological Management Zones

Precinct M boundaries

All precinct boundaries

Precinct heritage items

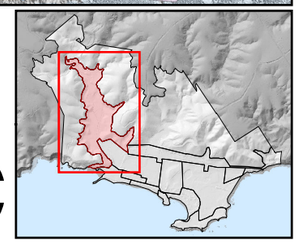
Management zones

Zone 1

Zone 2

Zone 3

0 50 100 150 200 250 300 Metres



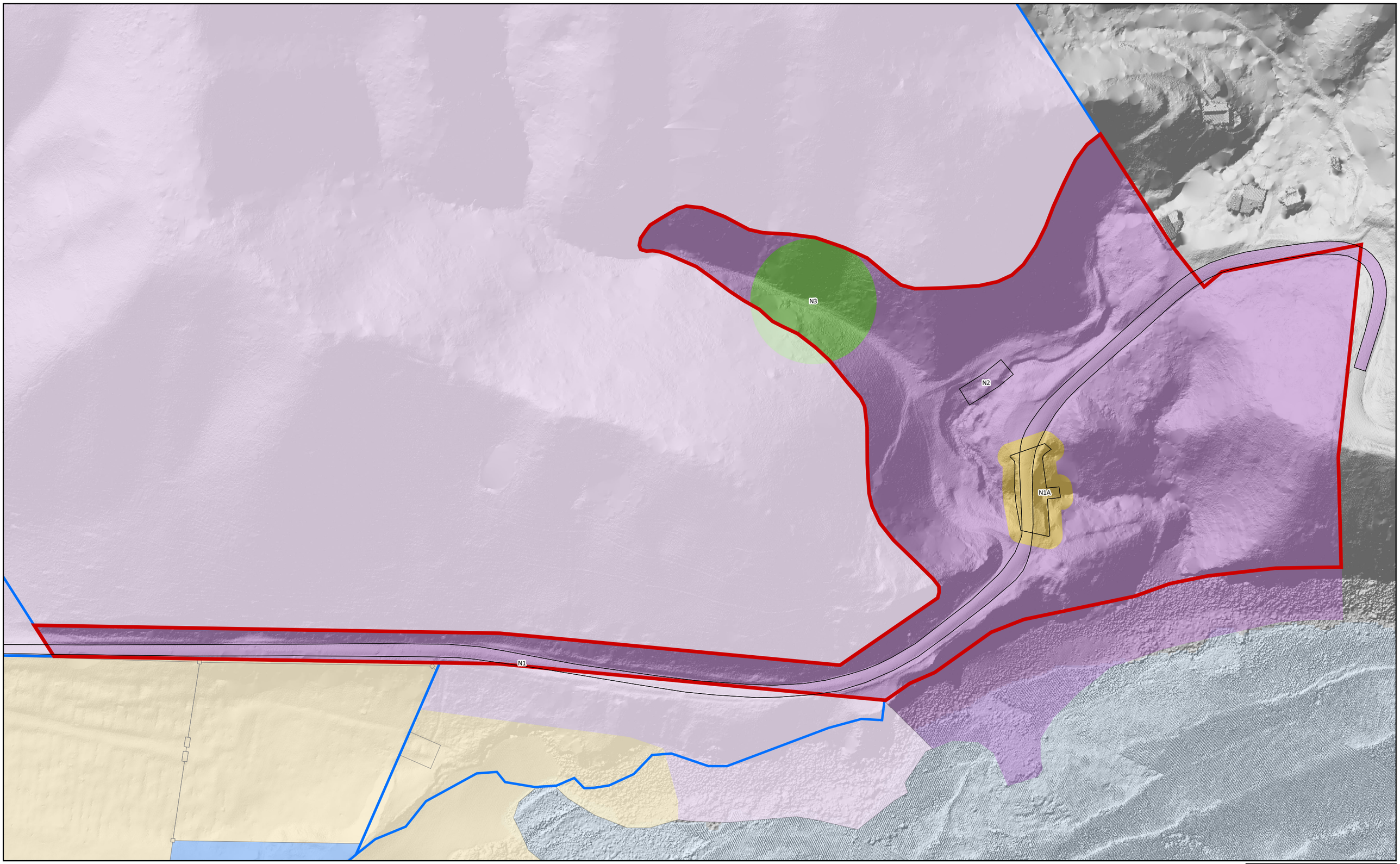


Plate 44. KAVHA Precinct N Archaeological Management Zones

Precinct N boundaries

All precinct boundaries

Precinct heritage items

Management zones

Zone 1

Zone 2

Zone 3

Zone 4

0 50 100 150 Metres

Appendix 1: Summary of the contribution (potential and realised) of new data sources

Background

During the finalisation of the AZMP two new island-wide datasets became available: 2019 LiDAR data and 1858 survey data. The LiDAR data, which comprise detailed elevation information, were collected as part of a CSIRO hydrological research project. Discussions between Extent Heritage and DIRDC during the AZMP process came to the agreement to use this dataset was to more accurately map known features in those areas of KAVHA that were either not covered by the 2015 drone survey or that were under dense vegetation and thus could not be seen during the 2015 drone survey. This was accomplished; however, the LiDAR data also revealed a number of *potential* new features within KAVHA. These features mostly take the form of unnatural rectilinear patterns in the ground surface that may indicate the location of former structures and other features.

Initial comparative analysis

The existence of the 1858 survey data was previously known, but until fairly recently there were complications to acquisition of decent digital versions. Since the inception of the AZMP, however, the National Archives of Australia have made them available as high resolution digital datafiles. These data comprise survey field books completed by surveyors working on Norfolk Island for much of 1858, and these books record the location of all the structures and features the surveyors encountered during their surveys. These data are primarily quantitative and record the locations and dimensions of structures and features in units of 'links'; one link is approximately 200 mm. Surprisingly, the survey data also revealed the location of many structures and features in KAVHA that appear to have not been recorded in previous investigations, such as the 1980 survey.

A selection of representative examples of the potential features identified by LiDAR and the previously unrecorded features identified in the survey field books are shown below.

Because of the number of features (potential and actual) identified between these two datasets, it was not possible to incorporate all of these features in the current AZMP, particularly because all of the potential new features will require additional work to verify and record them properly. As a result, there are now three classes of archaeological items not accounted for in the AZMP:

1) potential items identified through LiDAR that may or may not be genuine KAVHA heritage items;

2) unrecorded items identified through 1858 survey data that are not visible in the LiDAR data, but which are almost certainly genuine KAVHA heritage items and will need added to the registers, etc.; and

3) unrecorded items identified through both LiDAR and 1858 survey data that are almost certainly genuine KAVHA heritage items and will need added to the registers, etc.

Future directions

- As part of risk management, until the status of three classes of items can be determined, they should generally be considered to be part of Zone 1 and have high potential.
- More detailed investigation must be undertaken on the potential items to see if any can be discounted as visual artefacts generated during LiDAR data acquisition or post-processing.
- Historical research must be undertaken on potential items to determine their background and whether they were recorded during previous investigations but mapped inaccurately.
- Community involvement can be undertaken to see if there is any local knowledge (e.g. oral histories, family photo albums, other local histories) that can help uncover the background of any of the previously unknown items.
- Detailed historical aerial imagery (at a finer scale than that known from the 1944 aerial survey of Norfolk Island) will need to be sourced and analysed to see if any of these items are the result of modern post-1940s ground disturbance.
- Field examination will be necessary for those potential items that, after additional research, cannot be discounted as artefacts of the LiDAR data, and also for items that have not been previously recorded.
- Ground-penetrating radar and other non-invasive archaeological investigation techniques can be used to examine the locations of previously unknown structures and features.
- Inventory sheets will need to be updated to incorporate new items if they are verified to be genuine.
- The LiDAR elevation data can be directly used for 3D interpretation of the broader KAVHA landscape, and can form the basis of a dataset that could allow researchers anywhere to virtually visit KAVHA on their computers.
- New data could be used for a positive public outreach, for example the charismatic nature of some of the previously unrecorded items (e.g.: Emily's Grave) and the fieldwork requirements could provide for training up students and local people in archaeological methods.
- The AZMP and all associated mapping will need to be updated to incorporate new features.

Examples of Possible New Features

The following sections contain examples of a handful of the potential new features identified using these datasets.

Farm complex (potential item, previously unrecorded; shown in LiDAR)

An examination of LiDAR data for the area surrounding M21 (Cottage) in Arthur's Vale-Watermill Valley appeared to indicate the presence of a number of linear features extending 100m east up the hillside. In addition, the data also appeared to indicate more terracing and levelling in the area immediately surrounding the cottage than has been previously described. This may indicate that the cottage was not a relatively isolated structure but rather part of a larger farm complex.

In the figure below, M21 and E13 ("Panorama Courts") are outlined in blue; a modern fence line is shown as a black line; linear features (ditches and depressions) are highlighted with purple lines; terracing areas are highlighted in yellow; the overall possible farm complex is outlined in red.

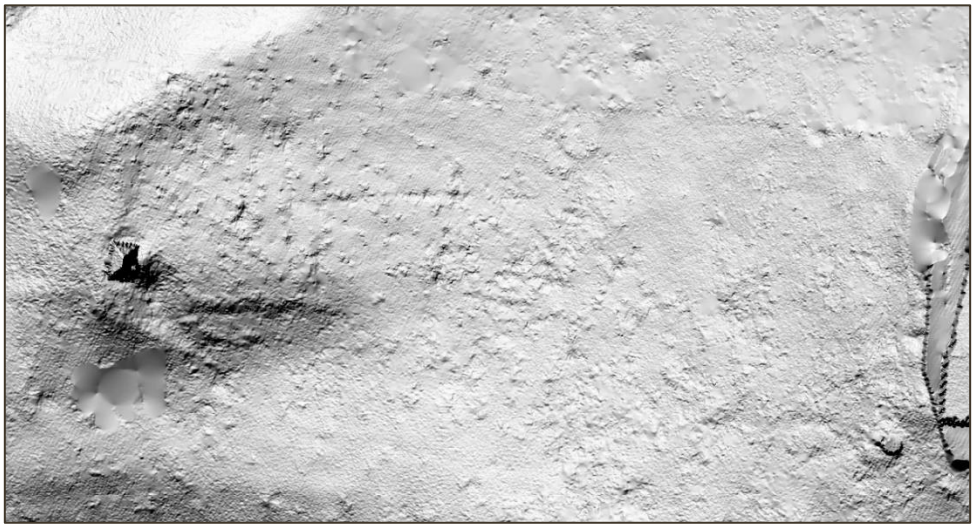


Figure 1. The general area of rectilinear features near M21 and E13, as shown in a topographic hillshade generated from LiDAR data. Source: Extent Heritage.

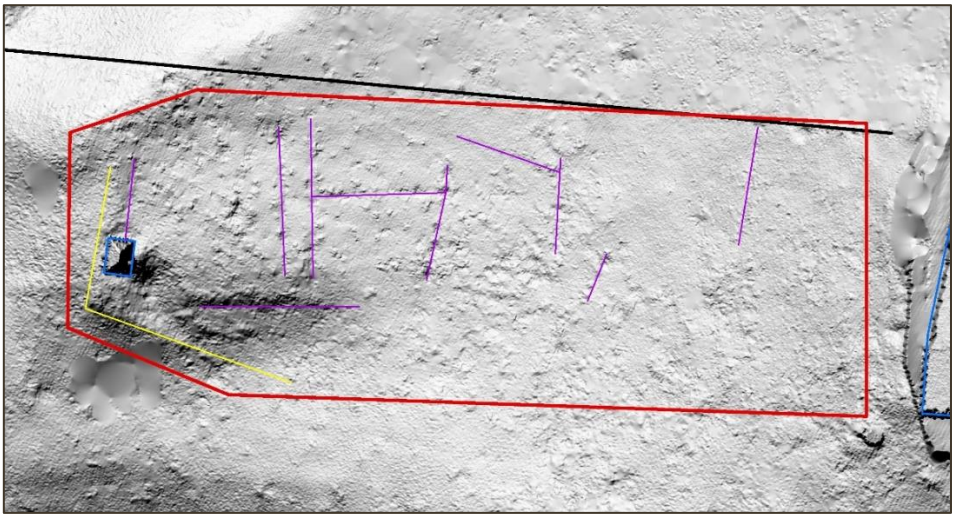


Figure 2. Potential features near M21 and E13 highlighted; colours explained in text. Source: Extent Heritage.

Drains and sundial (potential items previously unrecorded; shown in LiDAR and in 1858 survey)

Within the New Gaol complex there is a previously recorded well (item G4E) that was present in the yard between the service buildings and front cells. Immediately south of the well is a subtle linear depression that runs nearly 60m towards the south wall of the complex. Although the depth of the depression only ranges between approximately 4 to 8cm, it is clearly visible on both the LiDAR data and the drone elevation data. With no historical documentation attesting to the presence of this ditch, it appeared to simply be due to rainfall erosion or a modern disturbance possibly created for drainage control.

Figure 3. The New Gaol complex, as shown in a topographic hillshade generated from LiDAR data. Source: Extent Heritage.

In the following image, item G43 is circled in blue; the linear depression is highlighted in red.

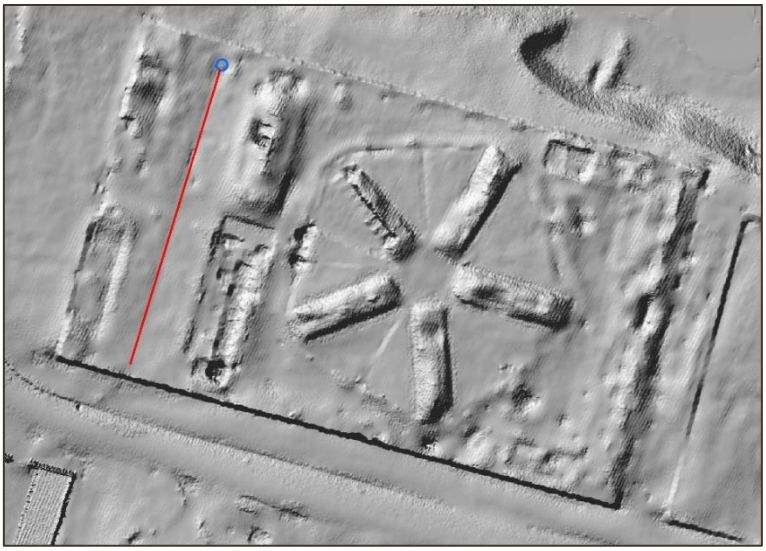


Figure 4. Drainage channel and well in New Gaol complex highlighted; colours explained in text. Source: Extent Heritage.

In examining the survey fieldbooks, however, the provenance of this depression was shown to be quite different. The fieldbooks clearly show a linear feature running from the well towards the south wall of the complex, and labelled as “Channel”. Interestingly, the channel does not

terminate at the wall but rather runs to a small square feature that is not labelled, but might possibly represent the starting point of an underground drain. East of the channel, north of the entrance passage to the cells, is another previously unattested feature: a sundial.

In the following figure, the well is circled in blue; the channel highlighted in red; the channel termination feature is highlighted in yellow; the sundial is circled in purple.

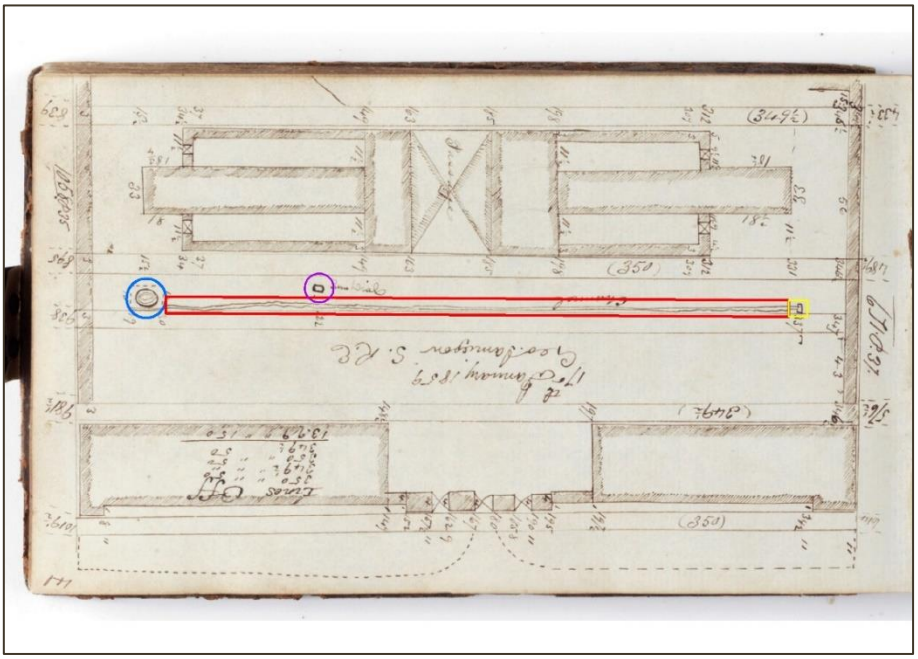


Figure 5. Drainage channel, well, sundial and possible drain highlighted on survey fieldbook for part of the New Gaol complex; colours explained in text. Source: Extent Heritage, National Archives of Australia.

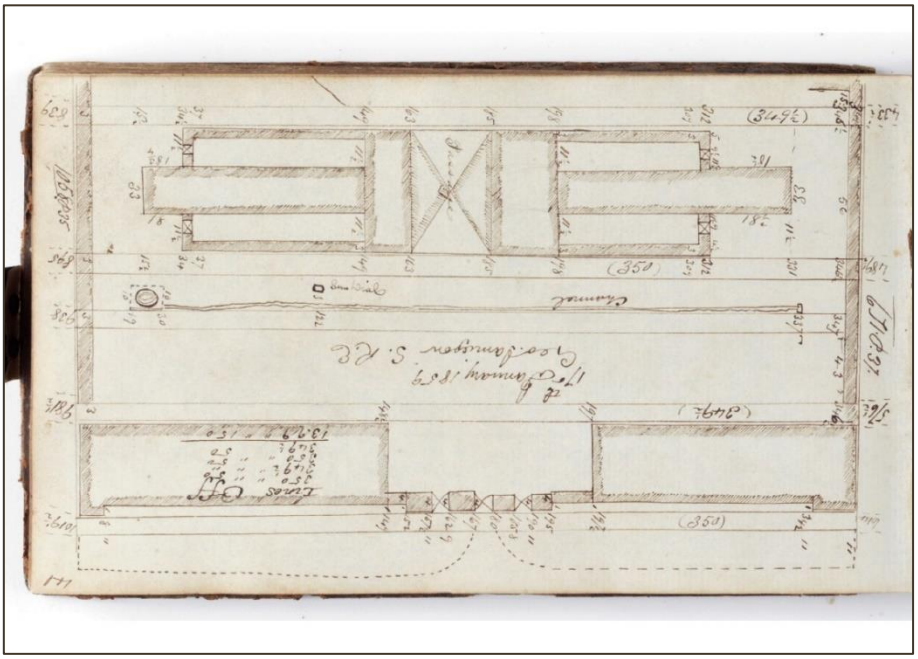


Figure 6. Original survey fieldbook without highlighting. Source: National Archives of Australia.

Emily's Grave (previously unrecorded item; shown in 1858 survey)

In addition to showing features that are not known from any other sources, the survey fieldbooks also record features for which no accurate location information was previously known, and which cannot be identified through elevation data. Among these items is the location of Emily's Grave, the burial for which Emily Bay was named.

The following image shows the survey fieldbook page representing Emily Bay. Persons unfamiliar with 19th century survey records will likely find it difficult to interpret the page, because the drawings are not done to scale, nor are the angles shown on the drawings necessarily representative of actual angular data. Rather, highly accurate location data is recorded as numeric values on the drawings, and the drawings serve as *aides memoire* for the surveyors to increase the speed with which they can draft accurate maps.

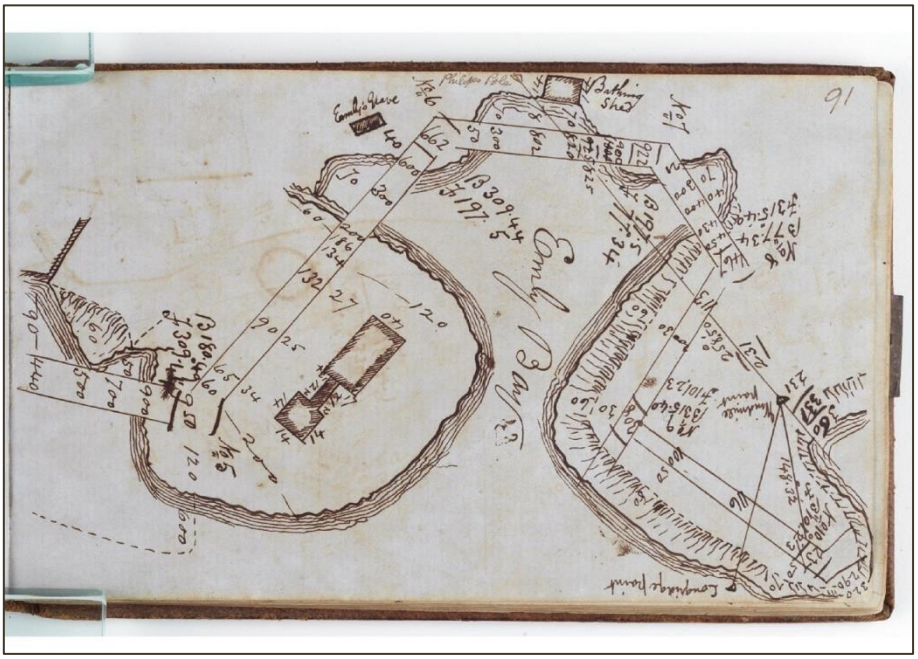


Figure 7. Survey fieldbook showing measurements around Emily Bay. Source: National Archives of Australia.

This particular fieldbook page includes a number of features, including the salt house, Emily's Grave and a bathing shed on the beach. In the following image, the fieldbook representation of the Emily Bay coast from near the salt house to Lone Pine is shown as a blue line; the salt house is outlined in purple; the beach bathing shed is outlined in yellow; and Emily's grave is outlined in red.

Note that the beach bathing shed is known from other historical maps, all of which are fairly inaccurate, and so this is the first accurate placement available for this item.

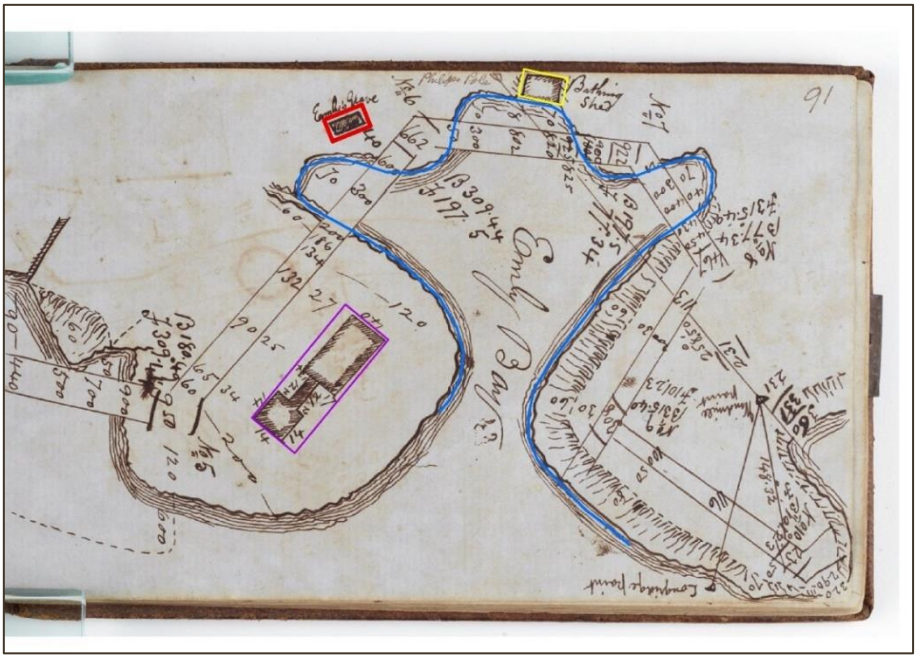


Figure 8. Salt house, Emily's Grave, bathing shed, and coastline highlighted on survey fieldbook for Emily Bay; colours explained in text.

Although the fieldbook map cannot be directly overlaid on the modern landscape to locate features identified on it, a bit of maths can untangle the surveyor's notes and allow their data to identify feature locations to a high degree of accuracy. In the following image, the salt house is visible at the left, and the surveyed location of Emily's grave is outlined in red.

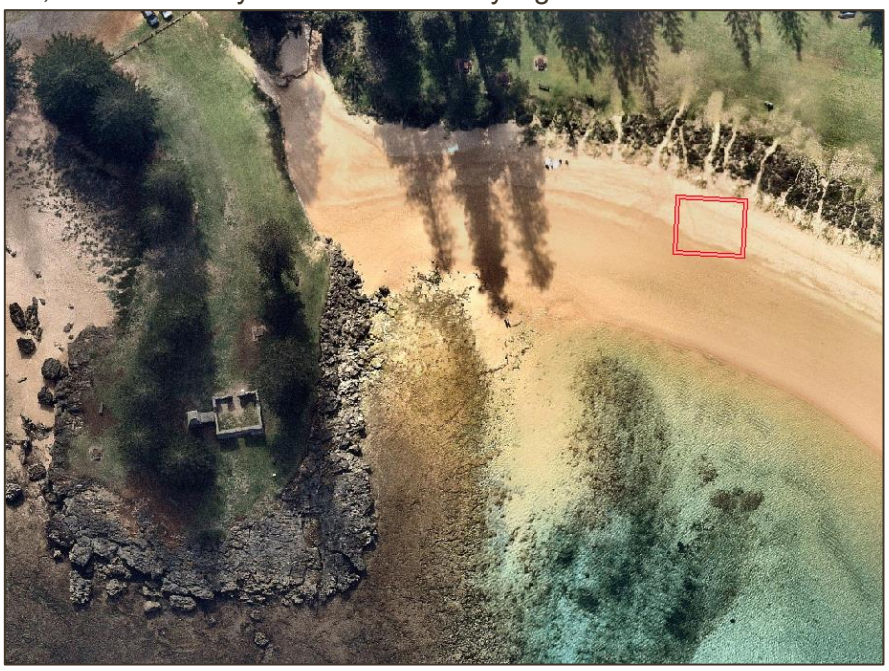


Figure 9. Aerial image of a portion of Emily Bay showing the location of the Salt House with the general location of Emily's Grave, as identified in the survey fieldbook. Source: Extent Heritage.

Square depression (previously unrecorded item outside drone survey coverage; shown in LiDAR)

The drone survey that was undertaken several years ago used photogrammetric means to derive elevation from aerial photography. The results are highly accurate and detailed, but unfortunately have two major downfalls. First, there is no elevation data in areas of high vegetation, because elevation data can only be calculated photogrammetrically if the ground can be seen. Second, the drone survey did not actually cover all of KAVHA.

The following figure shows a piece of high ground on the east side of Arthur's Vale, overlooking the mill pond. The green region indicates the areas for which elevation data was available from the drone survey. The red region indicates the remainder of KAVHA, for which no drone data was available. Uncoloured areas are outside KAVHA.

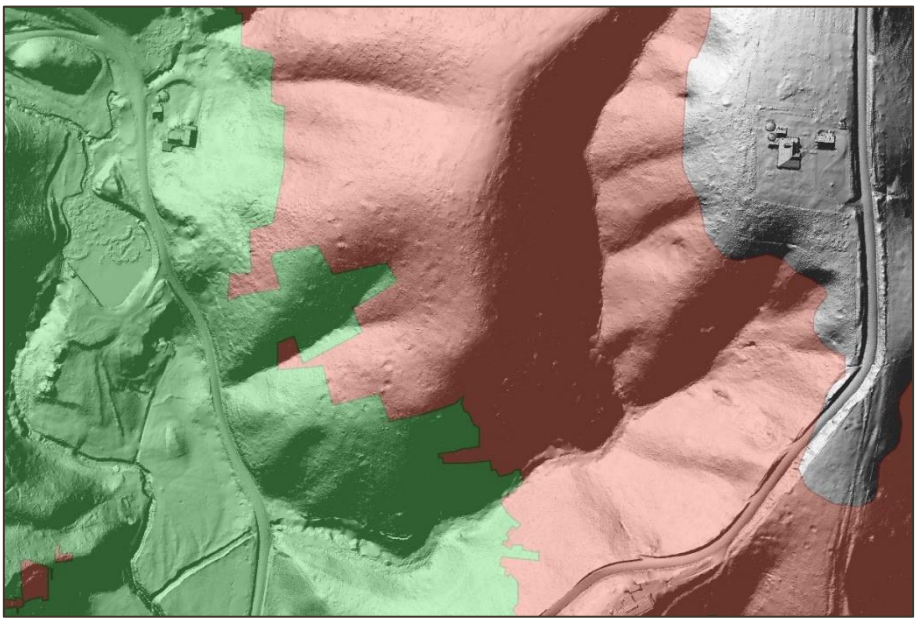


Figure 10. Indication of drone survey coverage in part of KAVHA on a topographic hillshade generated from LiDAR data; colours explained in text. Source: Extent Heritage.

Near the centre of the area shown in the previous image, and just outside the boundaries of the drone survey coverage, a potential feature was identified in the LiDAR data. The feature appears to be a slight depression, and almost perfectly square: approximately 16m x 16m. The depression is shallower than the surrounding ground by approximately 5cm to 20cm, with the deepest depressions on the uphill side of the potential feature.

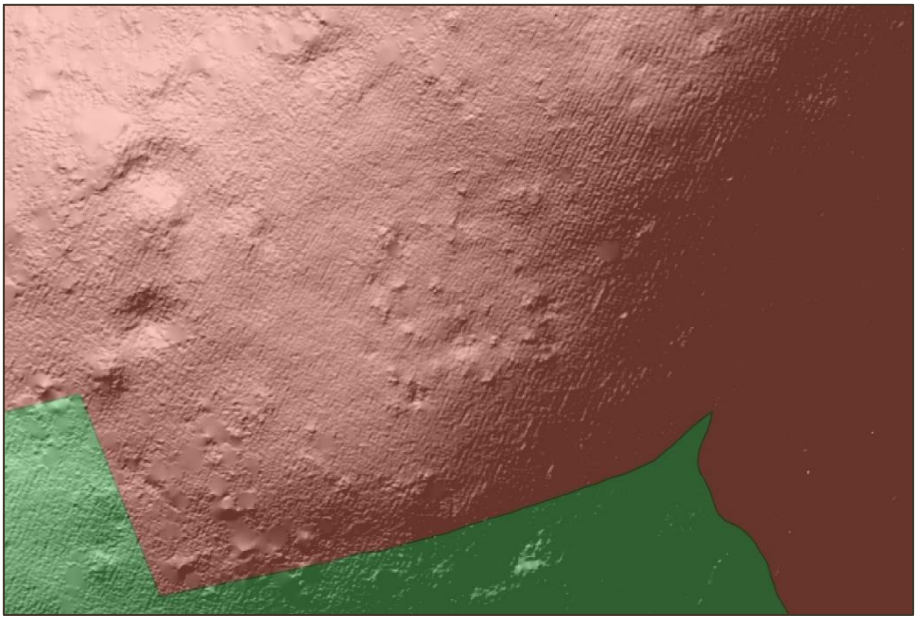


Figure 11. Area of potential feature outside drone survey area on a topographic hillshade generated from LiDAR data; colours explained in text. Source: Extent Heritage.

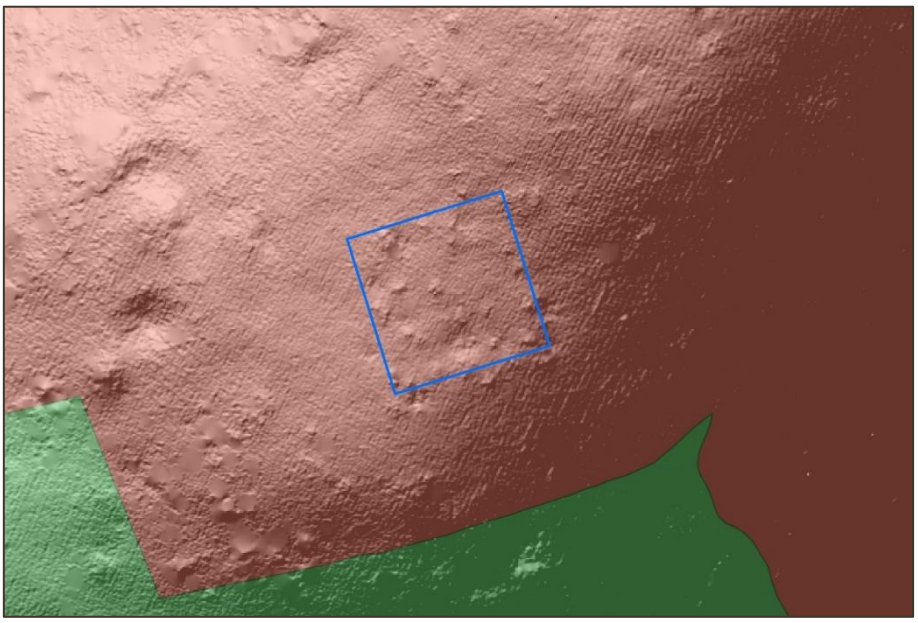


Figure 12. Highlighted area of potential feature located outside drone survey area on a topographic hillshade generated from LiDAR data; colours explained in text. Source: Extent Heritage.

Sub-canopy elevation information (capacity for LiDAR data to provide ground information in areas obscured by vegetation)

As a final point, one of the most significant ways in which the LiDAR data has opened up opportunities to better represent and manage the KAVHA landscape is by giving a peek at the sorts of terrain that lie beneath dense tree canopies.

As a simple example, the following image shows the area near Emily Bay where the marae excavations took place. In the areas where the drone could see the ground, the general landscape can be seen, but near the centre of the image in the pine plantation the surface appears as a smooth blur. This is an example of how the drone elevation data appears in locations obscured by trees.

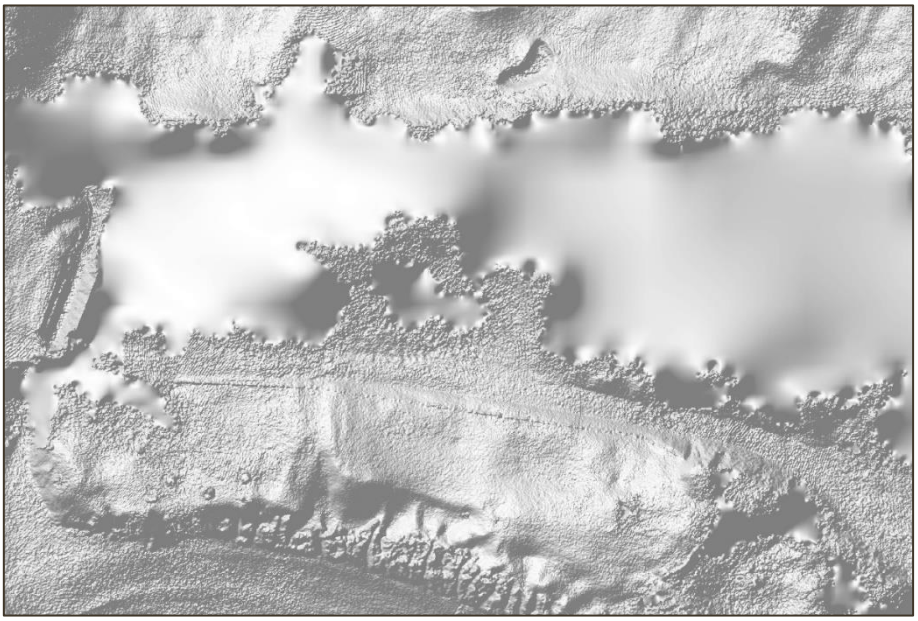


Figure 13. Example of mapping distortions caused by inability of drone data to see terrain below vegetation, shown as a blur in a topographic hillshade. Source: Extent Heritage.

The same location is shown again in the two images below, both of which were generated using the LiDAR elevation data. Because LiDAR has the capability to peer beneath tree canopies and dense foliage, it is possible to use this data to see the general outline of the landforms around the Polynesian settlement. Note that it is also possible to clearly make out the toilet block, which cannot be seen at all in the drone data.

The second image below shows the same area with false elevation colouring to better emphasise the nature of this part of the KAVHA landscape.

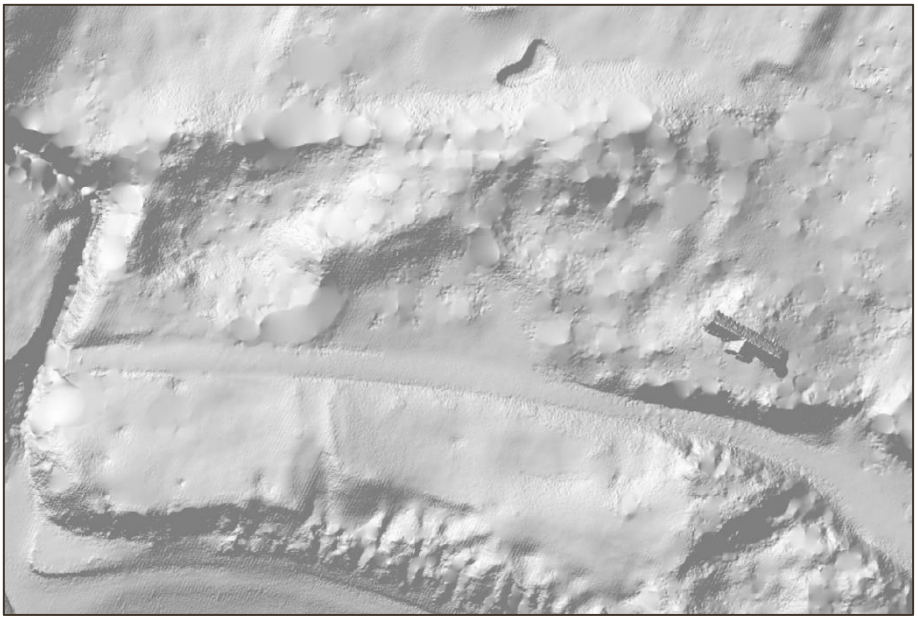


Figure 14. The same landscape as in the previous feature, with topographic hillshade generated from LiDAR data. Source: Extent Heritage.

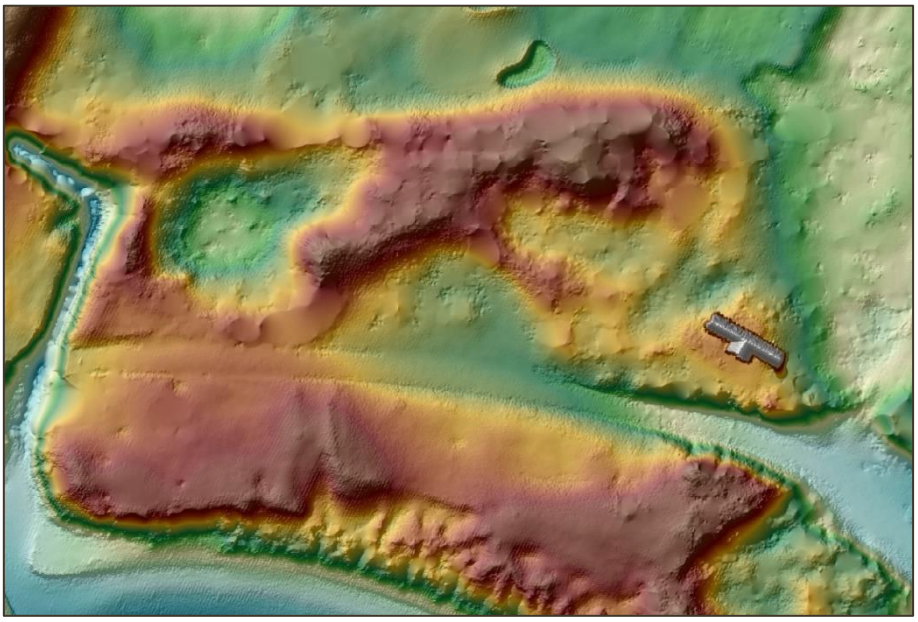


Figure 15. Example of the same area with false-colour elevations indicated. Source: Extent Heritage.