APPENDIX 5.1.8-1

ASSESSMENT OF CABLE AND REED'S MODEL OF SITE DISTRIBUTION AND ITS APPLICATION FOR DANIEL ISLAND

This appendix reviews URS Greiner's evaluation of the model developed by Cable and Reed (1996) for the Charleston Harbor area and its application for the Daniel Island rail corridor alternates. This evaluation was based on a separate group of prehistoric archaeological sites on Daniel Island other than those used by Cable and Reed in their study. Thus, these sites can serve as an independent test of their model. As Cable and Reed state in their monograph, the predictive site model developed for the Charleston Harbor area consists of a group of multiple regression equations (Cable and Reed 1996:157). These equations were developed and applied to interior settings, such as typified by the Francis Marion National Forest, and to coastal or maritime settings, such as characterized by areas along the larger streams and estuaries. The mathematical equations developed for the model were used to generate various probability zones, in the form of irregular-shaped polygons, within which prehistoric archaeological sites would be expected to occur. These polygons were ranked into high, medium, and low probability areas. However, the model was not constructed to predict the specific location of any one prehistoric site within any one polygon; rather, each polygon was assigned a probability ranking, either high, medium, and low, for the location of prehistoric sites. Cable and Reed were able to distinguish readily between low and high probability zones, but were less successful in separating between medium and high probability zones.

The results of Cable and Reed's model are quite simple. For interior settings, they were able to demonstrate that increased site density was directly correlated with well-drained soils in close proximity to streams or other hydrologic features (e.g., interior swamp formations) or, to areas of increased soil patch diversity. The latter refers to the juxtaposition of well-drained and poorly drained soils, a situation occurring where higher topographic settings are found situated adjacent to streams or interior swamps. For the coastal or maritime zone, Cable and Reed found that similar criteria were effective for predicting the location of prehistoric sites. In coastal fringe areas, the density of prehistoric sites could be correlated with areas of well-drained soils situated proximate to patches of poorly drained soils (i.e. swamps) and to areas of salt marsh (Cable and Reed 1996:121). The authors pointed out that salt marshes constituted the highest percentage of poorly drained soils in the coastal fringe area (Cable and Reed 1996:121). In summary, Cable and Reed's model states that prehistoric archaeological sites will be found on moderate to well-drained soils associated with drainage features or salt marshes, identified in their model by areas of poorly drained soil. Thus, testing the model was accomplished by assessing the location of an independent set of prehistoric sites on Daniel Island to see if they were situated with regard to the above noted criteria.

Testing the model involved plotting the location of 73 additional prehistoric archaeological sites on Daniel Island. These are sites that were not considered by Cable and Reed in the construction of their model. These sites were plotted in the GIS data base URS Greiner has developed for the EIS on Daniel Island. Using the GIS program Arc View, these sites were correlated with soils mapped

on Daniel Island. Variables such as distance to nearest water source (stream or interior swamp), aspect, and potential eligibility for listing in the National Register were also recorded.

With regard to soil groups, prehistoric sites fell into two categories, those that were entirely within one soil group (classed by drainage rank), and sites that had boundaries encompassing more than one soil drainage group. Of the 73 total prehistoric sites considered here, 45 of the sample fell within a single soil drainage group. Forty-one of the sites (or, 91.11-percent of this sub-group) were found to occur on moderate and well drained soil categories. It should be noted that moderate and well-drained soils are considered together for heuristic purposes. Soils identified as having only moderate drainage capability were likely better drained before sea-level rise affected the Charleston Harbor area. These two categories are thus considered equivalent for predicting the location of prehistoric archaeological sites on Daniel Island. The remaining four sites (8.88-percent) of this sub-group were found to occur within poorly drained soil categories. These appear to be in poorly drained soils only on the basis of existing soil maps for Berkeley County. Field inspection may reveal that these sites are located on small areas of higher, better -drained ground that glossed over in the soil maps.

The remaining 28 sites encompassed both moderate to well-drained soils and poorly drained soils. This inclusion of both well-drained and poorly drained soils within one site boundary most likely reflects inaccurate assessment of site boundaries. Thus, poorly drained soils are inadvertently included within the site's boundary. Examination of the site files held at the SCIAA offices clearly showed that several site boundaries crossed streams or swamps to encompass adjacent areas of higher topographic relief. Thus, poorly drained soils would be included within the site area. However, these sites also reflect strong selection for well-drained terrain in that the majority soil type was always classed as a moderate to well-drained group. Nineteen sites of this second group (67.85-percent) have as the majority well drained soils and a minority of poorly drained soils. The remaining 9 sites (47.36-percent) have as the majority type moderately well drained soils and only a minority of poorly drained soils. Combining both groups, fully 69 sites of the 73 that make up the sample (or, 94.52-percent) are found on moderate to well drained soils. Thus, Cable and Reed's model is accurate with regard to the location of prehistoric sites. Given the high correlation between prehistoric sites and well-drained soils, no statistical tests are considered necessary to further elucidate this relationship.

In summary, it is clear that the basic model of prehistoric site location in the Charleston Harbor area as defined in Cable and Reed's model provide an effective means for determining probable locations of additional prehistoric archaeological sites. Modified as described below, the model can be applied to each rail alternate to assess the probability of prehistoric archaeological site occurrence.

Other factors may have a more variable effect on the location of prehistoric archaeological sites. In reviewing Brooks and Scurry's (1978) Amoco survey, Cable and Reed noted that aspect did not play an important role in site location, except for larger, multi-component sites (Cable and Reed 1996:58). However, considering the sample of 73 sites used in the evaluation here, it is clear that

landforms with a southwest, south, or southeast aspect would be more likely to sustain prehistoric sites then those landforms with northern or northeastern aspects. This pattern corresponds with results that were initially reported by Brooks and Scurry from their survey of the Amoco property that borders Daniel Island to the northeast (Brooks and Scurry 1978:). Yet there are sites that exhibit aspects facing north, northeast and northwest, suggesting that other factors come into play as well in landform selection for occupation. Although aspect thus may play a role in site selection, it cannot be fully evaluated without more detailed field checking a site's location relative to topographic setting.

A caveat concerning the nature of Cable and Reed's model and its application for the Daniel Island project needs to be specified. As noted above, their model involved the generation of geographically expansive and irregular-shaped polygons. These polygons were assigned rankings of low moderate or high probability for their potential to contain prehistoric archaeological sites. However, the model did not specify locations within these polygons where any one prehistoric site would be located. Thus, its application for Daniel Island needs to be modified. Since the rail alternatives consist of narrow, linear transects that cross a variety of topographic and ecological settings, the window within which prehistoric sites need to be predicted is much smaller. It is not enough to simply say that since any rail alternative crosses a high probability polygon it will encounter an archaeological site. For purposes of the Daniel Island project, their model needs to be reduced to the basic tenet that underlies the generation of the various probability areas, and that is the intersection of poorly drained and well-drained soil groups. Identifying the interface between these two soil drainage groups is the best solution to identifying high probability areas for prehistoric site locations along the narrow rail corridor alternatives on Daniel Island.

The most direct way to operationalize Cable and Reed's model in assessing the probability of prehistoric archaeological sites along the Daniel Island rail alternates is to determine the number of interfaces between poorly drained and moderate to well drained soils. This step can be accomplished using the soil maps that show various soil groups mapped by drainage category as a background to the rail alternates. Then, each interface (or boundary) between poorly drained and moderate to well drained groups can be counted. To reiterate, moderate and well-drained soils occupy the higher terrain in the project area, while poorly drained soils mark drainage features or interior swamps. Thus, identifying interfaces between poorly drained and well-drained soils focuses attention (for survey purposes) on those areas that would have provided micro-environmental zones for exploitation by the prehistoric inhabitants of the region. This provides a simple way to assess each alternate using the basic results of Cable and Reed's model of prehistoric site distribution in the Charleston Harbor area.