4.7 HISTORIC AND ARCHAEOLOGICAL RESOURCES

The impacts of the project to historic and archaeological resources eligible for or potentially eligible for the NRHP will be assessed in accordance with the requirements of Section 106 of the NHPA. According to 36 CFR Part 800.5(a)(1), an adverse effect occurs when an undertaking "may alter, directly or indirectly, any of the historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association."

4.7.1 Architectural Resources

Figure 4.7-1 identifies the location of all NRHP-eligible architectural resources within the study area. Fifteen of these eligible resources are located within the Area of Potential Affect (APE). These resources include a church, railroad corridor, former school, community club, tourist court, and ten domestic buildings or farmsteads. Table 4.7-1 lists each resource by Candidate Build Alternative (CBA). The specific location of each resource in relation to the CBAs is shown in Figures 4.7-2 through 4.7-15. The figures show the boundaries of the eligible property in relation to the 500 foot planning corridor.

Table 4.7-1
ELIGIBLE RESOURCES BY OPTION

Resource Name	DHR #	CBA	Figure #
Sacred Heart Church	074-5021	1, 2, 3	4.7-2
Bond House/Estes School	074-5025	1	4.7-3
Parker House	091-5062	1	4.7-4
Wakefield Community Hunt Club/Wakefield Sportsmens Club	091-5058	1	4.7-5
Pulley Farm/Cedar Lawn Farm	087-5477	1	4.7-6
Norfolk & Petersburg Railway Corridor	091-5098	1	4.7-7
Prince George Golf Club / Chester Plantation	074-0059	2	4.7-8
Brittle House	087-5492	2	4.7-9
Hobbs Property	046-5101	2	4.7-10
Woodland Farm	091-5071	3	4.7-11
Morris-Goodrich Farm	090-5032	3	4.7-12
Bailey-Pretlow House	087-0073	3	4.7-13
Bailey-Holmes House	087-0001	3	4.7-14
William Scott Farm	046-0086	3	4.7-15

During the alternatives development process, alignment shifts were made to avoid direct use of each of these properties. Although some of the following diagrams show the planning corridor limits encroaching on the eligible boundaries, the project can be designed such that there is no Right-of-Way encroachment on the eligible property. Also, the potential crossings of the Railway Corridor, should CBA 1 be selected, will be developed in a manner that will not be a "use" of that property. Therefore, there would be no Section 4(f) involvements with any of these eligible historic properties.

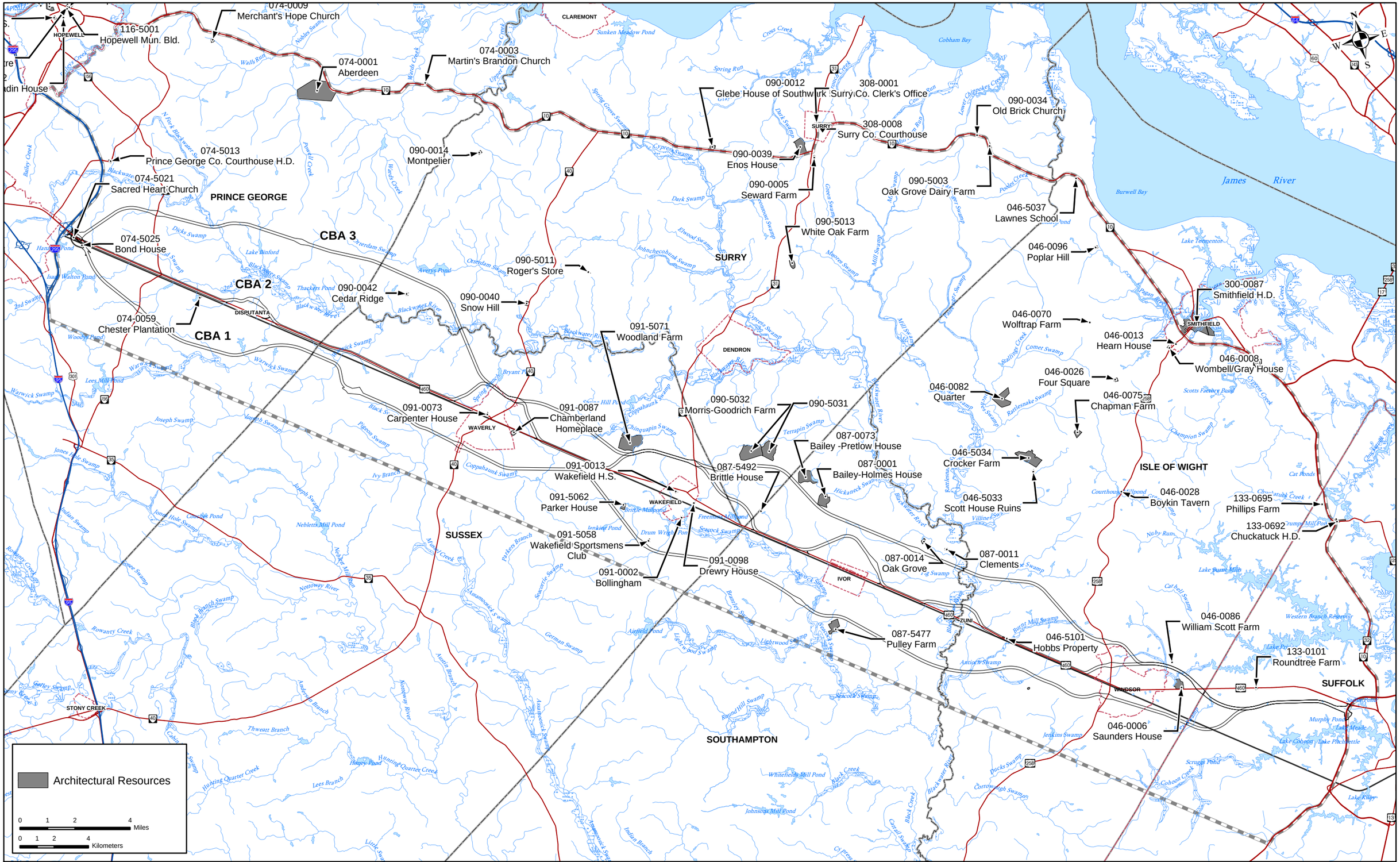
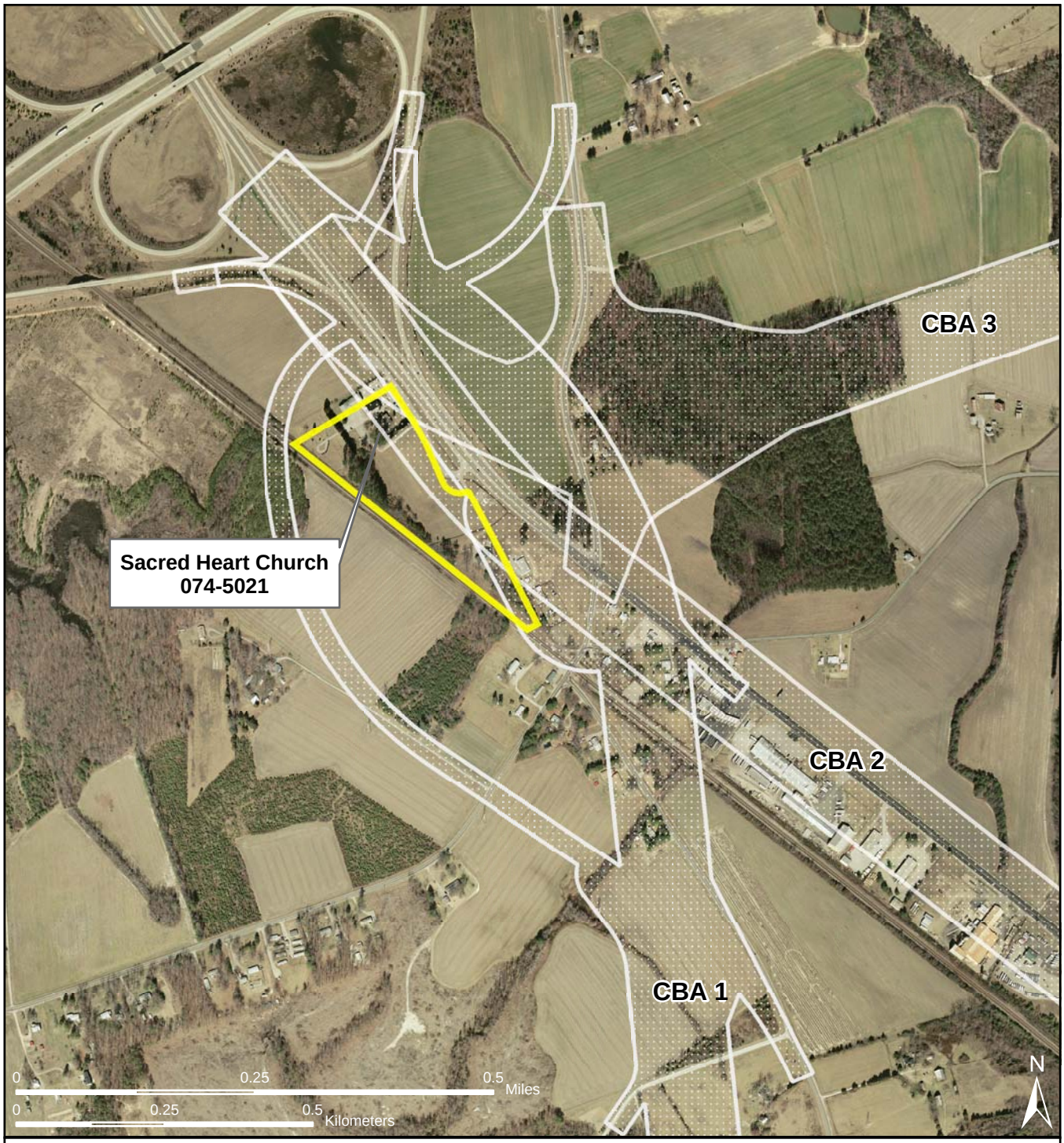


FIGURE 4.7-1
NRHP-ELIGIBLE ARCHITECTURAL RESOURCES



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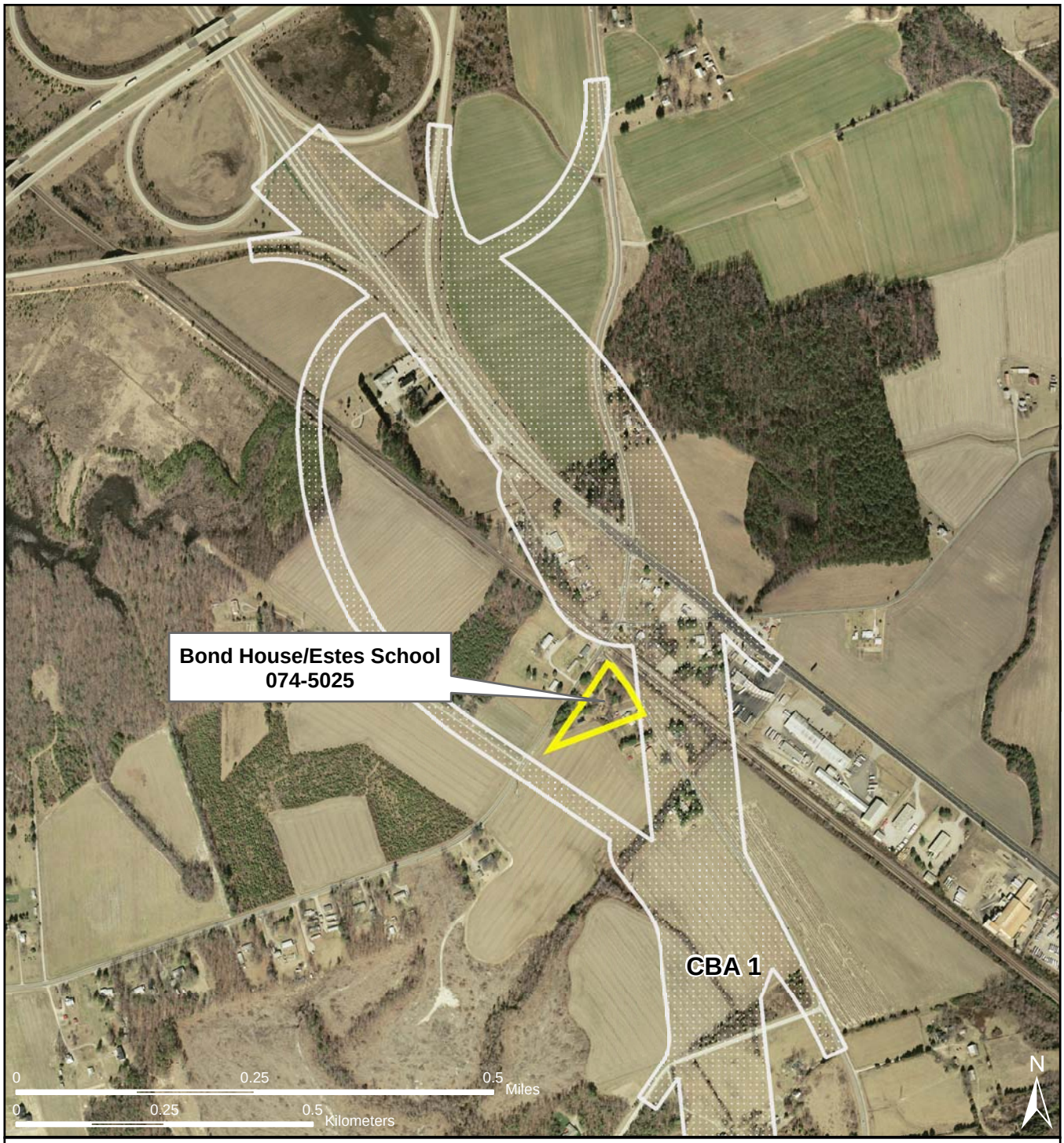
Candidate Build Alternatives

FIGURE 4.7-2
SACRED HEART CHURCH



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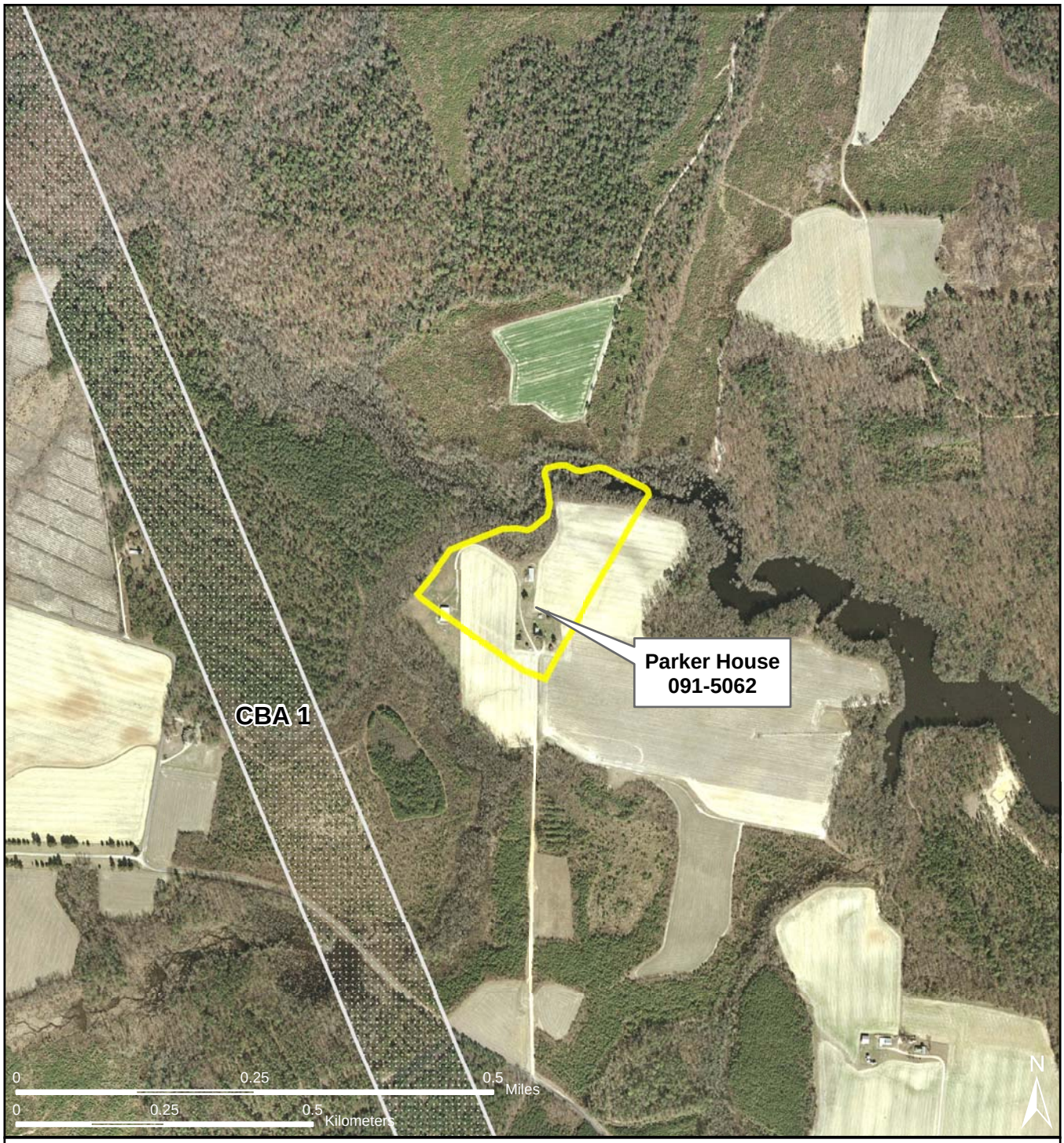
Candidate Build Alternatives

FIGURE 4.7-3
BOND HOUSE/ESTES SCHOOL



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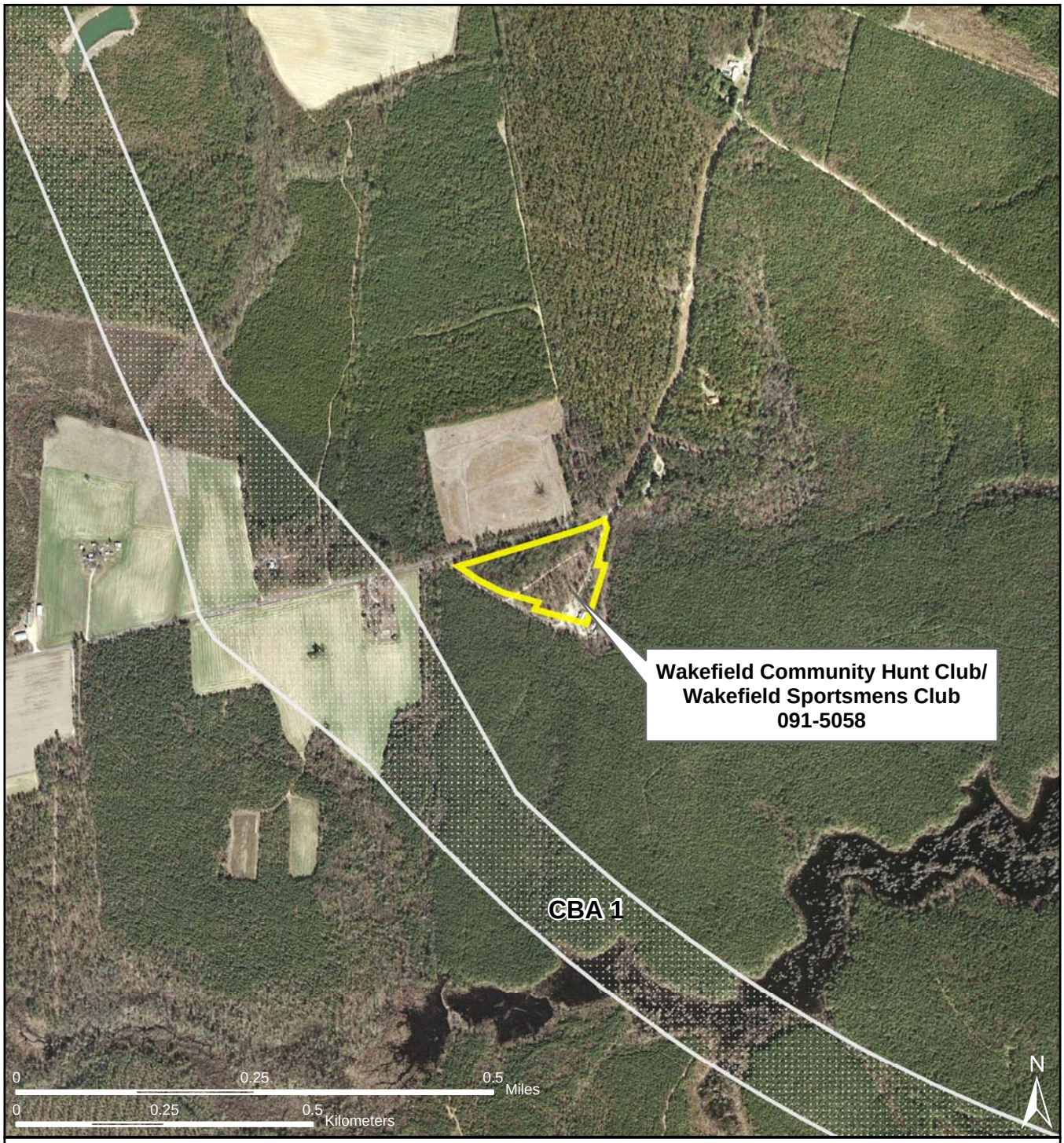
Candidate Build Alternatives

FIGURE 4.7-4
PARKER HOUSE



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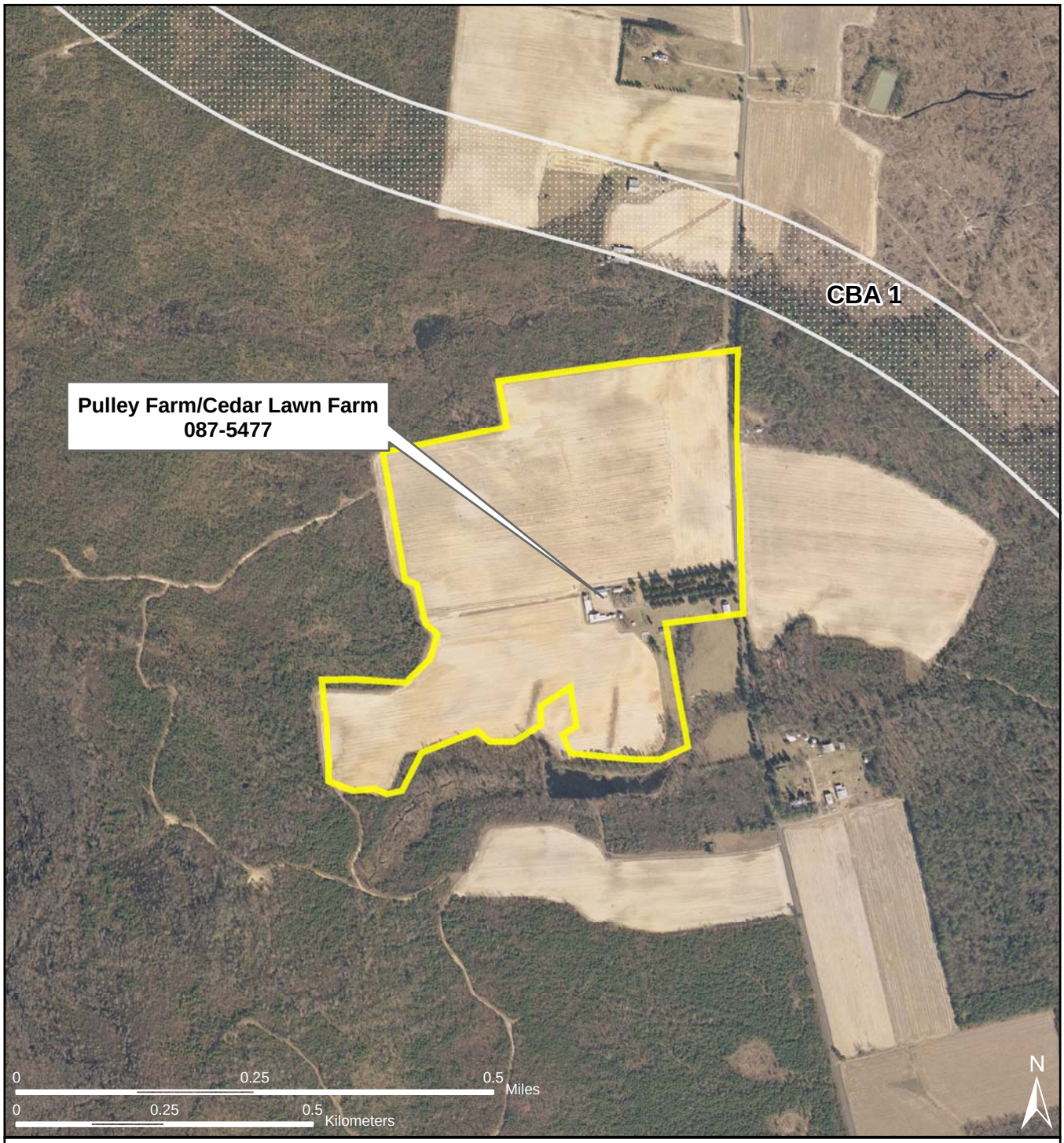
Candidate Build Alternatives

FIGURE 4.7-5
WAKEFIELD COMMUNITY HUNT CLUB/
WAKEFIELD SPORTSMENS CLUB



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Candidate Build Alternatives

FIGURE 4.7-6
PULLEY FARM/CEDAR LAWN FARM

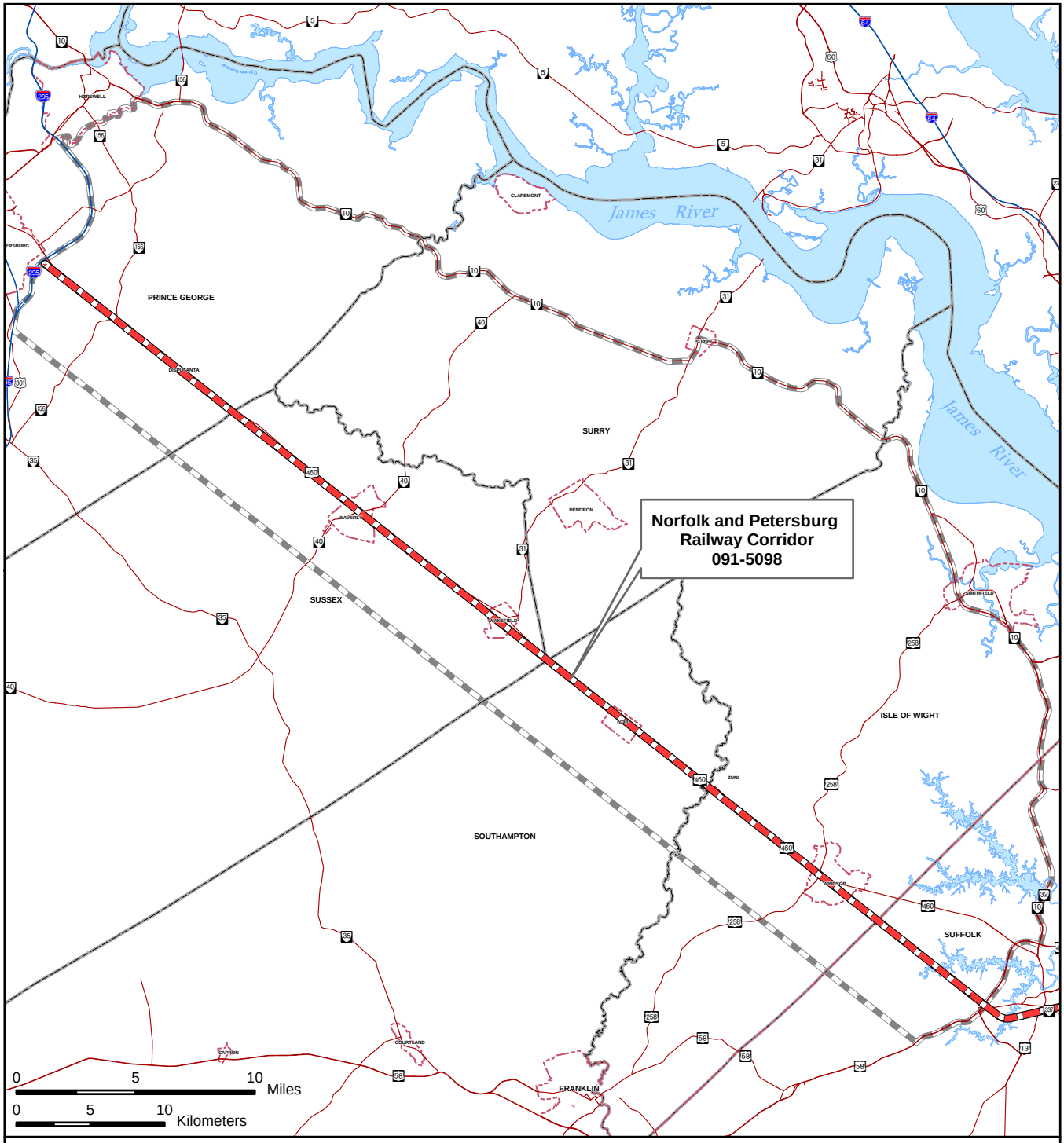
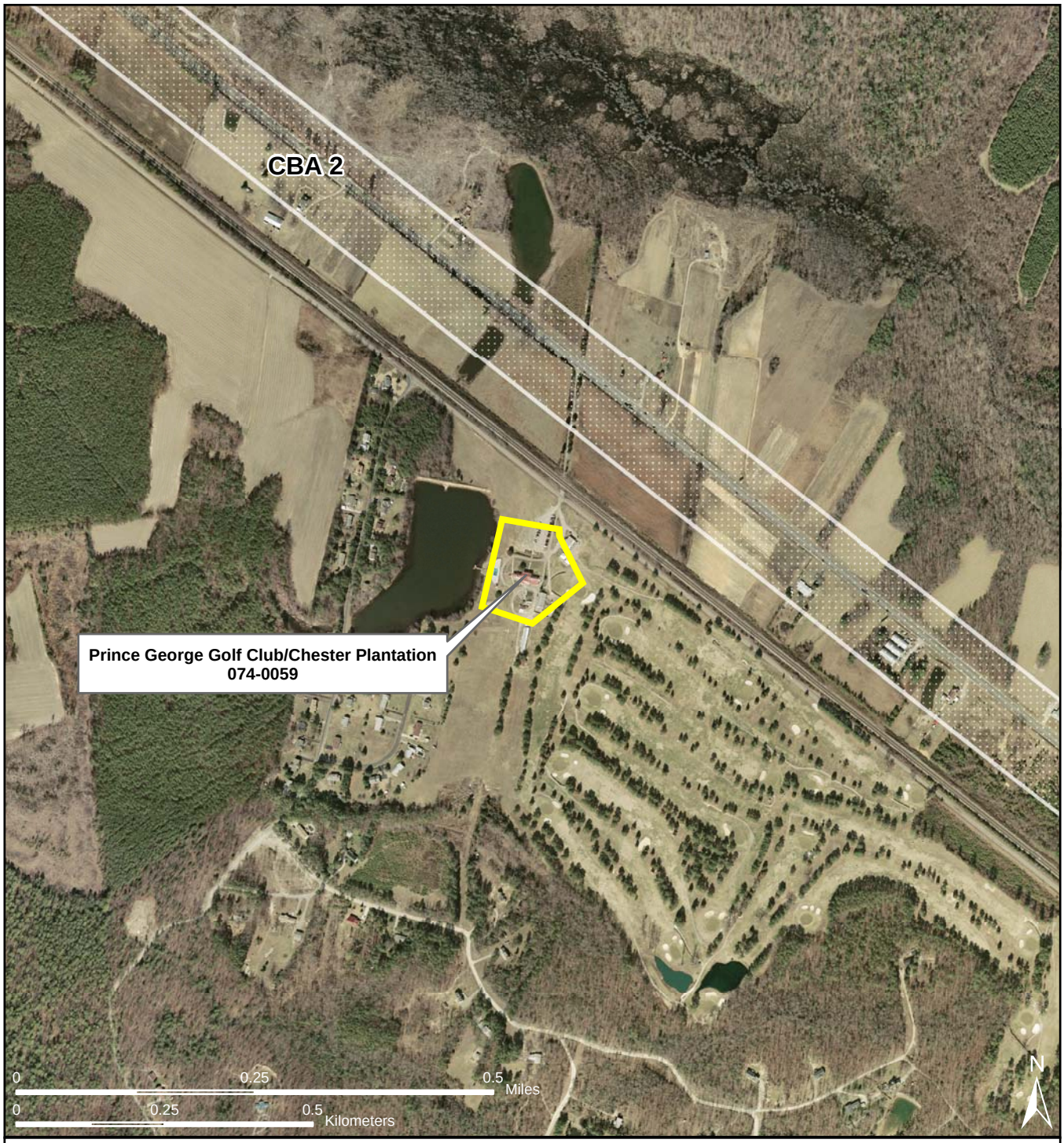


FIGURE 4.7-7
NORFOLK AND PETERSBURG
RAILWAY CORRIDOR



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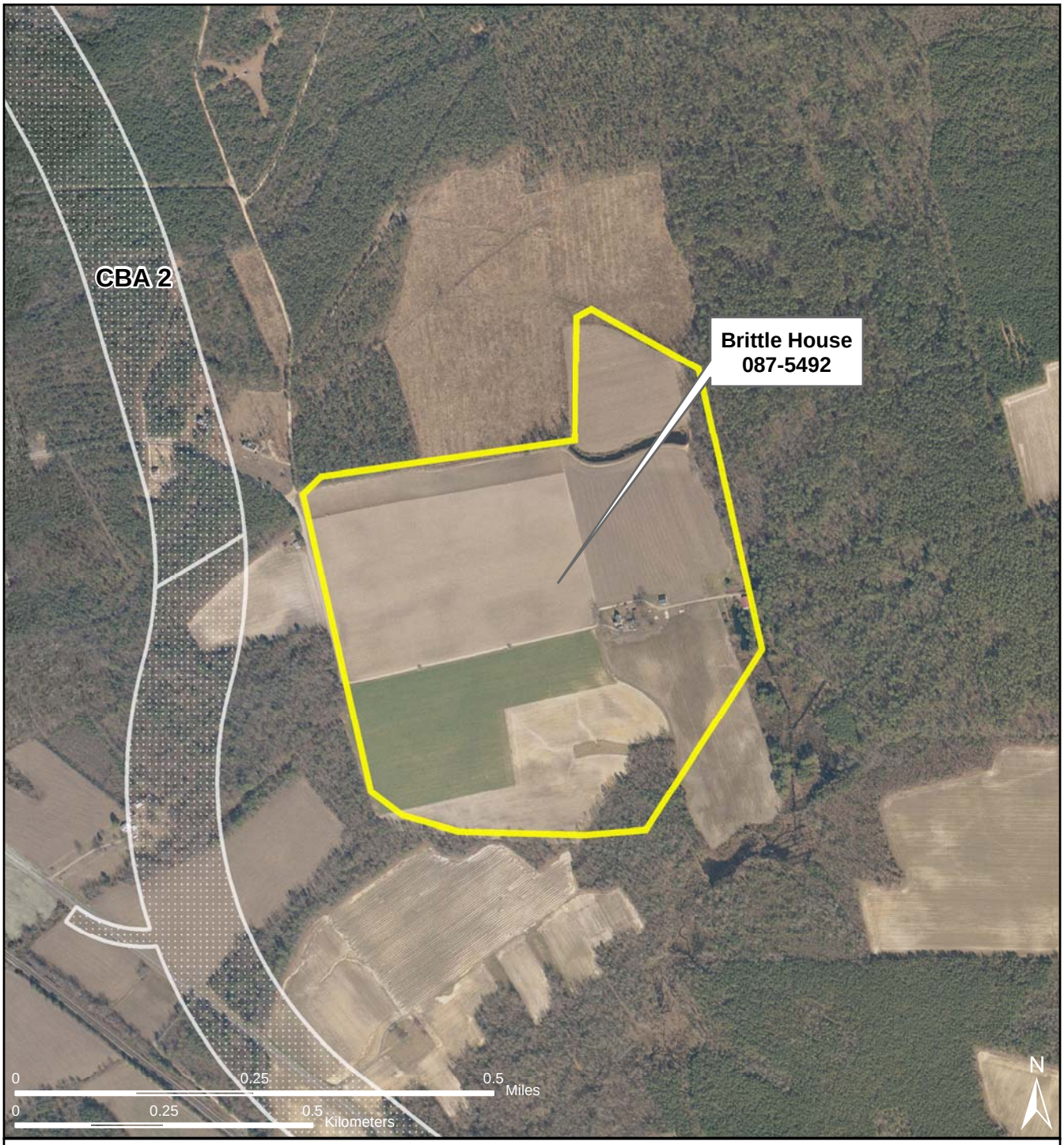
Candidate Build Alternatives

FIGURE 4.7-8
PRINCE GEORGE GOLF CLUB/CHESTER PLANTATION



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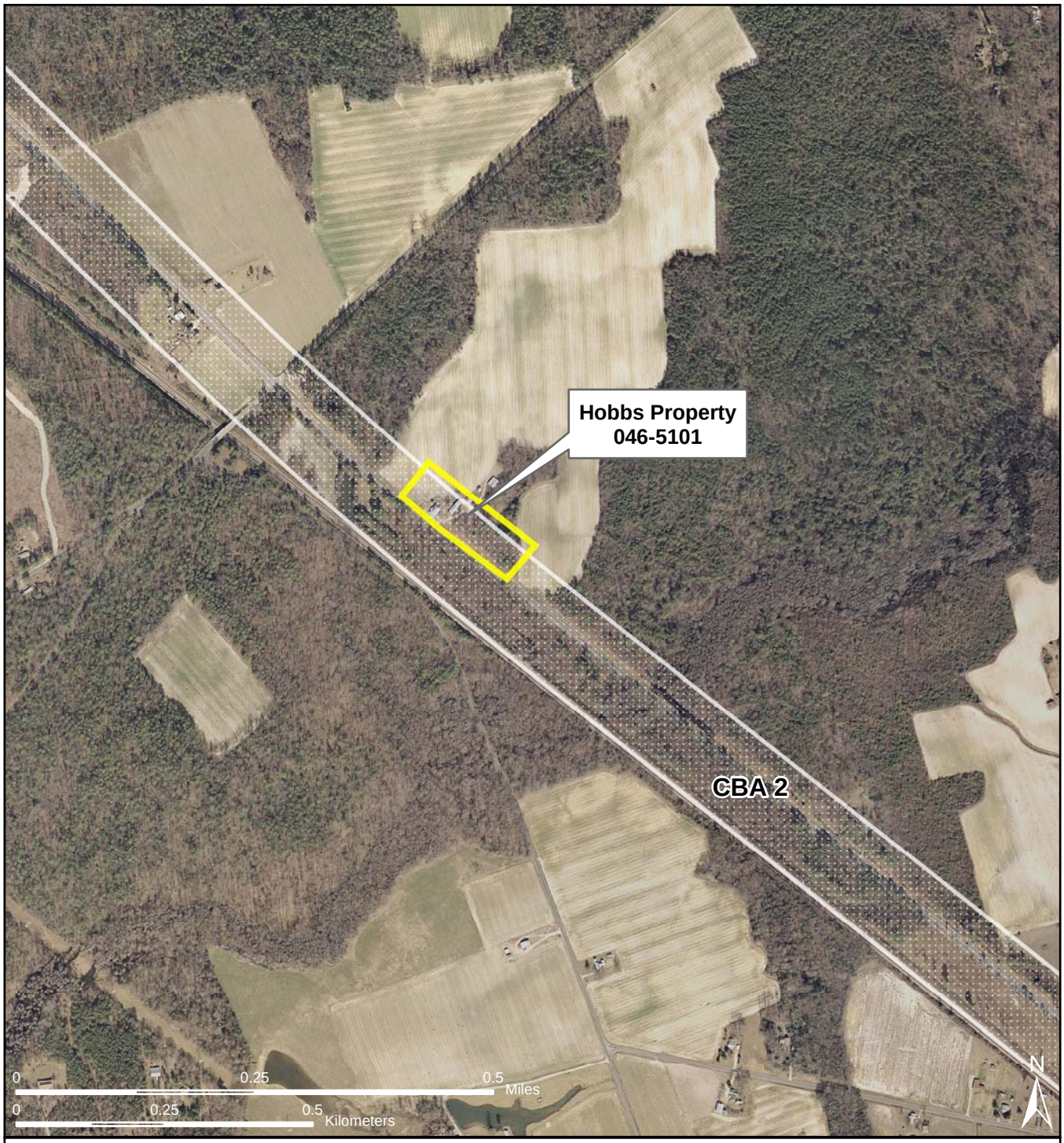
Candidate Build Alternatives

FIGURE 4.7-9
BRITTLE HOUSE



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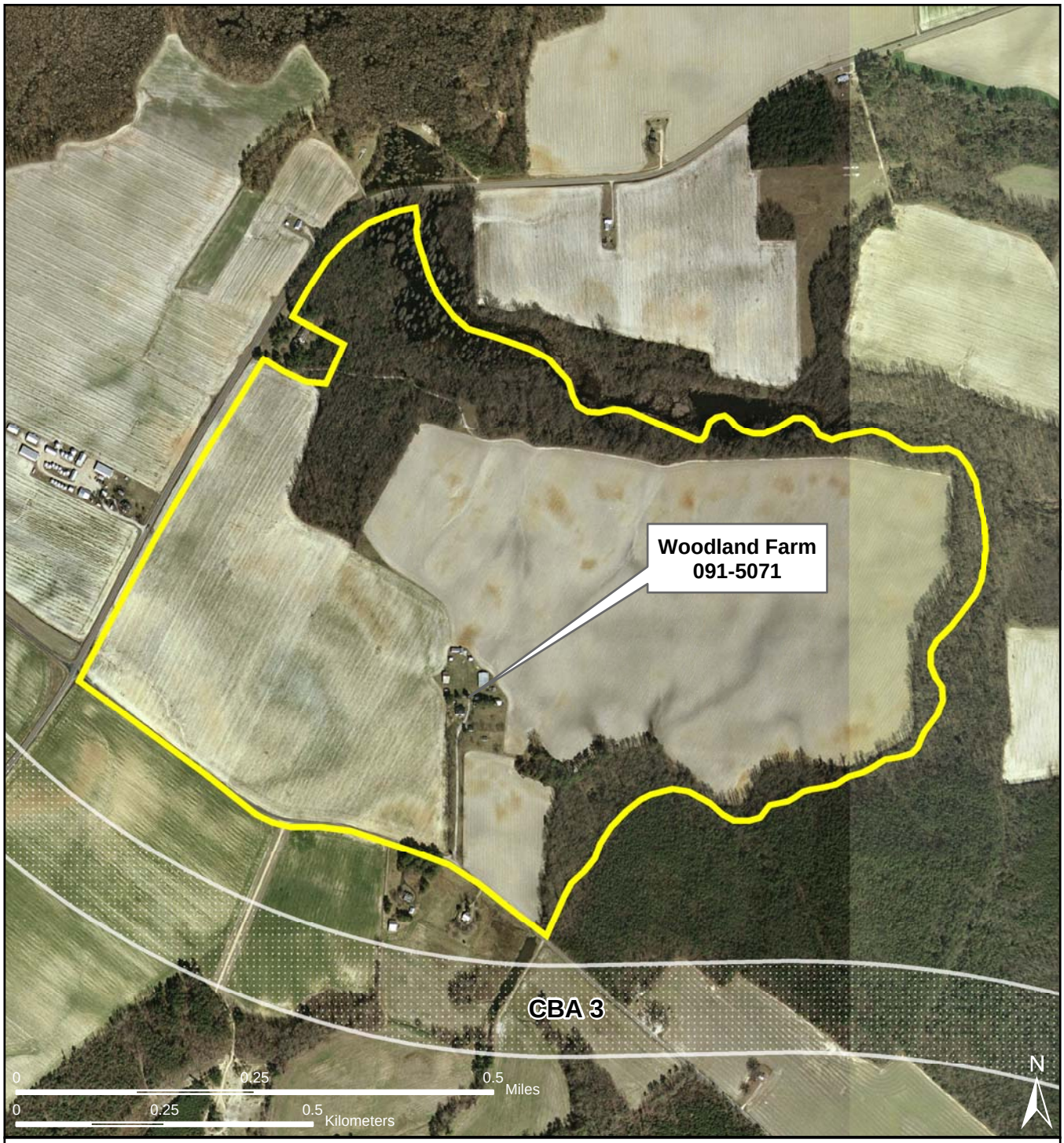
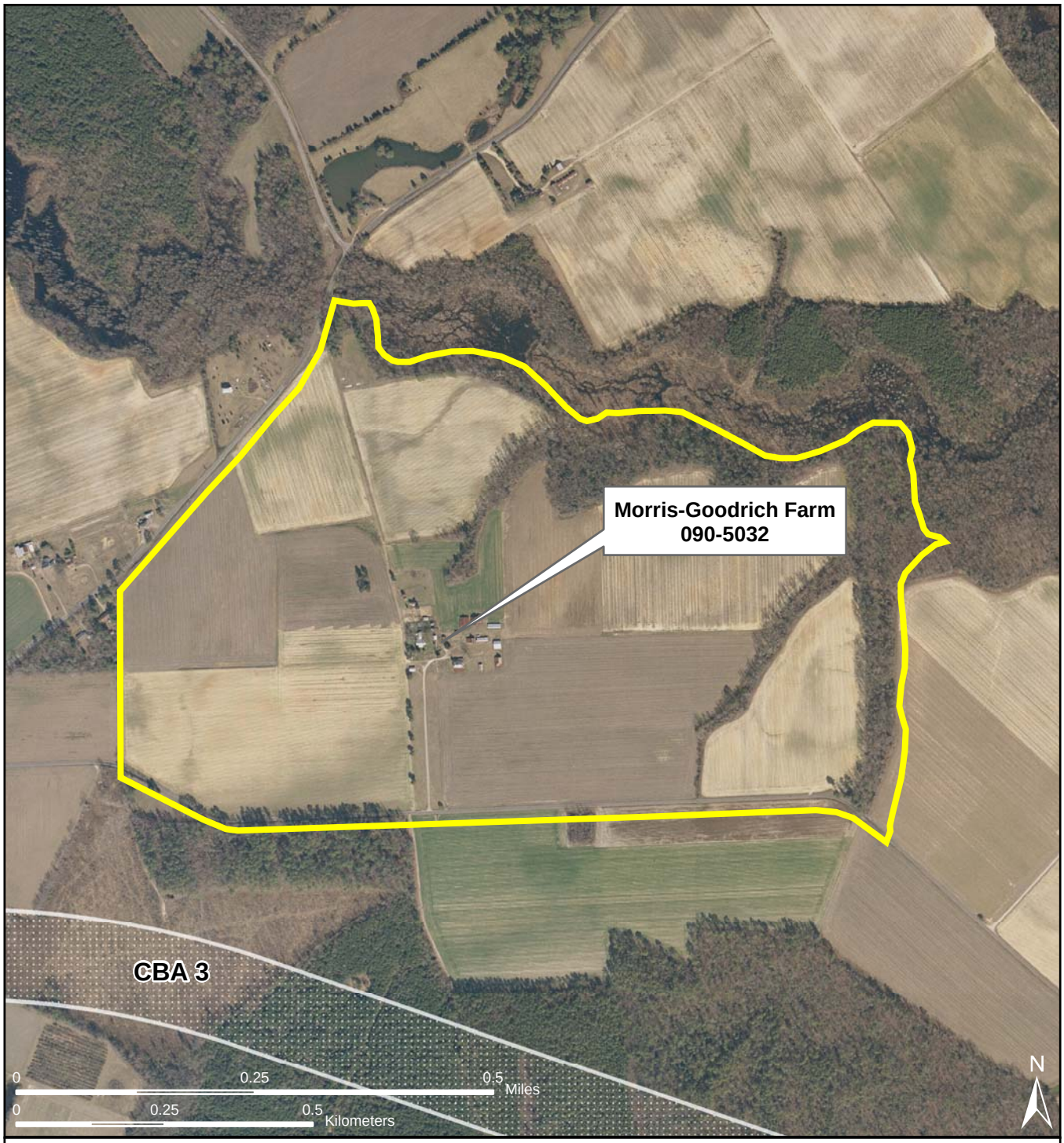
Candidate Build Alternatives

FIGURE 4.7-10
HOBBS PROPERTY



Candidate Build Alternatives

FIGURE 4.7-11
WOODLAND FARM



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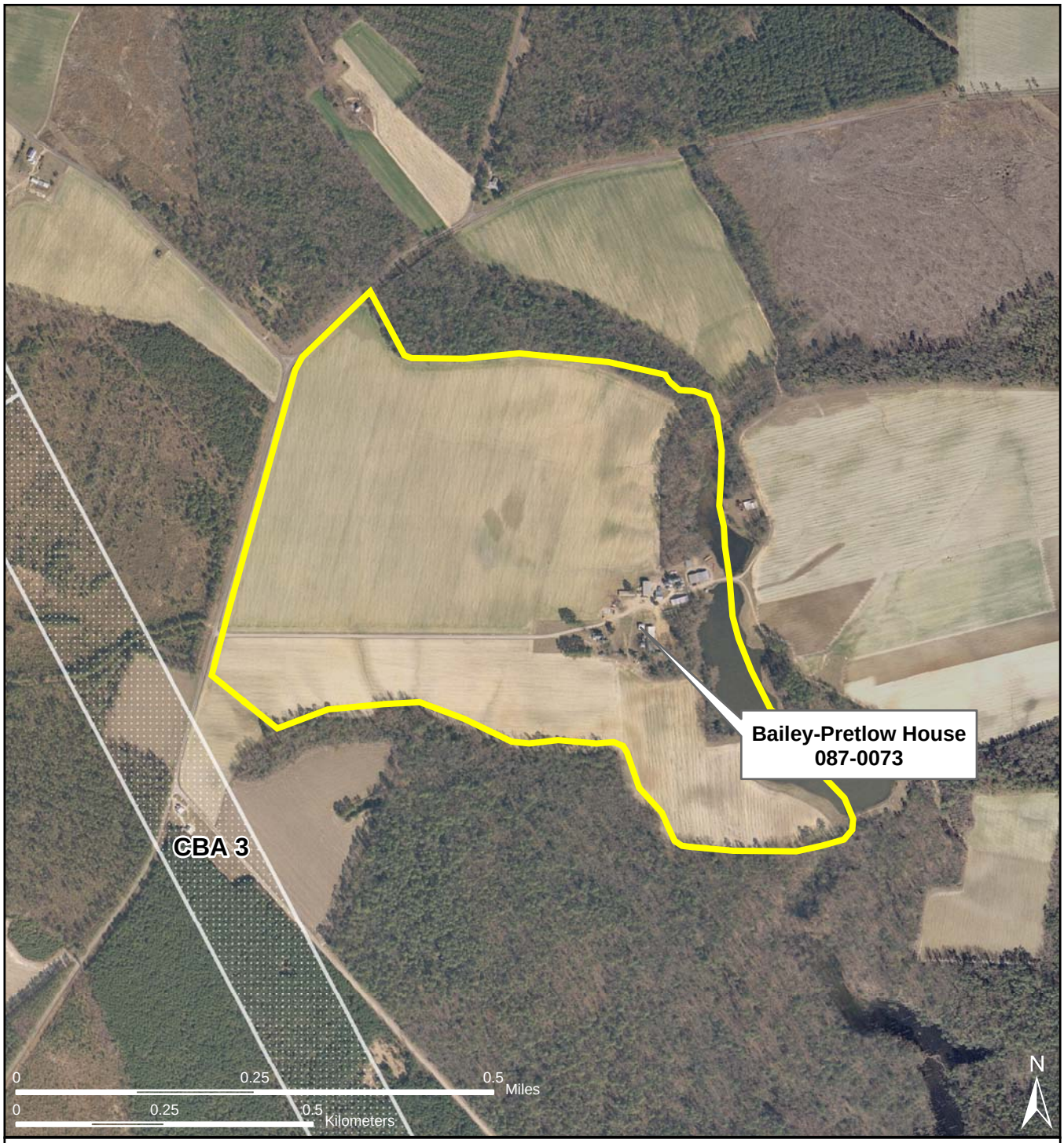
Candidate Build Alternatives

FIGURE 4.7-12
MORRIS-GOODRICH FARM



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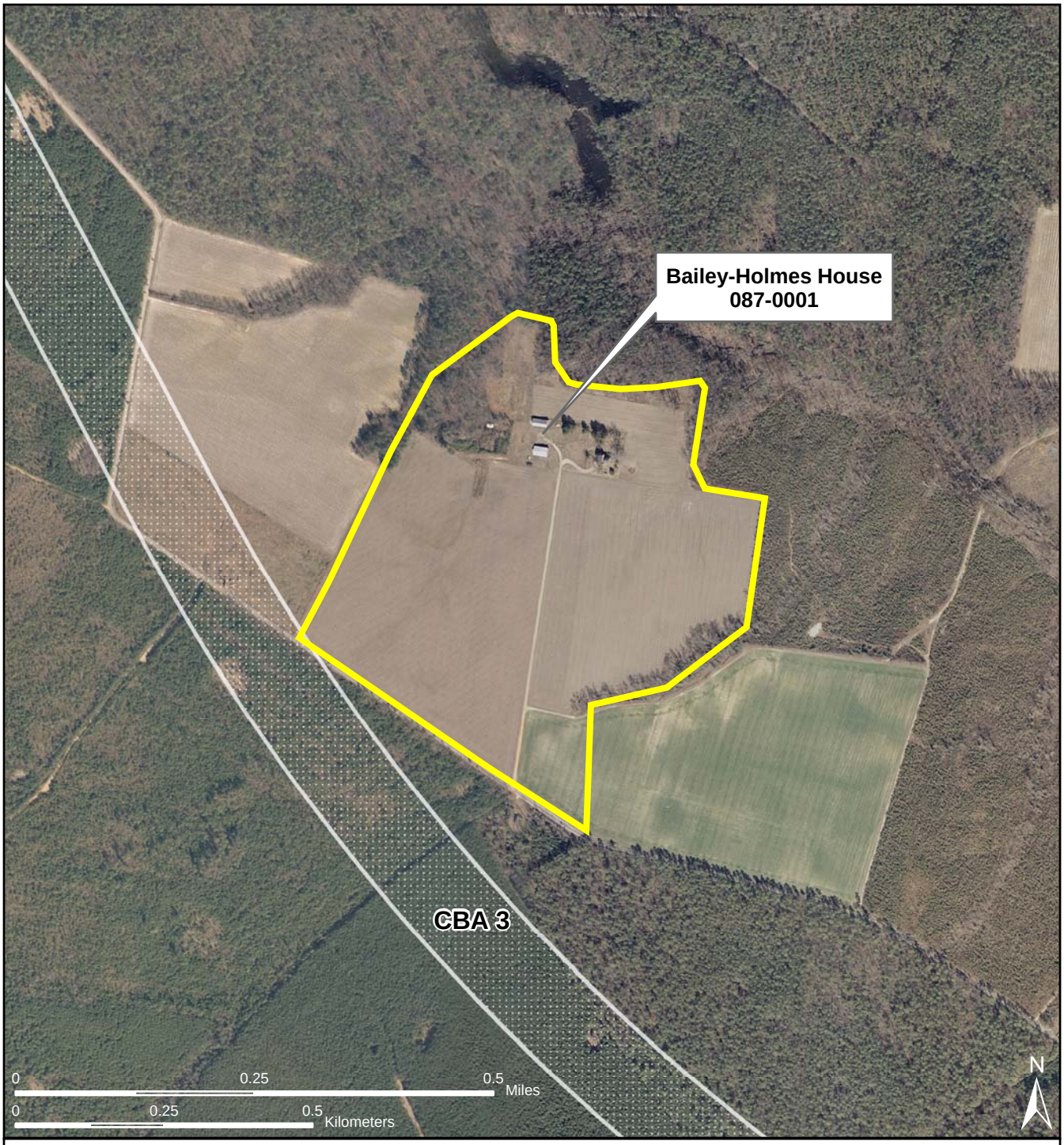
Candidate Build Alternatives

FIGURE 4.7-13
BAILEY-PRETLOW HOUSE



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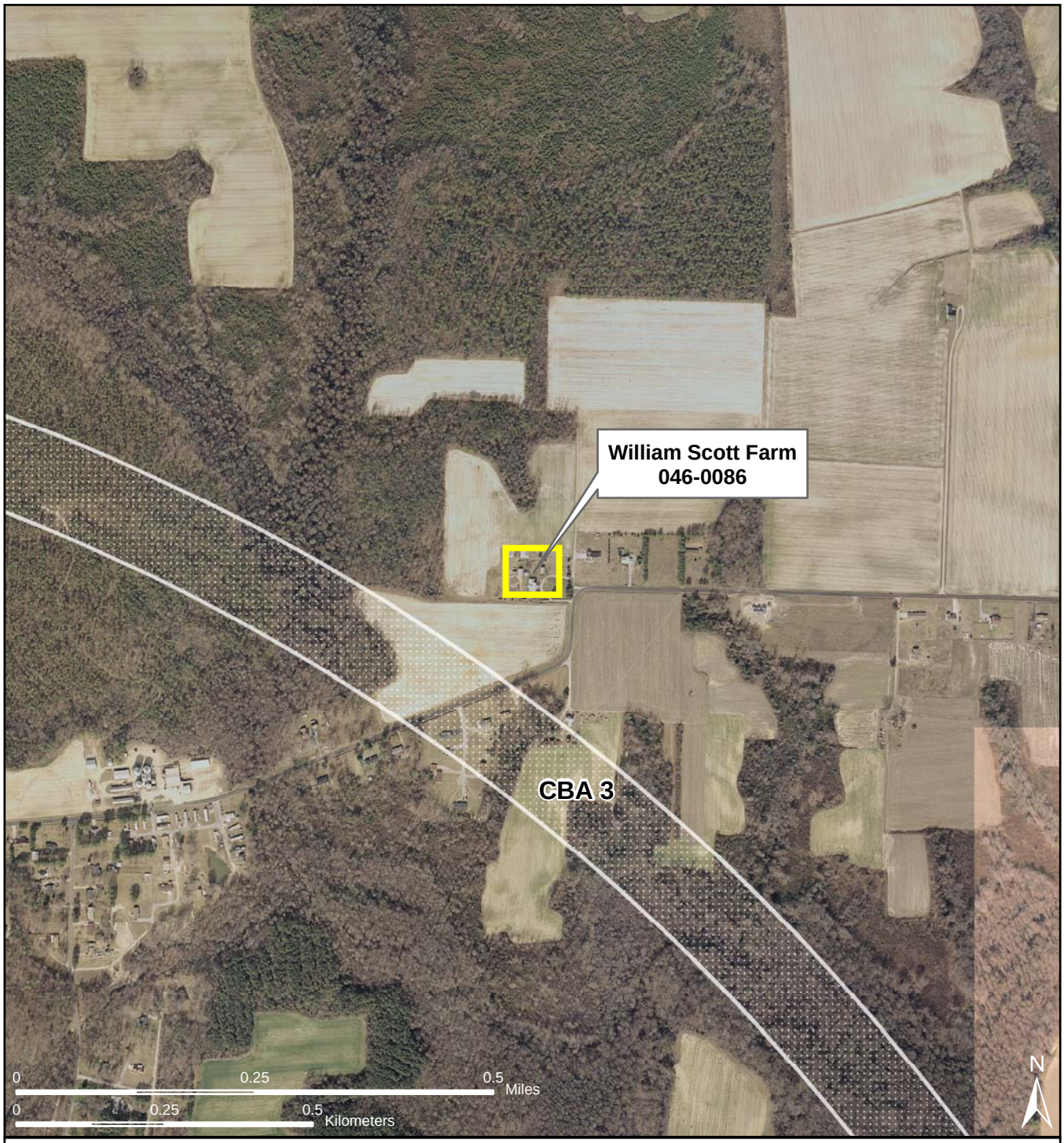
Candidate Build Alternatives

FIGURE 4.7-14
BAILEY-HOLMES HOUSE



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Candidate Build Alternatives

FIGURE 4.7-15
WILLIAM SCOTT FARM

A final Determination of Effect for the project will be made and coordinated with the SHPO during the development of the FEIS. Section 106 effects to each resource potentially affected by the selected alternative will be evaluated. The No-Build and TSM Alternatives would not affect any eligible architectural resources.

4.7.2 Archaeological Resources

A limited number of archaeological sites have been previously recorded within the proposed corridor options (Table 4.7-2). CBA 1 contains four sites; CBA 2 contains one; and CBA 3 contains one site.

Table 4.7-2
PREVIOUSLY RECORDED ARCHAEOLOGICAL SITES

Site #	Quadrangle	Alternative and Segment (CBA)	Site Description (NA=Native American; H=Historic Period)	Previous Recommendations or NRHP Status, If Known
44PG0143	Prince George	1 3	NA-Late Archaic H-19th-20th c.	Not eligible
44IW0139	Windsor	1	NA-Unknown H-Mid 19th-20th c.	Not eligible
44IW0168	Zuni	1	H-19th-20th c.	Not eligible
44IW0169	Zuni	1	H-19th c.	Potentially eligible
44SX0320	Waverly	2	H-19th to 20th c.	Not eligible; 75-95% destroyed

An archaeological assessment was prepared to compare the three CBAs. The archaeological assessment addresses the potential of each of the three alternatives to contain archaeological sites. The assessment for each corridor included the identification of any archaeological sites or significant sites of events not manifested by material remains that may be affected and that may be valued chiefly for preservation in place. The review also assessed the potential for any corridors to contain sites meriting preservation in place or sites that would be extraordinarily complex and/or expensive to excavate.

Sites from all the major periods are represented in the general Study Area for the Route 460 Location Study, and with the exception of sites from the Paleoindian period, the potential for additional sites from each period is high. Native American sites are especially likely on terraces, ridges, or dry floodplain areas adjacent to major streams. The potential is moderate in interstream upland areas. The potential for Paleoindian sites is highest at crossings of major streams such as the Blackwater River and Blackwater Swamp, but due to the general rarity of these sites, the potential is more moderate overall. Archaic and Woodland period sites are more numerous in the Study Area and the potential for additional sites is high at stream crossings and somewhat lower in upland areas. Postcontact sites are numerous in the Study Area. Additional postcontact sites are expected along streams, along historic roadways, and in uplands made more accessible by expanding roadways. Postcontact sites from the Civil War may also be present. Not all sites, however, will have the potential to affect location decisions for the project.

The proportionate size of each segment within each alternative was calculated, and the numerical value assigned to the potential for each type of site was multiplied by this value. The weighted potentials for a particular site type for all the segments in an alternative were added together to arrive at a numerical value representing the average overall potential for encountering a particular type of site in each alternative. These numerical values were then reassigned their descriptive equivalents.

The results in Table 4.7-3 suggest that the potential for sites that could affect location decisions is low to moderate or moderate for all of the site types in all of the alternatives. For stratified sites with Paleoindian or pre-Paleoindian components, the potential ranges from low to moderate in CBA 1 to moderate in CBA 2 and 3. For Woodland period village sites with possible human burials, the potential ranges from low to moderate in CBA 2 to moderate in CBA 1 and 3. For historic cemeteries with large burial populations, the

potential is low to moderate in CBA 1 and 3 and moderate in CBA 2. Finally, there is low to moderate potential for Civil War earthwork sites in CBA 1 and 3 but moderate potential in CBA 2. The results suggest that the alternatives differ only slightly in their potential to contain significant sites.

Table 4.7-3
SUMMARY OF POTENTIAL FOR ARCHAEOLOGICAL SITES
FOR CANDIDATE BUILD ALTERNATIVES 1, 2, and 3

CBA #	Distance (miles)	Area (acres)	Stratified Sites with Paleo-Indian or pre-Paleo-Indian Occupations	Woodland Village Sites with Human Burials	Historic Cemeteries with Large Burial Populations	Civil War Earthworks
1	53	3455	low to moderate	moderate	low to moderate	low to moderate
2	55	3447	moderate	low to moderate	moderate	moderate
3	53	3440	moderate	moderate	low to moderate	low to moderate

In accordance with 36 CFR Part 800.4(b)(2) and by agreement executed between VDOT and the VDHR for large scale projects involving multiple alternatives, a Phase I archaeological survey will only be conducted on the selected alternative if that alternative is a build alternative.

4.7.3 Resolution of Potential Adverse Effects

The Section 106 process requires the FHWA to notify the Advisory Council on Historic Preservation (ACHP) if a project will adversely affect a historic property, so they can determine the need to be involved in consultation. If the selected concept adversely affects historic properties, a Memorandum of Agreement (MOA) must be executed which documents how the adverse effect will be taken into account. It the ACHP chooses not to participate in consultation, the Section 106 process is considered complete when an MOA has been executed between the FHWA and the SHPO and is filed with the ACHP. If the selected concept results in a no adverse effect on historic resources, the Section 106 process is considered complete when the FHWA and the SHPO concur on the no adverse effect determination.

4.8 AIR QUALITY

4.8.1 Methodology

A microscale air quality analysis was conducted to determine the potential effects of the CBAs on local air quality. The "worst-case" project level carbon monoxide (CO) concentrations were determined for the existing (2003), interim (2015), and design (2026) years. These CO concentrations were then compared to the National Ambient Air Quality Standards (NAAQS).

Microscale air quality modeling was performed using EPA's CAL3QHC program. Input emission factors were based on the EPA mobile source emission factor model (MOBILE 6.2). Dispersion parameters within the program are based on EPA's CALINE3 air quality dispersion model. Following the guidelines set forth in VDOT's Project *Air Quality Analysis Consultants Guide, Revision 13,* CO levels in the study area were estimated for each CBA, including the existing and No-Build scenarios. Sites were selected based on worst-case existing and estimated future traffic conditions and their location relative to the alignment where the highest CO concentrations could be expected and where the general public would have access during the analysis periods (i.e. sidewalks and bike lanes).

Maximum one-hour and eight-hour CO levels were estimated for each CBA for the existing year (2003), interim or completion year (2015 Build and No-Build scenarios) and the design year (2026 Build and No-Build scenarios).

Microscale modeling is used to predict CO concentrations resulting from emissions from motor vehicles using roadways immediately adjacent to the location at which predictions are being made. A CO "background level" must be added to this value to account for CO entering the area from environmental and other non-mobile sources upwind of the receptors. Based upon VDOT recommendations, a one-hour background and eight-hour background concentrations of 6 ppm and 3 ppm, respectively, were applied to all analysis sites.

Traffic data used for the air quality analysis was developed as part of an overall traffic analysis for this study. The microscale CO analysis was performed for the peak one-hour and eight-hour standard. These are the periods when the greatest air quality effects of the proposed project are expected. The average number of vehicles per hour during the peak eight-hour period was calculated as 0.6 percent of the average daily traffic. This persistence factor was recommended by VDOT. The persistence factor was recommended by VDOT and is based on guidance in FHWA's *Manual for Air Quality Considerations in Environmental Documents*.

4.8.2 Impacts

Maximum one-hour and eight-hour CO levels predicted for each CBA are shown in Table 4.8-1 and Table 4.8-2 respectively. These tables also include the predicted CO levels expected to occur under the existing and No-Build condition. All predicted concentrations are below the applicable one-hour (35 ppm) and eight-hour (9 ppm) Federal Standards established for this pollutant.

Table 4.8-1
ONE HOUR PREDICTED CO CONCENTRATIONS (PPM)

CBA	Location		Existing (2003)	No-Build (2026)	Interim (2015)	Build (2026)
	From	To				
1	Proposed Interchange at US 258, in Windsor	Eastern Terminus at US 58 Bypass	10.2	8.3	6.8	7.3
2	Proposed Interchange at Route 460 East of Windsor	Eastern Terminus at US 58 Bypass	10.2	8.3	6.8	7.1
3	Proposed Interchange at Route 460 East of Windsor	Eastern Terminus at US 58 Bypass	10.2	8.3	6.9	7.4

Table 4.8-2
EIGHT HOUR PREDICTED CO CONCENTRATIONS (PPM)

CBA	Location		Existing (2003)	No-Build (2026)	Interim (2015)	Build (2026)
	From	To				
1	Proposed Interchange at US 258, in Windsor	Eastern Terminus at US 58 Bypass	5.5	4.4	3.5	3.8
2	Proposed Interchange at Route 460 East of Windsor	Eastern Terminus at US 58 Bypass	5.5	4.4	3.5	3.7
3	Proposed Interchange at Route 460 East of Windsor	Eastern Terminus at US 58 Bypass	5.5	4.4	3.5	3.8

The highest predicted one-hour and eight-hour CO concentrations occur along CBA 1 between the City of Windsor and the US 58 Bypass at eastern terminus of the project. This location also has the highest hourly volume of vehicles (over 3,400 in all future scenarios) of all sites analyzed. Recognizing that the predicted concentrations of CO include background concentrations of 3 and 6 ppm for the eight- and one-hour levels, respectively, the proposed project will have little effect on existing levels of localized pollution. The CO concentrations for each CBA will decrease in the design year compared to the existing conditions and are well below the NAAQS for CO for each CBA. The temporary air quality impacts from construction are not expected to be significant. Construction activities are to be performed in accordance with VDOT's *Road and Bridge Specifications*. The Specifications are approved as conforming to the SIP and require compliance with all applicable local, state, and federal regulations.

4.8.3 Project-Level Conformity

The purpose and need of the study focuses on meeting the current and future regional transportation needs of the area. The Route 460 Location Study is currently included for construction in the constrained Long-Range Plan for the Hampton Roads and Richmond/Petersburg regions, and the plan has been found to conform to the State Implementation Plan under the 1-hour ozone standard by FHWA and FTA. However, according to the constrained long-range plan developed by the Tri-Cities MPO for the Richmond/Petersburg region, Route 460 is listed as a reconstruction project and not a new location project. Therefore, the selection of a new location alternative would require the need for a new conformity finding. The Route 460 Location Study is listed as a new location project in the Hampton Roads region constrained long-range plan of which 50 percent will be funded by tolls. No phases of the project are currently included in either region's Transportation Improvement Program with the exception of preliminary engineering and the environmental study.

4.9 NOISE

4.9.1 Methodology

Traffic noise levels were approximated at all noise-sensitive properties along the three CBAs using the latest versions of the FHWA Traffic Noise Model (TNM 2.5) and the TNM 2.5 Look Up Tables. A two-dimensional approach was used that allowed for comparisons of the alternatives. Using loudest hour design year 2026 traffic data for the CBAs and ten percent of design year ADTs for other primary roadways and secondary roadways, build case noise levels at various distances from the CBAs and other roadways were calculated. The distances from the CBAs and other roadways to all noise sensitive properties were approximated and the applicable noise levels were applied to each property. Existing noise levels were approximated in a similar manner, using ten percent of existing ADTs for primary and secondary roadways to calculate noise levels at various distances from the roadways. No-build traffic data was available only for existing Route 460 and other primary routes with ADTs greater than 1,000, and therefore, 2026 no-build noise levels could not be determined for most noise-sensitive properties using traffic projections. However, at those properties where the existing noise levels were approximated to be 66 dBA or greater, no-build levels were also assumed to equal or be greater than 66 dBA. Properties where existing levels reach 66 dBA or higher are in close proximity to existing roadways, and traffic on these roadways has been assumed to be at least the same in 2026 as it was in 2003.

4.9.2 Noise Impact Assessment

The potential noise impact of the CBAs for the Route 460 Location Study was assessed in accordance with FHWA and VDOT noise assessment guidelines, which are described in detail in Chapter 3.

In the following table and discussion, noise impact is summarized for three separate categories. "Approach or Exceed NAC Only" impact, or *"NAC"* impact occurs where project noise levels approach or exceed the FHWA Noise Abatement Criteria (see Chapter 3), but the increase above existing is less than 10 dB. "Substantial Increase Only" impact, or *"SI"* impact, occurs where the project alternative causes a

substantial increase in the existing noise level – 10 dB or more – but the future level is less than 66 dBA L_{eq}. *"Both"* impact, or "Both NAC and Substantial Increase" impact occurs where both conditions exist; i.e. a 10 dB or more increase above the existing noise level and the predicted future noise levels approach or exceed 67 dBA L_{eq}.

Table 4.9-1 provides a summary of the noise impacts for each CBA by impact category. Impact in areas where noise levels approach or exceed the NAC have also been tabulated for the 2003 existing condition and 2026 no-build alternative in the same study corridor as traversed by the associated build alternative. Properties displaced by proposed roadway improvements (whether new alignment or widening) were not included in the count of impacted properties for the existing or no-build conditions.

Table 4.9-1
SUMMARY NOISE IMPACT TOTALS

CBA 1				
Impact	Approach or Exceed NAC Only *"NAC"*	**Substantial Increase Only *"SI"***	**Both NAC and Substantial Increase *"Both"***	**TOTAL**
	None	124 Residences 1 Church 1 School	32 Residences	156 Residences 1 Church 1 School
Existing	None	NA	NA	None
No-build	None	NA	NA	None
CBA 2				
Impact	Approach or Exceed NAC Only *"NAC"*	**Substantial Increase Only *"SI"***	**Both NAC and Substantial Increase *"Both"***	**TOTAL**
	16 Residences 1 Church	71 Residences 1 School	4 Residences	91 Residences 1 Church 1 School
Existing	3 Residences	NA	NA	3 Residences
No-build	20 Residences	NA	NA	15 residences
CBA 3				
Impact	Approach or Exceed NAC Only *"NAC"*	**Substantial Increase Only *"SI"***	**Both NAC and Substantial Increase *"Both"***	**TOTAL**
	2 Residences 1 Church	162 Residences 1 Church	18 Residences	182 Residences 2 Churches
Existing	2 Residences	NA	NA	2 Residences
No-build	3 Residences	NA	NA	3 Residences

A comparison of noise impact by alternative indicates that more noise-sensitive properties will be affected by CBA 3 than by CBA 1 or CBA 2. A total of 182 residential properties and 2 churches will receive noise impact in design year 2026 with CBA 3. 162 of these residences and 1 church will receive *SI* impact only, while only 2 residences and the other church will be impacted only by noise levels approaching or exceeding the NAC. 18 of the residential properties will experience both types of impact. Two of these 184 properties currently receive noise levels approaching or exceeding FHWA Noise Abatement Criteria.

In the 2026 no-build condition, three properties will receive noise levels approaching or exceeding FHWA Noise Abatement Criteria.

A total of 156 residential properties, 1 church, and 1 school will receive noise impact in design year 2026 with CBA 1. All of these properties will be impacted as a result of substantial increases in noise levels, and 32 will also experience noise levels approaching or exceeding 67 dBA L_{eq}. None of these properties currently receive noise levels approaching or exceeding FHWA Noise Abatement Criteria. Similarly, in the 2026 no-build condition, no properties will receive noise levels approaching or exceeding FHWA Noise Abatement Criteria.

The least number of impacted properties will result with CBA 2. A total of 91 residential properties, 1 church, and 1 school will be impacted, with 71 residences and the school receiving only a substantial increase impact, and 16 residences and the church receiving only a *NAC* impact. Four of the residences will receive both types of impact. Three of these 93 properties currently receive noise levels approaching or exceeding FHWA Noise Abatement Criteria. In the 2026 no-build condition, twenty properties will receive noise levels approaching or exceeding FHWA Noise Abatement Criteria.

4.9.3 Noise Abatement

FHWA Policy requires that noise abatement measures be considered wherever noise impact is predicted to occur. Measures identified by FHWA for consideration include traffic management, alteration of horizontal and vertical alignment, and construction of noise barriers. Traffic management measures, which include speed reductions and truck restrictions, would compromise one of the main purposes of this project and have been eliminated from further consideration. Alignment shifts could be effective in reducing noise levels at some locations but could also create additional noise impact and result in additional property takings. Further consideration of this abatement measure will take place later in the project development process.

The construction of noise barriers has been considered at every location where noise impact has been predicted. FHWA and VDOT require that noise barriers be both “feasible” and “reasonable” to be recommended for construction. To be feasible, a barrier must be effective, that is it must reduce noise levels at noise sensitive locations by at least 5 decibels, thereby “protecting” or “benefiting” the property. A residential property is “protected” if it will be exposed to future noise impact and will receive at least 5 decibels of noise reduction from a barrier. By comparison, a residential property is “benefited” if it is not exposed to future noise impact, but will still receive at least 5 decibels of noise reduction from a barrier designed to protect impacted properties.

The noise analysis included a preliminary feasibility evaluation for noise barriers. In locations near impacted properties where roadway access must be maintained, the properties were considered “not protected” (see Table 4.9-3). Barrier lengths, heights, and locations have been estimated using TNM for all other impacted properties. None of the impacted properties associated with CBA 1 or CBA 3 require road access that would make noise barriers ineffective. However, with CBA 2, eight impacted residential properties will require such access and are listed as “not protected” in Table 4.9-2. The feasibility of constructing noise barriers will be fully evaluated for those properties impacted by the selected alternative during the design phase of the project.

Barrier reasonableness, which is partially based on cost-effectiveness, has not been fully evaluated in this analysis, since barrier costs cannot accurately be determined during the Location Study stage. However, preliminary cost estimates were calculated based on estimated barrier length and height. Before the design public hearing, the appropriate barrier costs specific to that location will be determined and barrier cost effectiveness will be evaluated. Costs can include but are not limited to costs for barrier materials and installation, for additional right-of-way to accommodate the barriers, for the resolution of utility and drainage conflicts with the barriers, and for dealing with safety issues created by the barriers. To be “reasonable,” a barrier cannot cost more than $30,000 per protected or benefited residential property. See the Noise Technical Report for a summary of proposed barriers and their approximate cost per protected or benefited residential property. A barrier found not to be reasonable due to cost can still be constructed if a third party (other than FHWA or VDOT) funds the amount above $30,000 per residential

property. The reasonableness determinations for non-residential properties such as schools and churches are made on a case-by-case basis. The determinations are based not only on the barrier cost, but also on the type and duration of the activity taking place, the size of the affected area, the severity of the impact, and the amount of noise reduction provided.

Table 4.9-2 provides a summary of the barriers with each of the three CBAs. Included are the number of barriers, the total length and surface area, and a very preliminary total cost for barrier materials and installation. CBA 3, which is predicted to impact the largest number of noise-sensitive properties, would require the largest number and square footage of noise barriers to provide noise protection to impacted properties. CBA 2, with the least number of impacted properties, would require the least number and square footage of barriers to protect impacted properties.

Table 4.9-2
SUMMARY NOISE BARRIER TOTALS

CBA	Number of Barriers	Total Linear Feet	Total Square Feet	Total Cost	Sites Protected	Feasible Barriers	Cost-Effective Barriers
CBA 1	51 Barriers	103,150	1,451,550	$30,482,550	156 Residences 1 Church 1 School	All	None
CBA 2	40 Barriers	37,650	562,100	$11,804,100	83 Residences 1 Church 1 School 8 Sites Not Protected	All (8 sites not protected)	None
CBA 3	63 Barriers	110,250	1,628,490	$34,198,290	182 Residences 2 Churches	All	None

Note: All results in this table have been based on preliminary noise analysis and design, and may change upon detailed analyses. The cost-effectiveness of barriers protecting churches and schools are based on cost and other factors as discussed in Section 4.9.3.

4.10 WATER QUALITY AND WATER RESOURCES

4.10.1 Surface Water Resources

Stormwater runoff from highways and associated rights-of-way typically contains a specific suite of pollutants which can occur in widely varying concentrations. Pollutants of concern associated with highway construction and use include a variety of substances from common organic materials to toxic metals. Some pollutants, such as herbicides, road salts, and fertilizers, are intentionally placed in the environment to promote safety or roadside vegetation. Other pollutants, such as the incidental release of small amounts of petroleum products and metals from trucks and cars, are the indirect effect of roadway utilization. A major factor that determines concentrations of pollutants in highway stormwater runoff is the volume of traffic carried by a particular segment of roadway.

4.10.1.1 Non-Point Source Effects

The magnitude of stormwater pollutant loading attributed to a particular construction activity along with the proximity of that activity to sensitive waters (such as public water supplies and special aquatic habitat) can factor into water quality. Should a build alternative be selected, the effects of pollutant loadings will vary along the corridor. Primary factors that will influence the effect of highway runoff pollutant loading within any particular surface water body include the type and size of the receiving water body, the