August 23, 2001

Colonel David L. Hansen
U.S. Army Corps of Engineers
Norfolk District
803 Front Street
Norfolk, Virginia 23510-1096

Attn: Mr. Gerald Tracy
Regulatory Branch

Re: Mr. Daniel Hoffler, Project No. 00-V1662, Northampton County, VA

Dear Colonel Hansen:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the above referenced project in Northampton, County, Virginia and its effects on the northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*), in accordance with section 7 of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq*.). Mr. Hoffler proposes to construct a 748-foot long rip-rap revetment landward of mean high water and to remove two unauthorized rock groins. This biological opinion is based on information provided in the permit application, telephone conversations, field investigations, and other sources of information. The U.S. Army Corps of Engineers' (Corps) proposed action is to issue a Department of the Army permit to the applicant for the proposed construction and removal activity. A complete administrative record of this consultation is on file in this office.

I. CONSULTATION HISTORY

10/12/00 The Corps faxed the Service a species notification.

10/26/00 The Service sent the Corps a letter recommending a site visit to determine the effects of the project to the northeastern beach tiger beetle.

11/18/00 The Corps contacted the Service to arrange a site visit.

12/19/00 The Service, the Corps, and the contractor, Chris Wilson, met on site.

01/04/01 The Service sent the Corps a letter recommending formal consultation.

03/08/01 The Service received the Corps' March 6, 2001 letter requesting initiation of formal consultation.

03/12/01 The Service sent the Corps a letter acknowledging receipt of the request for formal consultation.

II. BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

This project is located at the end of Route 634, Savage Neck, Northampton County, Virginia (Figure 1). The applicant proposes to construct 748 linear feet of rip-rap revetment landward of mean high water (MHW), outside Corps jurisdiction. Also, the applicant proposes to remove two unpermitted, partially constructed rock groins approximately 10 feet wide and extending 20 feet channelward of MHW (Figures 2-3). Since the rocks that will be removed from the intertidal zone will be used for the rip-rap revetment, the Corps has taken jurisdiction over the entire project. The stated purpose of the proposed action is to protect the shoreline and preserve the beach.

The applicant's shoreline is a sandy beach with an average width of 15 feet at MHW (Figures 4-8). The beach has an 8-foot high bank and is experiencing erosion. The entire shoreline contains tiger beetle habitat.

The "action area" is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. The Service has determined that the action area for this project is the beach zone that includes the area around the groins to be removed, the area where construction equipment will be on the beach, and the area to be rip-rapped plus 1000 feet on both ends. The future impacts of the rip-rap revetment is estimated at 1000 feet beyond each to account for future scour (C.B. Knisley, pers. comm. 2001).

STATUS OF THE SPECIES RANGEWIDE

Life History - The northeastern beach tiger beetle is a beach-dwelling insect measuring approximately 1.3 cm in length. It has white to light tan wing covers, often with several fine grayish-green lines, and a bronze-green head and thorax (Knisley 1991, U.S. Fish and Wildlife Service 1994). Adult tiger beetles are active, diurnal, surface predators. They forage along the water's edge on small amphipods, flies, and other beach arthropods or scavenge on dead amphipods, crabs, and fish (Knisley *et al*. 1987, U.S. Fish and Wildlife Service 1994). Most foraging occurs in the damp sand of the intertidal zone and scavenging has been observed to occur more often than predation (Knisley *et al*. 1987). Larval northeastern beach tiger beetles are sedentary predators that live in well-formed burrows on the beach from which they extend to capture passing prey. Adult tiger beetles are present on beaches from early June through early September, where they spend most of the day along the water's edge (Knisley *et al*. 1987, Terwilliger and Tate 1995). Adults are active on warm, sunny days where they can be seen feeding, mating, or basking (U.S. Fish and Wildlife Service 1994). They are less active on rainy, cool,

or cloudy days because they cannot maintain their body temperature. They must rely on a variety a behaviors, such as foraging and basking, to maintain their high body temperatures (Knisley *et al*. 1987).

Adult beetles lay eggs on the beach during the summer. Larvae pass through three developmental stages and emerge as adults two years following egg-laying (Knisley *et al*. 1987, U.S. Fish and Wildlife Service 1994). However, some larvae that hatch early and catch an abundance of food may develop and emerge after only one year (U.S. Fish and Wildlife Service 1994). Development through three larval stages and pupation takes place in the burrow (Knisley *et al*. 1987). First instars occur from late August through September; second instars from September to late fall; and third instars from late fall to early spring and through the second year (Knisley *et al*. 1987). Knisley *et al*. (1987) found that the distribution of first and second instars was similar and that highest densities of third instars were in the mid- to upper-tidal zone. Therefore, most burrows were underwater during high tide. Larval burrow depths ranged from 9 to 24 cm and increased with distance from the water's edge, suggesting that burrow depth may be related to subsurface moisture (Knisley *et al*. 1987). Generally, larval burrows are plugged and not visible when the sand is dry and warm. Larvae lack a hard cuticle and are susceptible to desiccation, therefore, they tend to become inactive during hot, dry conditions (U.S. Fish and Wildlife Service 1994). Larvae are active primarily at night and plug their burrows during most of the day. Larvae typically occur in an 8-12 m width of beach within and above the intertidal zone. However, this area may be wider in areas of washover or where the upper beach is flat and is periodically inundated by high tides (U.S. Fish and Wildlife Service 1994). Larvae have been documented on beaches less than 8 m wide. Studies have shown that larvae can survive flooding from 3-6 days (U.S. Fish and Wildlife Service 1994). Larvae have been found crawling on the beach, apparently moving to dig a new burrow in a better location (U.S. Fish and Wildlife Service 1994). This behavior is likely a response to variations in tide levels, soil moisture, or sand accretion and erosion patterns. Larvae overwinter in their burrows and hibernate until mid-March. When sand is damp and cool in the spring, there are low levels of larval activity (C.B. Knisley, Randolph Macon College, pers. comm. 1994). Highest, most predictable periods of larval activity are from late August through early November. Larval activity is highly variable and greatly influenced by temperature, substrate moisture, tide levels, and seasons (U.S. Fish and Wildlife Service 1994).

Knisley *et al*. (1987) found that first emergence of adults ranged from 5-13 June in Virginia. Rainfall appears to enhance emergence since numbers of adults usually increase after a rainfall. The number of adults increases rapidly in June, peaks in mid-July, begins to decline through August, and few adults can be found in September. There is a period of approximately two weeks after adults emerge when there is little to no dispersal (Hill and Knisley 1994a). Then, a small but significant number of beetles disperse to other sites. There is a regular dispersal phase after peak numbers emerge in early July (Knisley and Hill 1989, U.S. Fish and Wildlife Service 1994). Mark-recapture studies have determined that adult tiger beetles may travel 8-19 km (Knisley and Hill 1989) from sites where they were marked, and some individuals may disperse up to 24 km (Knisley 1997a). In Northumberland County, Virginia a total of 10,131 adults were marked and released; 91 beetles dispersed to new sites

(mainly between two close, large sites 1.5 km apart) (Hill and Knisley 1994a). Large sites seem to serve as recruitment areas, while small sites serve as stop-overs during migration (Hill and Knisley 1994a). "It is probable that feeding or resting occur at these smaller sites and that without them, the larger sites may not experience as much migration" (Hill and Knisley 1994a). Migration serves to disperse genetic material, allow for the colonization of new sites, and enable beetles to leave eroding sites (Hill and Knisley 1994a).

Populations of the northeastern beach tiger beetle are highly variable from year to year because they are subject to local population extinctions and capable of dispersal and recolonization (U.S. Fish and Wildlife Service 1994). Two- to three-fold or greater year-to-year variations in numbers at a given site are common (Knisley and Hill 1989, 1990). Many sites that have adults, especially small sites, are not suitable breeding sites, but may temporarily support adults that have dispersed from other sites (U.S. Fish and Wildlife Service 1994). Larvae are not found, or may not survive, at many sites where adults are found. Ideal tiger beetle beaches are greater than 5-8 m wide (C.B. Knisley, Randolph Macon College pers. comm. 1994). Adult and larval beetles are typically found on highly dynamic beaches with back beach vegetation and prefer long, wide beaches that have low human and vehicular activity, fine sand particle size, and a high degree of exposure (Knisley *et al*. 1987). Although narrow beach width is frequently the reason for lack of larvae, there are instances where larvae have variable densities or are absent on wide beaches. Knisley (1997b) found that while beach slope does not appear to affect larval densities, sand particle size does. Larval densities were highly variable relative to sand particle size, however, larvae were rare at sites with > 60% coarse sand (defined as the percentage of sand particles too large to sieve through the 100-size mesh sieve) (Knisley 1997b). Occurrence of this subspecies has been statistically correlated with back beach vegetation; low human and vehicle activity; and wide, long, dynamic beaches (Knisley 1987a).

Status of the Species Within its Range - Historically, the northeastern beach tiger beetle was a common inhabitant of coastal beaches from Cape Cod, Massachusetts to central New Jersey, and along the Chesapeake Bay, from Calvert County, Maryland south through Virginia. The species is extirpated from Rhode Island, Connecticut, and New York (Long Island) (U.S. Fish and Wildlife Service 1994). Potential habitat for tiger beetles still exists at some of the historical sites along the Atlantic Coast (U.S. Fish and Wildlife Service 1994). The only known extant populations along the Atlantic Coast are in southeastern Massachusetts and New Jersey. The two Massachusetts populations are on Martha's Vineyard and near Westport. The highest number of adult beetles observed at Martha's Vineyard was 1,787 in 1990. In 1995, 1,009 adults were documented, and the 2001 population is estimated at 1000 since 440 adults were seen (S. von Oettingen, U.S. Fish and Wildlife Service, pers. comm. 2001). The Westport population was discovered in 1994 (152 adults observed) but had declined to 10 adults in 1995 and to 2 adults in 2001 (S. von Oettingen, U.S. Fish and Wildlife Service, pers. comm. 2001).

The single known extant population in New Jersey is a result of reintroduction of larval beetles. During autumn 1994, larvae collected from Virginia and larvae reared in a laboratory were released at two different sites on Sandy Hook in the National Park Service's Gateway National Recreation Area. In

summer 1995, adults were documented at both sites, and mating and foraging were observed (A. Scherer, U.S. Fish and Wildlife Service, pers. comm. 1996). In autumn 1995, first instar larvae were documented; a result of reproduction from the reintroduced beetles. During autumn 1995, 367 additional larvae from Virginia were translocated (Knisley and Hill 2001). During autumn 1995 and the subsequent winter of 1995/1996, severe erosion occurred and some tiger beetle sites were completely eroded. During 1996, little larval activity was documented and no further reintroduction took place. In spring 1997, 486 larvae from the Chesapeake Bay were released at Sandy Hook and during that summer, 178 adults were documented (Knisley and Hill 2001). In April 1999, 585 larvae were translocated, and 260 adults were counted in July (Knisley and Hill 2001). In 2000, 554 larvae were translocated in April, and 720 adults were counted in July (Knisley and Hill 2001). The population has continued to increase, with 749 adults counted in 2001 (A. Scherer, U.S. Fish and Wildlife Service, pers. comm. 2001). Since that count was probably after the adult peak, Knisley estimates the population is over 2000 (A. Scherer, U.S. Fish and Wildlife Service, pers. comm. 2001).

Besides the work in New Jersey, limited northeastern beach tiger beetle reintroduction attempts have been made elsewhere. An experimental reintroduction of adult tiger beetles was conducted in 1991 in the Chesapeake Bay to determine appropriate reintroduction methods for use in restoring beetles to their historical range along the Atlantic Coast. During the summer of 1992, adult beetles from Martha's Vineyard were transferred to Cape Cod National Seashore, Massachusetts (U.S. Fish and Wildlife Service 1994). The weather became unfavorable during the release and a reintroduction attempt was not successful (U.S. Fish and Wildlife Service 1994). During this attempt, it was observed that the beetles moved only short distances from the release site. It was hypothesized that non-dispersing beetles have very limited ranges and that the release of larvae should be investigated to better aid recolonization.

The stronghold of tiger beetle distribution is the Chesapeake Bay. The higher survival of this species in the Bay versus the Atlantic Coast may be due to historically lower levels of human activity in the Bay and less natural mortality from winter storms, erosion, etc. (U.S. Fish and Wildlife Service 1994). Between 1988 and 1993, the northeastern beach tiger beetle was documented at 13 sites in Calvert County, Maryland (U.S. Fish and Wildlife Service 1994). In 1998 and 1999, the Service funded comprehensive larval and adult tiger beetles surveys along the majority of the shoreline of the Chesapeake Bay in Virginia. Knisley and Hill (1998) found 27,099 adult tiger beetles at 62 sites on the western shoreline of the Bay in Virginia. Knisley and Hill (1998) discovered 23 new sites but determined that nine sites had apparently been extirpated since Roble's 1996 survey. Knisley and Hill (1999) found 32,167 adult tiger beetles at 35 sites on the Virginia Eastern Shore, though larval numbers were inexplicably low. Ten new sites were discovered during the 1999 surveys. Because storms and other natural and man-made factors can rapidly alter beach habitat, it is difficult to determine exactly how many sites exist at a given time.

Comparisons of numbers of tiger beetles over time present a problem because both adult and larval activity is not completely understood. Surveys may be confounded by differences in weather,

disturbance, time of year, time of day, cloud cover, immigration, surveyor methodology differences, etc. (Knisley and Hill 1998). Overall, there is much more shoreline modification on the western shore of the Chesapeake Bay than the Eastern Shore (Knisley and Hill 1999). Another comprehensive survey on the western side of the Bay is being conducted in 2001, and that survey will be more comparable to the 1998 survey because the same surveyor conducted both surveys. Preliminary results from the 2001 survey are that numbers of adults were about the same as 1998 on the western shore (C.B. Knisley, Randolph Macon College pers. comm. 2001).

Northeastern beach tiger beetles in the Chesapeake Bay and Massachusetts are currently physically and genetically isolated from each other. Vogler *et al*. (1993) examined genetic variation in these populations. They found that the isolated Martha's Vineyard population and Chesapeake Bay populations had very low genetic variability which may indicate a history of frequent natural extinctions. "The Martha's Vineyard population can be further distinguished by the presence of an allozyme allele . . . that has not been observed in the Chesapeake Bay beetles" (U.S. Fish and Wildlife Service 1994). "Thus, although populations from these two areas represent the same subspecies, they should be considered as separate conservation units (Vogler and DeSalle 1994)" (U.S. Fish and Wildlife Service 1994).

The Service funded a Population Viability Analysis (PVA) for the Chesapeake Bay populations of the tiger beetle. The purpose of the PVA was to compare management strategies, not to estimate extinction probabilities, *per se* (Gowan and Knisley 2001). The PVA divided populations throughout the Bay into Geographical Recovery Areas (GRA) and compared six management strategies. Without increased protection of the most important tiger beetle populations, the extinction probability within each GRA over the next century is high (Gowan and Knisley 2001). The PVA concludes that protection of 25-50 subpopulations is necessary to reduce extinction risk for the tiger beetle throughout the Bay (Gowan and Knisley 2001). The difficulty lies in selecting sites that assure adequate geographic coverage (Gowan and Knisley 2001). Populations must be large enough to be self-sustaining and must account for dispersal among populations.

Since 1996, 30 non-jeopardy biological opinions anticipating take of northeastern beach tiger beetles have been completed on the effects of shoreline stabilization activities in Virginia alone. This alteration of tiger beetle habitat shows no sign of slowing down. Furthermore, unpermitted activities may be contributing to the reduction of tiger beetle habitat in Virginia (C.B. Knisley, Randolph Macon College pers. comm. 2001).

Threats to the Species - In 1990, the Service determined a status of threatened for this beetle because of its greatly reduced range and high susceptibility to natural and human threats (Federal Register, Vol. 55, No. 152, August 7, 1990). Natural limiting factors include winter storms, beach erosion, flood tides, hurricanes (Stamatov 1972), and natural enemies. Primary natural enemies of adult tiger beetles are wolf spiders (*Arctosa littoralis*), asilid flies (C.B. Knisley, pers. comm. 1994), and birds (U.S.

Fish and Wildlife Service 1994). Larvae are probably more vulnerable to habitat disruption than adults (Knisley *et al*. 1987), and similar to other tiger beetle species, larval survivorship is low due to natural enemies and other limiting factors. "For example, only about 5% of the first instar larvae of several Arizona species reached adulthood" (Knisley 1987b). "Habitat disturbances could further reduce survivorship" (Knisley *et al*. 1987) and ". . . can eliminate suitable habitat, and when combined with natural mortality factors, could reduce populations to the point of extinction" (Knisley 1987b). The primary natural larval enemy is a small, parasitic wasp (*Methocha*) that enters the larval burrow, paralyzes the larvae with a sting, and lays an egg on the larvae. The egg hatches, and as it develops the larval wasp consumes the larval tiger beetle. Mites have also been found on larvae at Martha's Vineyard, but their effect, if any, is unknown (U.S. Fish and Wildlife Service 1994).

Anthropogenic threats to the northeastern beach tiger beetle include pollution, pesticides, high levels of recreational activity, off-road vehicular traffic, and shoreline alteration (Knisley *et al*. 1987, Knisley and Hill 1989, Knisley and Hill 1990, U.S. Fish and Wildlife Service 1994). The extirpation of the tiger beetle from most of its range has been attributed primarily to destruction and disturbance of natural beach habitat from shoreline development, beach stabilization, and high levels of recreational use (Hill and Knisley 1994b). Oil slicks and use of pesticides for mosquito control may have contributed to the decline of this species (Stamatov 1972). Most of the large northeastern beach tiger beetle populations in Maryland and many of those in Virginia are threatened by activities associated with the increasing human population and all are subject to oil spills and beach erosion (U.S. Fish and Wildlife Service 1994). Adult foraging, mating, and ovipositioning can be disrupted by human activity (Knisley *et al*. 1987). However, larvae are probably more affected because they spend most of their time at the tops of their burrows waiting for prey, and are disturbed by even the slightest activities such as vibrations, movement, and shadows (Knisley *et al*. 1987).

Knisley and Hill (1990) examined the effects of visitor use of Flag Ponds, a park in Maryland, on the tiger beetle. As human use continued to increase, no reduction in the population of adult tiger beetles was found. However, human impact appeared to result in the lack of newly emerged adults on the public beach. Larval survivorship was significantly lower on the beach area with the greatest amount of human use. Areas that were firmly stomped, to simulate increased foot traffic, resulted in a 50-100% reduction in numbers of active larvae (Knisley and Hill 1989). In addition, 25% of the burrows did not reopen within 10 days of stomping, suggesting that larvae may have been dead (Knisley and Hill 1989). Negative effects of foot traffic apparently involve compaction or disruption of burrows or direct injury to larvae. Because larvae occur in the intertidal zone, burrows can be easily compacted or dislodged by vehicles or high levels of human activity (Knisley *et al*. 1987).

Beach erosion, resulting from natural events or anthropogenic beach modifications, may also have serious effects on tiger beetles and their habitat. Erosion within the Chesapeake Bay is a natural phenomenon resulting from rising sea levels and prevailing winds. However, this process has been exacerbated by beach development activities that interfere with the natural beach dynamics.

Beach stabilization structures such as groins, jetties, rip-rap revetments, and bulkheads, which are designed to reduce erosion, may interrupt and capture sand from longshore movement and build up the beach around the structure but rob sand from the down-drift shoreline. Bulkheads and rip-rap typically result in reflection of wave energy, which ultimately removes the beach and steepens the profile. Such changes in the beach profile can take from 1-30 years. These structures also prevent the back beach from supplying sand to the forebeach, and concentrate wave energy at the ends of the bulkhead or revetment, resulting in erosion at these points (Knisley and Hill 1994).

Beach stabilization efforts also affect tiger beetles and their habitat. "Along a given length of shoreline, the first structure installed often has an adverse impact on the neighbor's shoreline (usually downstream of a longshore current), thus forcing a sequence of other shoreline modifications. Eventually, as shoreline modifications increase in number and amount of shoreline modified, the sand 'bank' is further depleted as erosion is halted and sand moves offshore into deeper channels. The long-term (50+ years) impacts of this scenario are unknown, but may eventually lead to a collapse of the natural beach habitat. . ." (Hill and Knisley 1995).

Tiger beetle larvae are not usually found at sites that have narrow, eroded beaches. At sites with large adult beetle populations, few or no larvae are found in areas with narrow beaches (1-3 m wide) (U.S. Fish and Wildlife Service 1994). Larvae seem to be limited to areas where beaches are at least 5 m wide, with some sand above the high tide zone (U.S. Fish and Wildlife Service 1994). Although larvae are more sensitive to erosion and beach impacts than adults, adults are also less abundant in these narrow sections.

Knisley (1997a) conducted three years (1994-96) of research on the effects of shoreline stabilization structures on the distribution and abundance of the tiger beetle; his findings are summarized below. A total of 24 sites (51 site sections) were surveyed for adult and larval beetles in Virginia. The sites were placed into one of the following categories: natural beach (14 sections), narrow beach (6 sections), groins (13 sections), groins/bulkheads (10 sections), and revetment (7 sections). The mean number of adults and larvae and beach width were greatest at natural beaches. The mean number of adults per 100 m (all sites, all 3 years) was 90 at natural beaches, 56 at sites with groins, 13 at narrow beaches, 13 at sites with groins/bulkheads, and 0.1 at sites with revetment. Larval densities (per 2 m transect) were 7.6 at natural beaches, 1.6 at narrow beaches and sites with groins, 1.0 at sites with groins/bulkheads, and 0 at sites with revetment. Mean fall beach width (measured from the most recent high tide to the end of the back beach) was 7.6 m at natural beaches, 3.6 m at sites with groins, 1.5 m at narrow beaches, 1.4 m at sites with groins/bulkheads, and 0.2 m at sites with revetment. "Patterns of distribution among these types of sites were similar for both adults and larvae, but clearly larvae were more selective and limited in distribution than were adults." For example, "While the difference in adult numbers was less than 2-fold between natural and groin sites, the differences for larvae were more than 4-fold. . . ." Natural beaches and those with sand deposition supported the greatest number of larval and adult tiger beetles. Bulkheads and revetments had the greatest negative impact on tiger beetles. "Even though larvae were found at some bulkhead sites and at other modified or narrow sites, they

probably have higher winter mortality than those at natural beaches. Because of a two-year life cycle, larvae are more likely to survive two falls and winters of erosion and beach narrowing when more beach width is available."

On June 3, 1994, a non-jeopardy biological opinion was issued to the Corps for Peaceful Beach Estates for the construction of a bulkhead and groins along the Chesapeake Bay, in Northampton County, Virginia. As part of the Corps' permit, a monitoring program was implemented at the project site. In 1994, the first complete survey was conducted and 2809 adults were found (Knisley 1997c). At the end of 1997, when only 2182 adults were found, Knisley concluded that the bulkhead/groin section continued to have a narrow beach with a continuing decline in adult and larval beetles. He found that the 220 m of beach south of the bulkhead/groins has experienced severe erosion since the installation of the bulkhead/groins. In the 1999 survey, Knisley and Hill (1999) found 547 adults. At Silver Beach in Northampton County, the long-term effects of the bulkhead and groins have been a dramatic decrease in numbers of tiger beetles.

On August 3, 1995, a non-jeopardy biological opinion was issued to the Corps for Habitats, L.L.C. to construct two rip-rap revetments, five groins, and four spurs along the Chesapeake Bay, in Northampton County, Virginia. As part of the Corps' permit, a monitoring program was implemented at the project site. In October 1995, Knisley conducted a pre-construction survey and determined that a moderate-sized tiger beetle population occurred at this site. After the 1995 survey, construction began. Knisley surveyed adults and larvae from 1995-2000 and concluded that the shoreline stabilization at this site did not result in a negative effect on adult or larval tiger beetle populations (Knisley 2000). These studies show that the effects of shoreline stabilization are often variable (Knisley 2000).

Beach nourishment is likely destructive to larvae and may render beach habitat unsuitable for subsequent larval recruitment and development (Knisley 1991). However, deposition of dredged material may also create habitat (Knisley 1997a). Dredged sand was placed south of Cape Charles in Northampton County, Virginia in 1987, and in 1989 there was a good population of both adult and larval tiger beetles (Knisley undated proposal). Although the addition of sand may actually maintain the habitat in the long term, it is likely that its immediate effects would result in larval mortality through crushing, smothering, or inability to dig out and resume normal activities (U.S. Fish and Wildlife Service 1994). Sand deposition could also have indirect negative effects on food (amphipod) availability (U.S. Fish and Wildlife Service 1994). The short- and long-term effects of beach nourishment on larvae need to be investigated. Since larvae seem to be very specific in their microhabitat distribution, sand particle size or other physical aspects of the microhabitat (*e.g.*, slope, profile), may be critical (U.S. Fish and Wildlife Service 1994).

Recovery Goals and Accomplishments - Recovery for the tiger beetle will depend to a large extent on re-establishing the subspecies across its former range along the Atlantic Coast and protecting it within the Chesapeake Bay (U.S. Fish and Wildlife Service 1994). The best approach for achieving this is

through landscape-scale conservation. The Service's recovery plan for this species defines several Geographic Recovery Areas (GRA) for conserving the northeastern beach tiger beetle and its ecosystem, providing a framework within which protection and population establishment efforts can be ranked and implemented (U.S. Fish and Wildlife Service 1994). Recovery will depend on maintaining the ecological integrity of essential tiger beetle habitat within each GRA, in order to achieve the population levels and structure needed for this species. Nine GRAs have been identified, four along the Atlantic Coast (Coastal Massachusetts and Islands; Rhode Island, Block Island, Long Island Sound; Long Island; Sandy Hook to Little Egg Inlet, New Jersey), two in Maryland (Calvert County, Tangier Sound), and three in Virginia (eastern shore of Chesapeake Bay, western shore of Chesapeake Bay north of the Rappahannock River, western shore of Chesapeake Bay south of the Rappahannock River). Full recovery will require the establishment of populations in each of the four Atlantic Coast GRAs as well as protection of existing populations in each of the five Bay GRAs (U.S. Fish and Wildlife Service 1994). Delisting will be considered when (U.S. Fish and Wildlife Service 1994):

1. At least three populations within each of the four Atlantic Coast GRAs have been established (defined at self-maintaining for at least five years, with no foreseeable threats) and permanently protected (defined as long-range protection from present and foreseeable anthropogenic and natural events that may interfere with their survival, and adequate protection measures including land acquisition, conservation agreements and/or easements, and management measures to protect the species' habitat that includes accounting for off-site impacts such as littoral sand drift).

2. Within the Chesapeake Bay, at least 26 populations are permanently protected at extant sites distributed among the five Bay GRAs as follows: Calvert County, Maryland (4 largest populations; Tangier Sound, Maryland (2 large [≥ 500 adults] populations); Eastern Shore of Chesapeake Bay, Virginia (4 large populations, 4 others); Western shore of Chesapeake Bay north of the Rappahannock River, Virginia (3 large populations, 3 others); and Western shore of Bay south of the Rappahannock River, Virginia (3 large populations, 3 others).

3. Life history parameters, human impacts, and factors causing decline are understood well enough to provide needed protection and management.

4. There exists an established, long-term management program in all states where the species occurs or is reintroduced.

For the most part, the four delisting goals have not been met. There is one protected population (Westport) in one of the Atlantic Coast GRAs, however recreational and foot traffic occurs at this site, and the population is dwindling (S. von Oettingen, U.S. Fish and Wildlife Service, pers. comm. 2001). In addition, this site does not meet the definition of "established" in the recovery plan since it has not been documented as self-maintaining for five years and there are foreseeable threats from recreational activities. Similarly, in Virginia several sites (Virginia–Bethel Beach, Hughlett Point, New Point

Comfort, a portion of Savage Neck, Parkers Marsh, and Trower Bayshore Natural Areas; Kiptopeke State Park; Smith Point North) have some form of protection, but not all have met the definitions of "established" or "permanently protected" as defined in the recovery plan. Goal three has partially been met, but goal four has not been met. Work is underway to meet goal three, but no management programs have been initiated as required for goal four.

The recovery plan (U.S. Fish and Wildlife Service 1994) identifies the following "significant Chesapeake Bay sites, based on a consistent population size of >200 *C. d. dorsalis* and/or conservation potential:" Scarborough Neck, Hyslop Marsh, Parkers Marsh (Accomack County, Virginia); Grandview Beach (City of Hampton, Virginia); Bavon, Bethel Beach, Gwynn Island, New Point Comfort, Rigby Island, Sandy Point Island, Winter Harbor (Mathews County, Virginia); Cape Charles South, Kiptopeke State Park, Picketts Harbor, Silver Beach, Savage Neck Dunes (Northampton County, Virginia); Dameron Marsh, Haynie Point, Hughlett Point, Jarvis Point, Smith Point, Vir-Mar Beach, Taskmakers Creek (Northumberland County, Virginia); Cove Point, Flag Ponds, Scientists Cliffs, Western Shores Estates (Calvert County, Maryland); and Cedar Island, Janes Island (Somerset County, Maryland).

"Because the species seems very susceptible to frequent local extirpation of populations, either from human or natural causes, preservation measures will require protection of a series of adjacent or nearby sites in a given area" (Knisley 1991). A northeastern beach tiger beetle conservation strategy was prepared for Virginia (Donoff *et al*. 1994). Initially, 15 priority conservation sites were identified (Kiptopeke State Park, Picketts Harbor, Cape Charles, and Savage Neck in Northampton County; Scarborough Neck and Hyslop Marsh in Accomack County; Sandy Point Island, Rigby Island, Bethel Beach, Bethel Beach North, Winter Harbor, and New Point Comfort/Bavon Beach in Mathews County; Smith Point and Hughlett Point in Northumberland County; Grandview Beach in the City of Hampton). However, due to the large number of tiger beetle sites in Virginia, the conservation strategy focused on 12 priority conservation sites in Mathews (Sandy Point Island, Rigby Island, Bethel Beach, Bethel Beach North, Winter Harbor, and New Point Comfort/Bavon Beach), Northampton (Kiptopeke State Park, Picketts Harbor, Cape Charles, and Savage Neck), and Accomack (Scarborough Neck and Hyslops Marsh) Counties (Donoff *et al*. 1994). The primary factors considered in developing the conservation plans were: (1) extent of occupied and potential habitat, (2) maintenance of dynamic beach strand habitat, (3) provision of buffer lands, and (4) provision for species movement corridors. "Several of the priority conservation sites are best treated as components of larger macrosites [several significant populations linked together]" (Donoff *et al*. 1994). The Bethel Beach macrosite would include Sandy Point Island, Rigby Island, Bethel Beach, Bethel Beach North, and Winter Harbor. Another macrosite includes Cape Charles, Picketts Harbor, and Kiptopeke State Park; three small sites, Elliotts Creek, Cape Charles-Old Plantation Creek, and Arlington-Old Plantation Creek, would also be included (Donoff *et al*. 1994).

Roble (1996) placed values on known tiger beetle sites in Virginia relative to each site's importance to future conservation efforts. Sites with a high site value included: Silver Beach, Savage Neck Dunes,

Cape Charles, Cape Charles-Old Plantation Creek, Picketts Harbor, Grandview Beach, Bethel Beach, Winter Harbor Creek Beach, Smith Point North, Smith Point South, Taskmakers Creek, Dameron Marsh, and Hughlett Point. Except for the Cape Charles-Old Plantation Creek site, these high value sites were also noted as significant Chesapeake Bay sites in the species recovery plan (U.S. Fish and Wildlife Service 1994). Some of these sites have some form of protection. The remainder are privately owned (Grandview Beach is owned by the City of Hampton) and are in need of additional protection (Roble 1996).

ENVIRONMENTAL BASELINE

Status of the Species Within the Action Area - In 1999, Knisley and Hill documented 7398 adult tiger beetles on the beaches at Savage Neck, making Savage Neck the largest population of tiger beetles on the Virginia Eastern Shore (Knisley and Hill 1999). The project area is on the southern end of Savage Neck, and in their report, Knisley and Hill divided Savage Neck into two sections: north and south (the northern section was larger and included the "middle" subsection). The southern section, where the applicant's property is located, had 1849 adults and 2 larval tiger beetles while the northern and middle sections had 5,549 adults and 57 larvae (Knisley and Hill 1999). The applicant has declined to have a survey performed and is willing to assume the presence of the northeastern beach tiger beetle. Since the Savage Neck population is the largest on the Virginia Eastern Shore, it is crucial to the recovery of the northeastern beach tiger beetle.

Previous studies have shown that tiger beetle populations at Savage Neck are variable. Density was estimated at 100 adults per 100 m in 1989 (Roble 1996). For comparison, the extrapolated current density based on current numbers is over 80 adults per 100 m at Savage Neck (7398 adults / 9000 m [the length of the beach at Savage Neck]). However, a 1994 survey of Savage Neck that covered 2100 m beginning just north of the action area reported only 14 adult tiger beetles in the first 400 m and a total of 369 (Roble 1994). Historically and currently, the northern end of Savage Neck appears to have more tiger beetles than the southern end.

Factors Affecting Species Habitat Within the Action Area - Beach erosion and the two unpermitted groins have affected the habitat at the project site. Figure 8 shows tree roots in the intertidal section of the beach and shows a living pine tree at the edge of the beach. These facts provide evidence that the shoreline is eroding.

There is a lot of sand of the offshore transport system in the vicinity of Savage Neck. This offshore sand contributes to the beach and is at least partially responsible for the long, wide beach throughout Savage Neck. Savage Neck provides a long section of natural shoreline without much shoreline modification.

EFFECTS OF THE ACTION

Direct Effects - Direct impacts to the tiger beetle will result from the crushing of adult beetles, and subsequent injury or death, during construction from use/placement/stockpiling of equipment and materials on the beach and foot traffic within the construction area. Construction will also result in temporary loss of habitat for adults through disruption of their daily activity patterns (*i.e*., foraging, mating, basking, egg-laying). Larval tiger beetles may be directly affected through crushing, dislodging, and entombment, resulting in death or injury, during construction by use/placement/stockpiling of equipment and materials on the beach and heavy foot traffic within the construction area. Larval beetles may also be prevented from feeding during that time due to their sensitivity to vibrations, movements, and shadows, resulting in injury and potentially death. Existing habitat for adult and larval beetles will be gained within the footprint of the groins that will be removed.

Interrelated and Interdependent Actions - An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. No activities interrelated to and interdependent with the proposed action are known at this time.

Indirect Effects - Indirect effects are defined as those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). The construction of the rip-rap revetment immediately landward of MHW will cut off the existing sand supply to the beach now occurring from the erosion of the upland bank. However, this reduction in sand supply may be offset by the supply of sand offshore. In the short term, the revetment is not expected to affect beach width. In the long term, however, the hardening of the shoreline will prevent natural shoreline migration. Furthermore, the revetment could cause an increase in reflected wave energy resulting in accelerated erosion of the beach. Of the most common shoreline stabilization methods, revetments typically lead to the greatest decline in tiger beetles (Knisley 1997a).

CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

Future maintenance of the proposed shoreline stabilization structures may not require Corps' authorization. These activities may result in injury or death to adult and larval tiger beetles through foot traffic on beach areas, use/stockpiling of equipment, and stockpiling/placement of materials. Maintenance activities may also result in temporary or permanent habitat loss. These activities may result in further impacts to the tiger beetle population at this site.

CONCLUSION

After reviewing the current status of northeastern beach tiger beetle throughout its range and in the action area, the environmental baseline for the action area, the effects of the removal of the two groins, the effects of the construction of the rip-rap revetment, and the cumulative effects, it is the Service's biological opinion that the issuance of a Department of the Army permit for this project, as proposed, is not likely to jeopardize the continued existence of the northeastern beach tiger beetle. No critical habitat has been designated for this species, therefore, none will be affected.

III. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and federal regulation pursuant to Section 4(d) of the ESA, prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns such as breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be undertaken by the Corps so that they become binding conditions of any permit issued to the applicant, as appropriate, for the exemption in action 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, the Corps or applicant must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement.

AMOUNT OR EXTENT OF TAKE

The Service anticipates incidental take of the northeastern beach tiger beetle will be difficult to quantify and detect because any beetles (adult or larvae) that are killed during project construction, stockpiling of equipment and materials, and habitat loss will be difficult to observe or locate due to their coloring, small body size, and tendency for larvae to remain beneath the surface. However, the following level of take of this species can be anticipated by areal extent of the habitat affected. The 748-foot long section

of shoreline on the applicant's property contains appropriate habitat for the northeastern beach tiger beetle. This 748-foot section contains a beach that is approximately 15 feet wide at MHW. This incidental take statement anticipates the taking of northeastern beach tiger beetles from the beach between the toe of the bank and MHW (11,220 square feet) resulting from construction activities, stockpiling of materials and equipment, habitat alteration (modifications to the beach profile, width, and distribution and amount of sand), and temporary and permanent habitat loss. Furthermore, the Service anticipates take of larval tiger beetles during the removal of the two unpermitted groins. The groins occupy approximately 200 square feet (10 feet wide by 20 feet long). Assuming that construction equipment will operate within 10 feet of each side of the groin, the total disturbed area will be 600 square feet.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of the northeastern beach tiger beetle:

- Construction activities must be conducted when adult beetles are not present.

- Human activity, materials, and equipment on the beach must be minimized to reduce the impact to adult and larval tiger beetles.

TERMS AND CONDITIONS

To be exempt from the prohibitions of Section 9 of the ESA, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are nondiscretionary.

1. No construction, earth-moving, or placement of materials or equipment will occur on the beach between June 1 and September 15 of any year. Construction may not occur until one larval survey is completed.

2. No ground disturbance or use of vehicles or heavy equipment will occur on the beach outside of the applicant's property boundaries.

3. The areal extent of beach disturbance shall be minimized. When removing the two groins, construction equipment shall not travel between the groins in the intertidal zone; they should access each groin from the beach above mean high water.

4. No refueling of equipment or vehicles will occur on the beach.

5. No use of pesticides on the beach.

6. The applicant is required to notify the Service before initiation of construction and upon completion of the project at the address given below. All additional information to be sent to the Service should be sent to the following address:

Virginia Field Office
U.S. Fish and Wildlife Service
6669 Short Lane
Gloucester, Virginia 23061
Phone (804) 693-6694
Fax (804) 693-9032

7. Pursuant to 50 CFR 402.14(i)(3), in order to monitor the impacts of incidental take, the federal agency or the applicant must report the impact of the action on the species to the Service. To meet this requirement, tiger beetle inventories (adult and larval) must be conducted. The survey area shall extend from 1000 feet south of the southern end of the rip-rap revetment to 1000 feet north of the northern end, for a total of 2,748 feet; but the survey area shall not extend past the applicant's property boundary. Surveys shall be performed by a Service-approved surveyor. A list of pre-approved tiger beetle surveyors is enclosed. You are not required to select someone from this list, but if you select someone else, you are required to send the proposed surveyor's qualifications to the Service for review at least 60 days prior to the survey. Since the anticipated impacts are not expected in the short term, surveys shall be conducted during the following years: 2003, 2005, 2007, and 2009. In addition, a pre-construction larval survey shall be conducted during October 2001.

Adult tiger beetles shall be inventoried on warm, sunny days between July 1 and July 25. The total number of adults observed on the beach will be recorded. Larval inventories shall be conducted between October 10 and 30 during low tide on cool and/or cloudy days. The number of larval burrows present within 2-meter-wide transects that extend from the edge of the water at the time of the survey to the back of the beach shall be recorded. Transects shall be separated by 50 to 100 meters, and the mean number of burrows per transect shall be calculated. An attempt to identify instar stage of larvae shall be made. The inventories shall be conducted in sufficient detail to assess the value of the beach habitat to the tiger beetle population and shall include detailed descriptions of the beach width and profile at set intervals along the entire length of shoreline. The Corps or the applicant shall submit to the Service a report documenting the surveyor and dates, methods, and results of the inventories and beach measurements within 30 days following completion of the second (larval) inventory each year. Capture and/or collection of beetles is not authorized under this requirement of the incidental take statement, except as permitted by appropriate federal and state regulatory agencies.

As part of the monitoring, photographs shall be taken to document changes to the beach over time. Photographs, at least 4 x 6 inches in size, shall be taken from five different fixed points in the action area. These photographs shall be included in the monitoring reports.

8. Care must be taken in handling any dead specimens of northeastern beach tiger beetle that are found in the project area to preserve biological material in the best possible state. In conjunction with the preservation of any dead specimens, the finder has the responsibility to ensure that evidence intrinsic to determining the cause of death of the specimen is not unnecessarily disturbed. The finding of dead specimens does not imply enforcement proceedings pursuant to the ESA. The reporting of dead specimens is required to enable the Service to determine if take is reached or exceeded and to ensure that the terms and conditions are appropriate and effective. Upon locating a dead specimen, notify the Service at the address provided.

The Service believes that a small number of individuals within an area measuring approximately 11,820 square feet (11,220 + 600 square feet) will be incidentally taken as a result of the proposed action in the short term (five years). Due to the variability in numbers of adults and larvae from year to year, it is difficult to quantify incidental take; however, the Service anticipates a small reduction in the numbers of adults and larvae using the beach zone in the short term. Long-term impacts to the tiger beetle population are more difficult to quantify but may be much more serious. While the rip-rap revetment is proposed in an area that is currently at the fringe of tiger beetle habitat, erosion and sea level rise could result in the rip-rap revetment completely removing tiger beetle habitat in the future. The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures. The Corps must immediately provide an explanation of the causes of the take, and review with the Service the need for possible modification of the reasonable and prudent measures and the terms and conditions.

IV. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to further minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

Due to the amount of shoreline stabilization/alteration taking place along the shoreline of the

Chesapeake Bay, the Service recommends that compensation for adverse impacts to and loss of northeastern beach tiger beetle habitat be undertaken. As the Corps continues to issue permits for shoreline alteration, the amount of habitat available for the continued existence of this species is decreasing. For recovery and delisting of the tiger beetle within the Chesapeake Bay of Maryland and Virginia, at least 26 populations must be permanently protected at extant sites (U.S. Fish and Wildlife Service 1994). In Virginia, 4 large (>500 adults) populations and 4 other (100 to 499 adults) populations must be protected on the Eastern Shore; 3 large populations and 3 others must be protected on the western shore of the Chesapeake Bay north of the Rappahannock River; and 3 large populations and 3 others must be protected on the western shore of the Bay south of the Rappahannock River. Presently, there are 6 large (2 protected) and 6 other (3 protected) populations on the Eastern Shore; 9 large (2 protected) and 12 (1 protected) others on the western shore north of the Rappahannock; and 6 large (2 protected) and 6 (1 protected) others on the western shore south of the Rappahannock.

The Service is concerned that in the future, projects proposed in areas critical to the continued existence of the tiger beetle may result in jeopardy to the species. Therefore, the Service recommends that the Corps require compensation for this project. Since this site supports more than 500 adult beetles, it should be compensated at a ratio of 3:1. That is, 2244 linear feet of shoreline with an appropriate upland buffer should be permanently protected via a permanent conservation easement. The Service will be glad to work with the Corps and the applicant to locate and preserve such an area.

For the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

V. REINITIATION NOTICE

This concludes formal consultation on the action(s) outlined in the request. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

The Service appreciates this opportunity to work with the Corps in fulfilling our mutual responsibilities

under the ESA. If you have any questions, please contact Mr. Eric Davis at (804) 693-6694, extension 104.

Sincerely,

Karen L. Mayne
Supervisor
Virginia Field Office

Enclosures

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