

A Wetlands Park Conceptual Plan

for
The Town of Cape Charles and Northampton County's
Sustainable Technologies Industrial Park

September 30, 1995



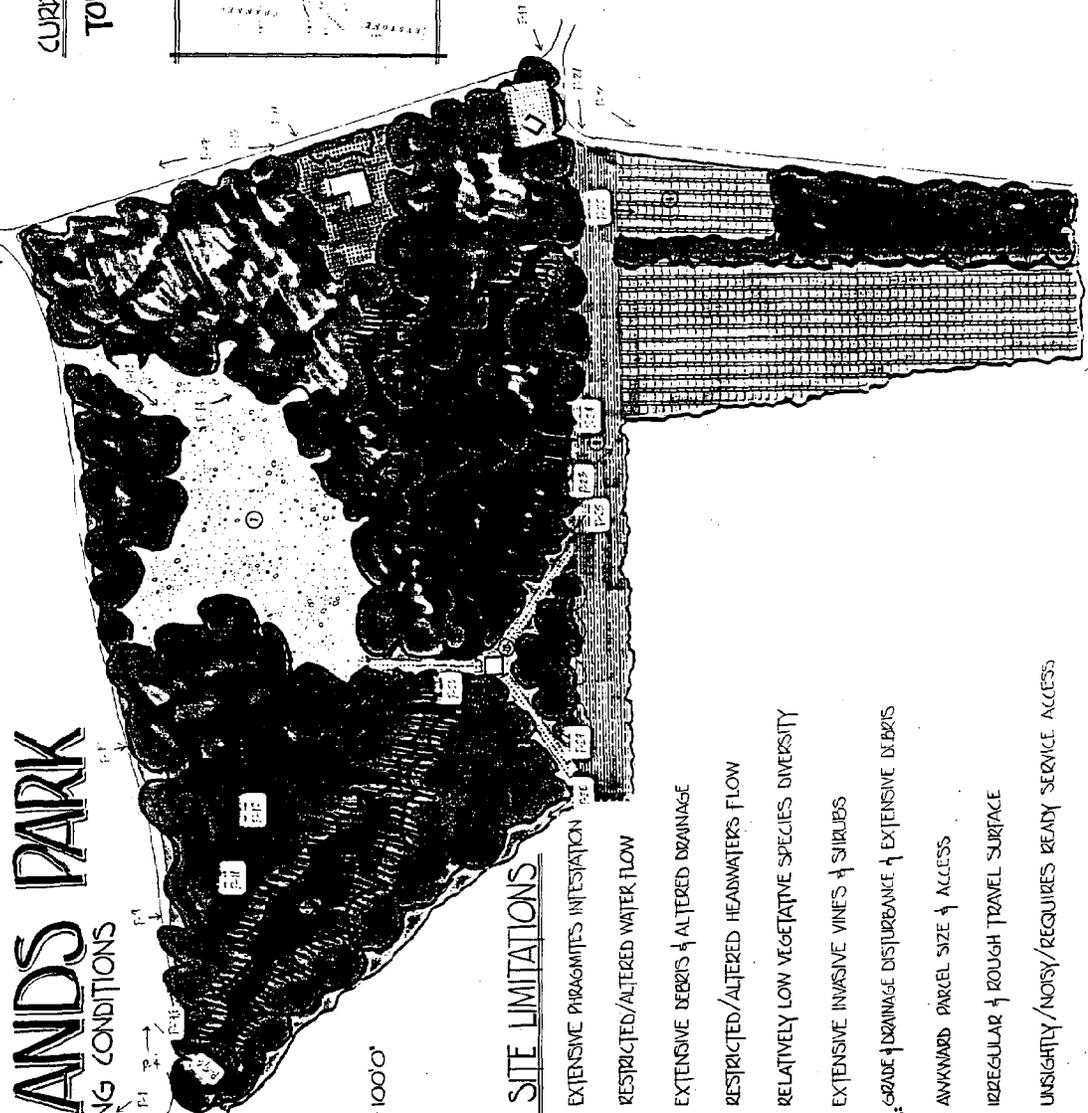
This plan was funded, in part, by the Department of Environmental Quality's **Coastal Resources Management Program** through Grant # NA47OZ0287-01 of the **National Oceanic and Atmospheric Administration**, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act of 1972, as amended. The views expressed herein are those of the authors and do not necessarily reflect the views of NOAA or any of its subagencies.

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NORTHAMPTON COUNTY
THE TOWN OF CAPE CHARLES

WETLANDS PARK

EXISTING CONDITIONS



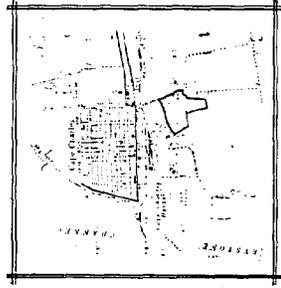
SCALE: 1" = 1000'

PROBLEMS & SITE LIMITATIONS

- ① WETLANDS : EXTENSIVE PARASITIC INFESTATION
- ② WETLANDS : RESTRICTED/ALTERED WATER FLOW
- ③ WETLANDS : EXTENSIVE DEBRIS & ALTERED DRAINAGE
- ④ WETLANDS : RESTRICTED/ALTERED HEADWATERS FLOW
- ⑤ FORESTS : RELATIVELY LOW VEGETATIVE SPECIES DIVERSITY
- ⑥ FORESTS : EXTENSIVE INVASIVE VINES & SHRUBS
- ⑦ OPEN/DISTURBED LANDS : GRADE DRAINAGE DISTURBANCE & EXTENSIVE DEBRIS
- ⑧ CROPLAND : ANKWARD PARCEL SIZE & ACCESS
- ⑨ GRASSLAND : IRREGULAR & ROUGH TRAVEL SURFACE
- ⑩ RADIO TOWER STRUCTURE : UNSIGHTLY/NOISY/REQUIRES READY SERVICE ACCESS

CURRENT LAND OWNERSHIP

TOWN OF CAPE CHARLES



VICINITY MAP

DELMARVA

BROWN & ROOT

CURRENT LAND USE

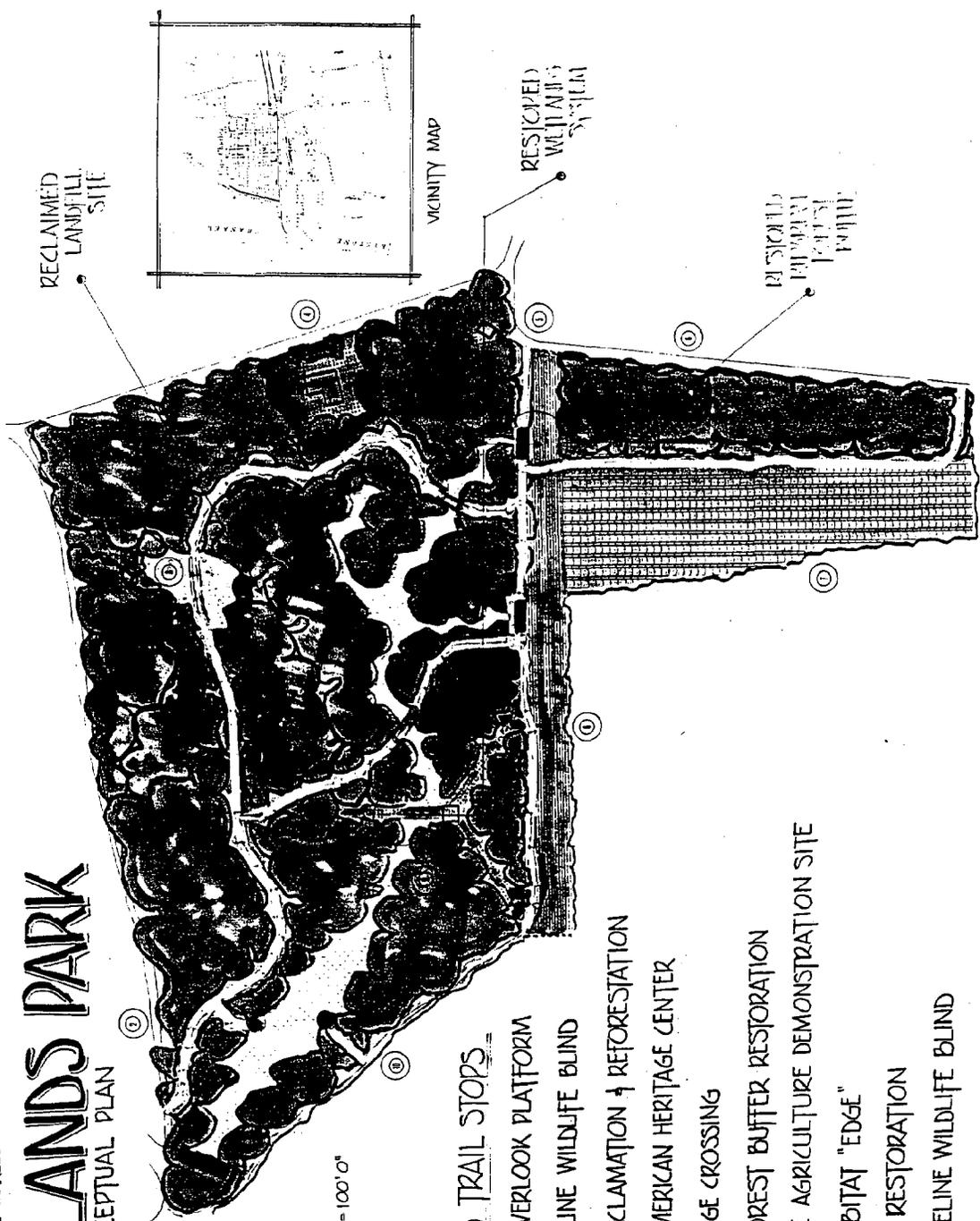
- ① FOREST/WOODLAND 7.0 ACRES
 - ② WETLANDS 3.2 ACRES
 - ③ OPEN/DISTURBED 4.6 ACRES
 - ④ OUT-PARCELS TO BE ACQUIRED/NEGOTIATED
 - ⑤ ROBERECHT (OLD SCHOOL PROPERTY) 2.4 ACRES
 - ⑥ THIBODEAUX (TELEPHONE SWITCHING BLDG) .4 ACRES
 - ⑦ SINCLAIR (RADIO ANTENNA) 1.5 ACRES
 - ⑧ GRASSLAND RIGHT-OF-WAY 2.6 ACRES
 - ⑨ FOREST/WOODLAND 1.4 ACRES
 - ⑩ WETLAND (STREAM BED) .3 ACRES
 - ⑪ CROPLAND (TRACT 2160) 6.6 ACRES
- TOTAL: APPROX 30.0 ACRES

NORTHAMPTON COUNTY
THE TOWN OF CAPE CHARLES

WETLANDS PARK

CONCEPTUAL PLAN

SCALE: 1" = 100' 0"



PROPOSED TRAIL STOPS

- ① WETLANDS OVERLOOK PLATFORM
- ② EAST SHORELINE WILDLIFE BLIND
- ③ LANDFILL RECLAMATION + REFORESTATION
- ④ AFRICAN - AMERICAN HERITAGE CENTER
- ⑤ SWAMP BRIDGE CROSSING
- ⑥ RIPARIAN FOREST BUFFER RESTORATION
- ⑦ SUSTAINABLE AGRICULTURE DEMONSTRATION SITE
- ⑧ WILDLIFE HABITAT "EDGE"
- ⑨ WETLANDS RESTORATION
- ⑩ WEST SHORELINE WILDLIFE BLIND

RECLAIMED LANDFILL SITE

VICINITY MAP

RESTORED WETLANDS

RESTORED RIPARIAN FOREST BUFFER

PROPOSED LAND USE

- FOREST/WOODLAND 13.1 ACRES
- WETLANDS 3.2 ACRES
- MEADOW .9 ACRES

OUT PARCELS

- ROBBERSCHIT (BUILDING + GROUNDS) 2.8 ACRES
- THEBODEAUX (STRUCTURE REMAINS)
- SINCLAIR (RADIO ANTENNA) 1.5 ACRES

- GRASSLAND 2.6 ACRES

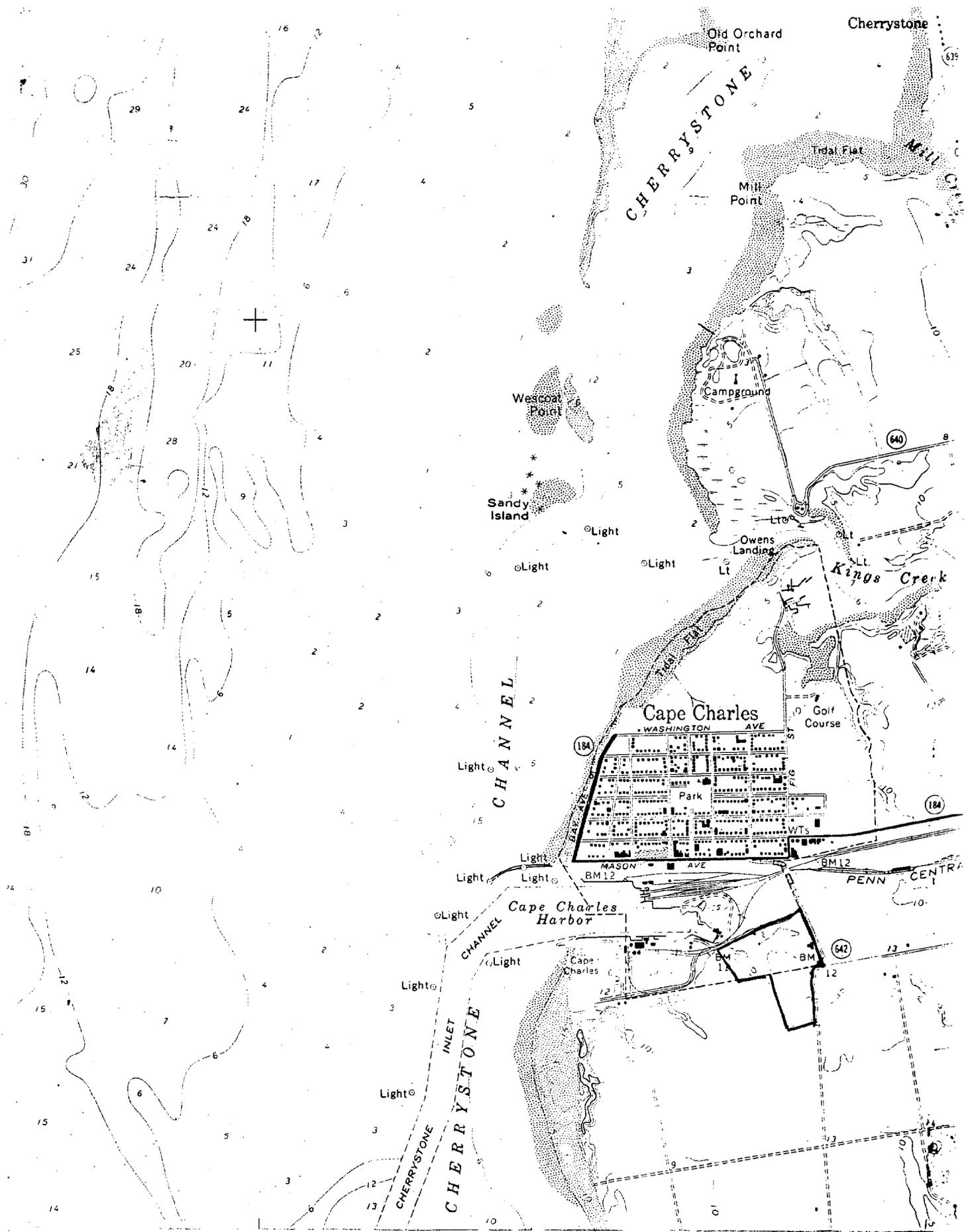
- FOREST/WOODLAND (IN TOTAL)
- WETLAND (STREAM RESTORED) .3 ACRES
- CROPLAND 5.6 ACRES

TOTAL : APPROX 30.0 ACRES

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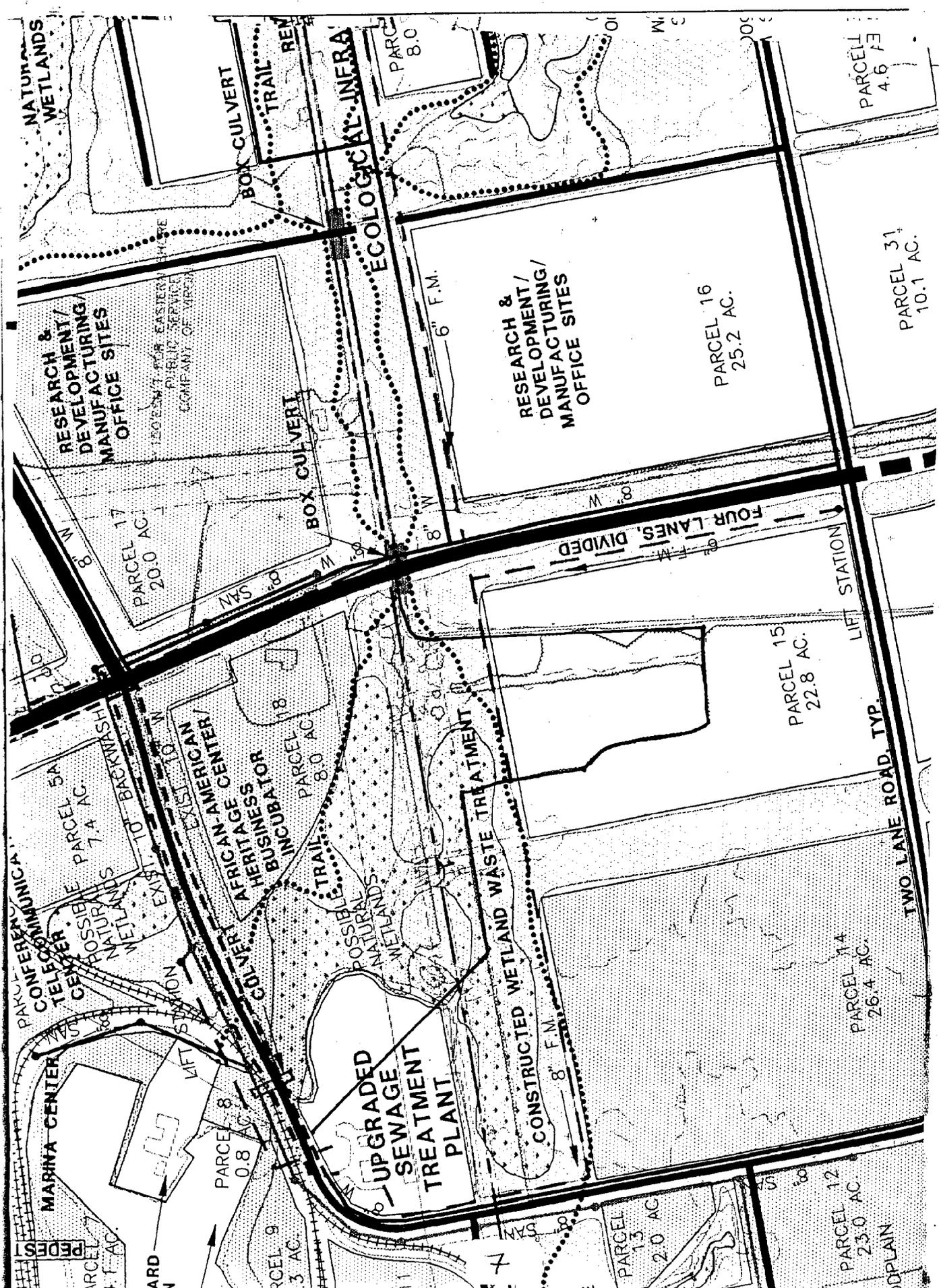
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5





NATURAL WETLANDS

RESEARCH & DEVELOPMENT / MANUFACTURING / OFFICE SITES

PARCEL 17
20.0 AC

ECOLOGICAL INFRA

PARCEL 8
8.0 AC

RESEARCH & DEVELOPMENT / MANUFACTURING / OFFICE SITES

PARCEL 16
25.2 AC

PARCEL 31
10.1 AC

PARCEL 15
22.8 AC

PARCEL 14
26.4 AC

PARCEL 12
23.0 AC

UPGRADED SEWAGE TREATMENT PLANT

CONSTRUCTED WETLAND WASTE TREATMENT

LIFT STATION

FOUR LANES, DIVIDED

TWO LANE ROAD, TYP.

PARCEL 10
7.4 AC

PARCEL 11
8.0 AC

PARCEL 8
0.8 AC

PARCEL 9
3 AC

PARCEL 13
2.0 AC

1202 S.W. 7TH FOR EASTERN PUBLIC SERVICE COMPANY OF VIRGINIA

PARCEL 5A
7.4 AC

PARCEL 7
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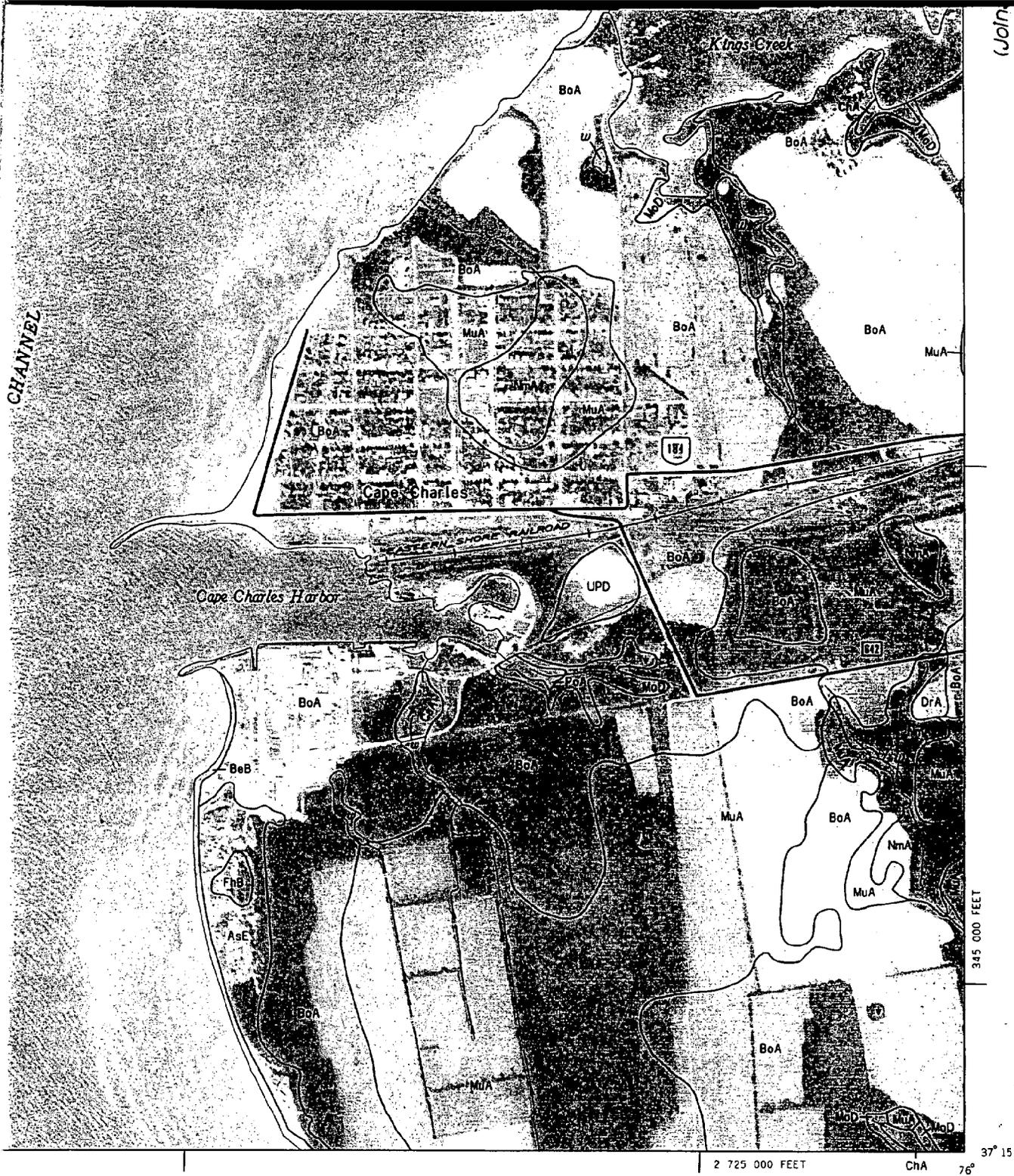
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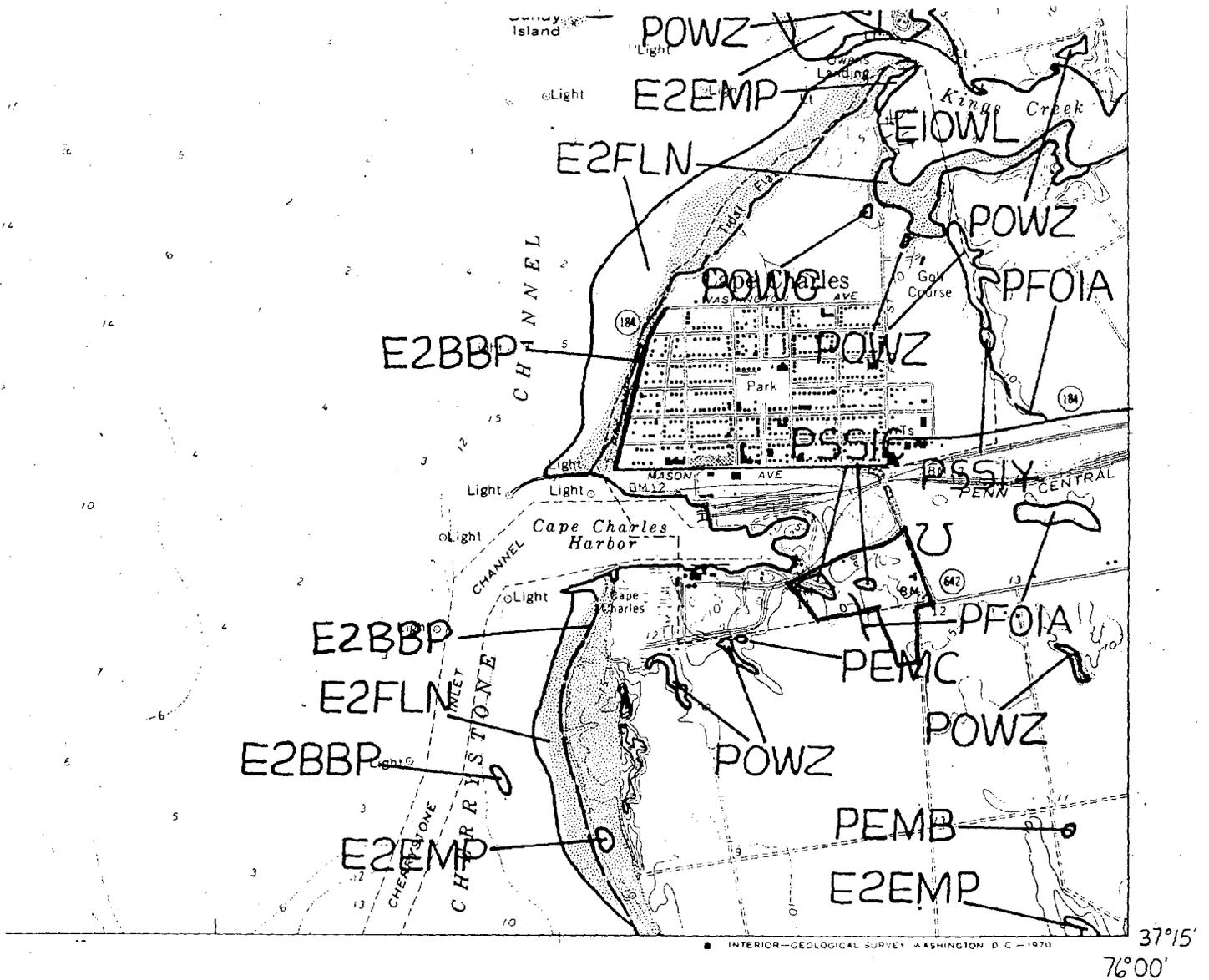
PARCEL 240
10.1 AC





Base maps are orthophotographs prepared by the U. S. Department of the Interior, Geological Survey, from 1982 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SHEET NO 13 OF 21



CAPE CHARLES, VA.

NOTES TO THE USER

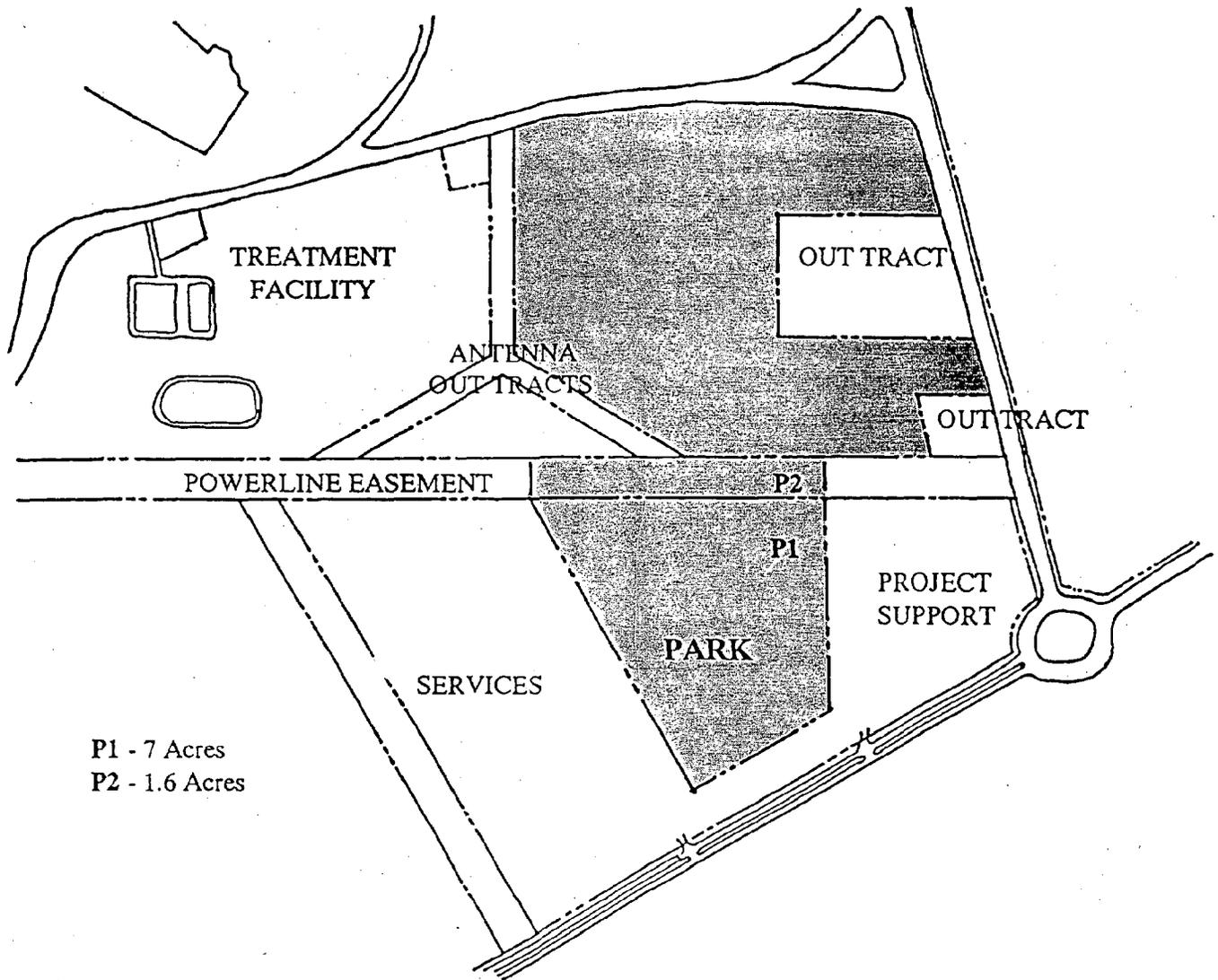
- Wetlands which have been field examined are indicated on the map by an asterisk (*).
- Dominance type (either vegetative or sedentary animal) can be added to the map by the interested user.
- Additions or corrections to the wetlands information displayed on this map are solicited. Please forward such information to the address indicated.

WATER REGIME
ANDS)

AERIAL PHOTOGRAPHY

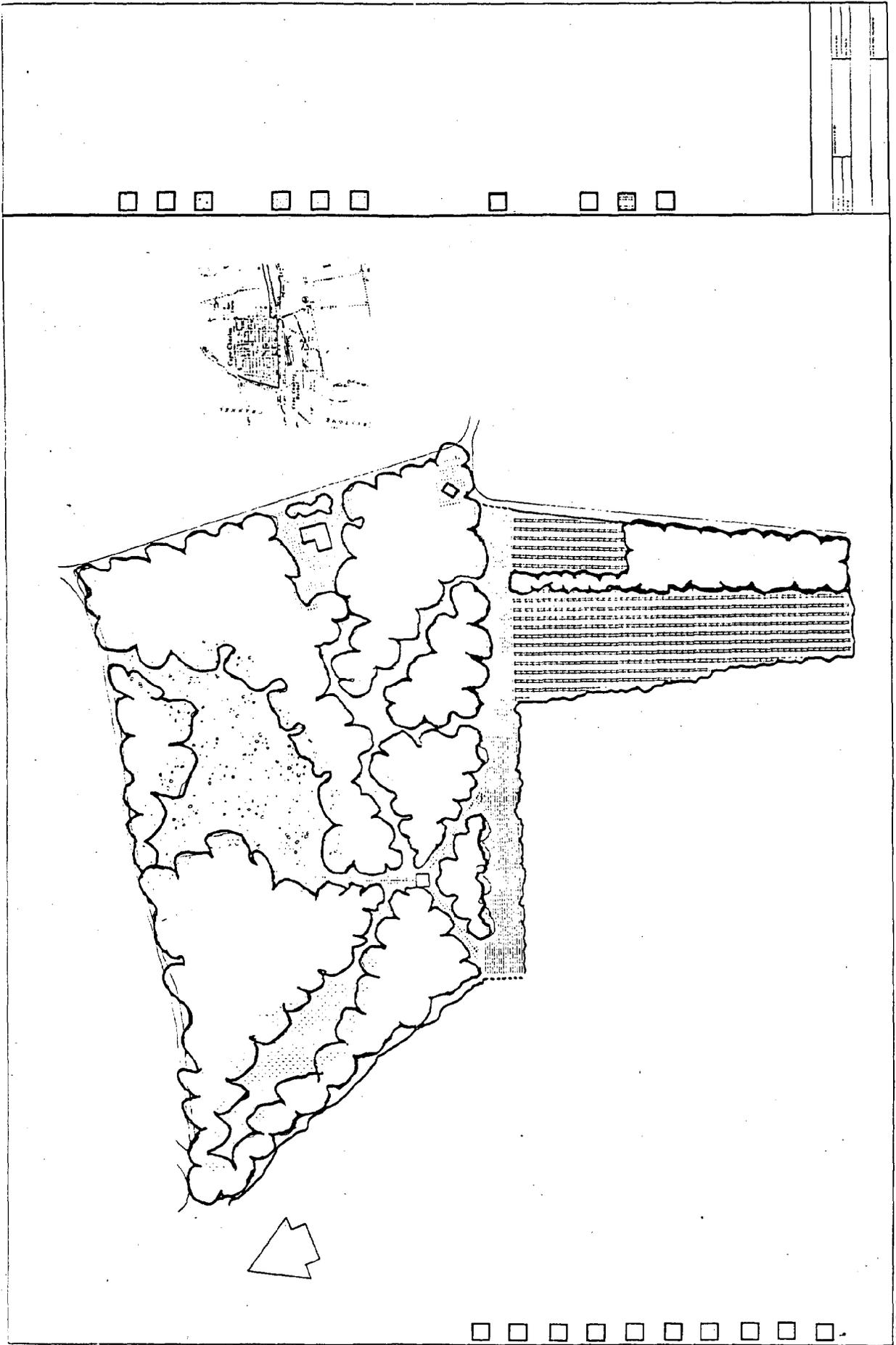


EXHIBIT C



P1 - 7 Acres
P2 - 1.6 Acres

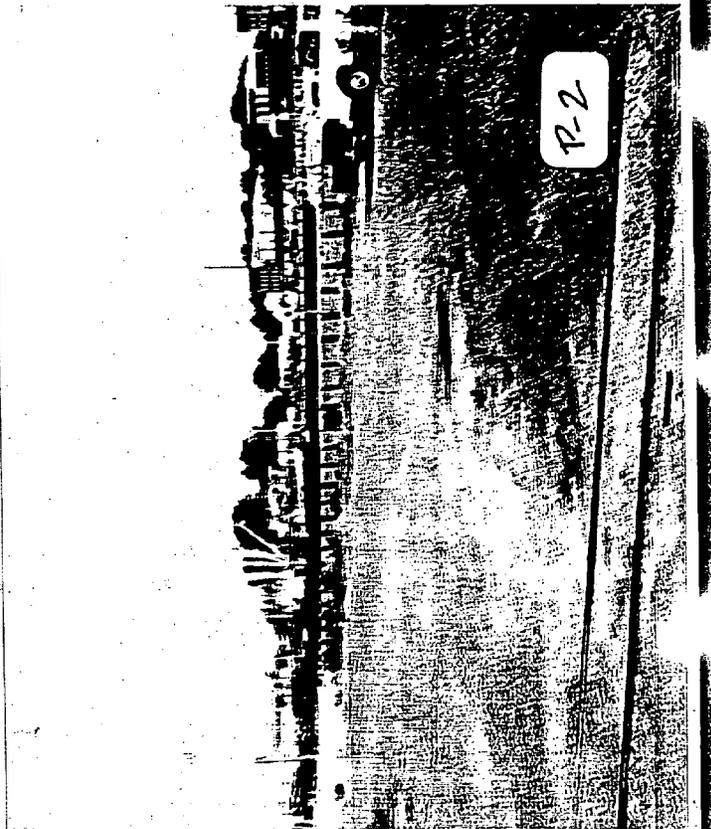
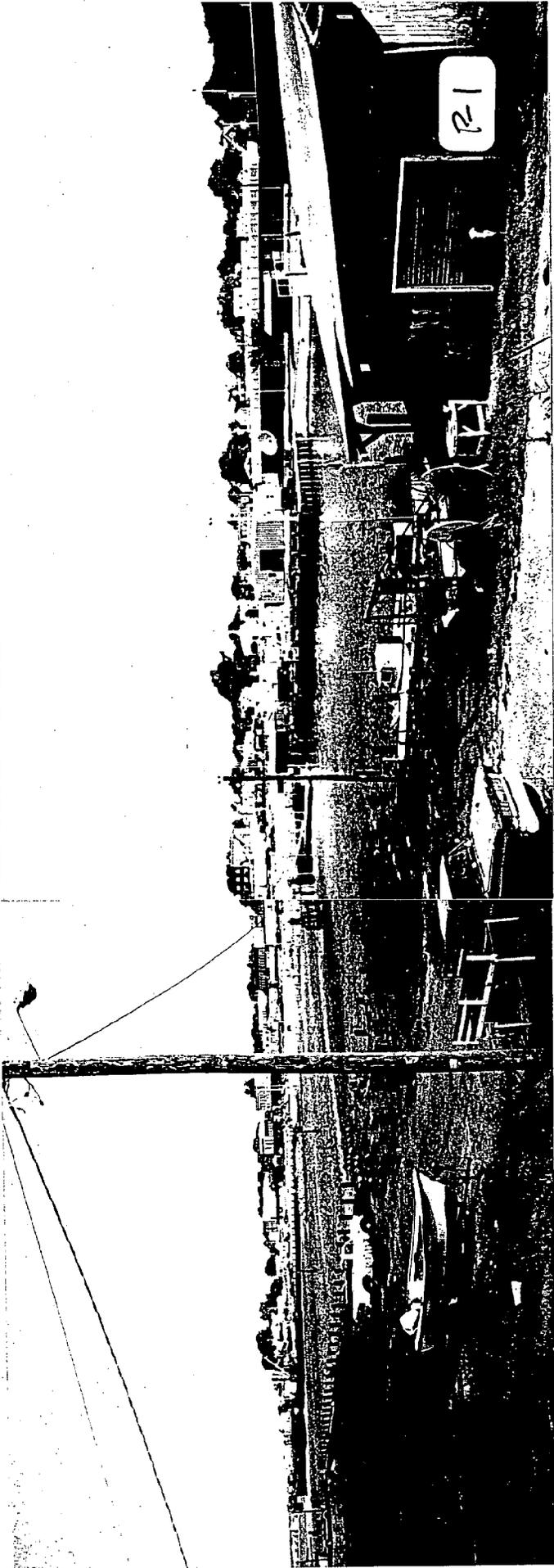
This diagram does not represent the final alignment of development lines, but is provided as a diagram to establish the relationship of the proposed wetlands park land to adjacent land uses proposed. The area enclosed in this diagram for the park is approximately 7 acres. Area contained in the power easement adjacent to the park tract, and of equal length, is an additional 1.6 acres.



PHOTOGRAPHIC SURVEY

The site inventory for the proposed Wetlands Park is presented in this photographic survey through page 38. Each photo is identified by number (example, P-1) and the numbers are keyed to the narrative description on the page below, and also to the 24'x36' site plan that accompanies this report, titled "Wetlands Park: Existing Conditions." The site plan indicates the relative position from which the photograph was taken (indicated by a similar white rectangular label) and an arrow points to the direction the camera was facing.

While the photographs can certainly provide a sense of the site conditions presently (fall 1995), referring to the 24'x36' site plan as you review the photographs and narrative can be even more illustrative. At the end of the 28 photographs, the narrative continues in the form of text, tables, and appendices.



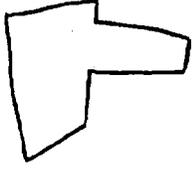


PHOTO INTERPRETATION

P-1: This photo shows the view from the northwest reaches of the large wetland pond, looking toward Cape Charles across the harbor. This view establishes the line between the proposed park and the Town, and suggests an excellent future parking area and starting point for the trail.

P-2: This more distant view reveals the road approach to the parking area. The raised concrete platform near the wharf could serve as an observation platform and trailhead. Trail users would then walk through the treed area to a safe road crossing to meet an expanded perimeter trail that passes in front of the wastewater treatment plant.

REQUIRED IMPROVEMENTS:

- ◆ Park signage, trail kiosk, parking delineation (P1, P2).
- ◆ Selective pruning of trailway through 1-acre tree buffer, and transition pedestrian rail crossing over abandoned track rails.

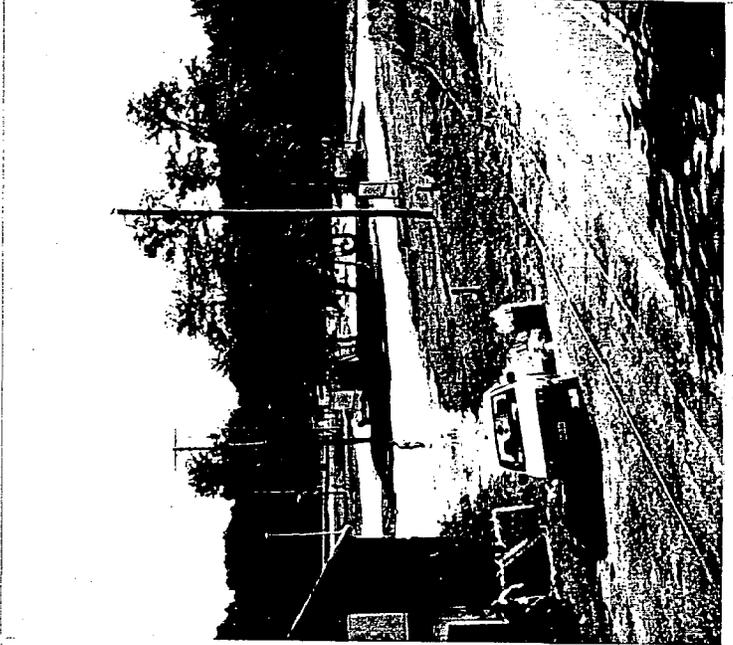
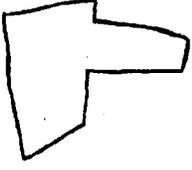


PHOTO INTERPRETATION



P-3: This photo, looking more westerly from the wetland upper pool and toward the Chesapeake Bay, reveals the safe road crossing near the distant signs, and the treed grass area in front of the wastewater treatment plant to the far left. The trail would go in both directions — continuing south toward the utility corridor, as well as east to the wetland viewing platform, where this photo was taken.

P-4: This photo completes the perimeter view, capturing the fisherman's processing plant immediately across the road from the wetland upper pool viewing platform, and eastward along the road approach from Town. This photo also reveals the fairly broad road shoulder along the portion of the road that passes the northern park edge (Route 1108). The intersection of the marina basin road and Route 1108 represents that point where visitors walking from Town would encounter the park.

REQUIRED IMPROVEMENTS:

- ◆ Park signage, roadway paint on crossing surface, pedestrian crossing sign, trail (P3).
- ◆ Park signage, paint on crossing surface, pedestrian crossing sign, trail.
- ◆ *Desirable:* remove debris, inactive storage tanks, etcetera, from fish processing building near road where pedestrians will walk.

P5



P6

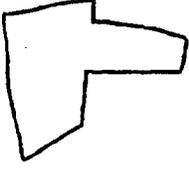


PHOTO INTERPRETATION

P-5: This view, facing southeast from the proposed viewing platform, reveals the lengthy prospect of the approximately 3-acre wetland pool flanked by forest. The extent of the infestation of phragmites is evident here, even in this photo taken at grade height (6').

P-6: This similar view is taken from a viewing height of 12', revealing what a visitor would see if viewing from a platform elevated 6' above grade. The wetland stream as it courses through the drainage is evident here.

WETLANDS CLASSIFICATION:

Palustrine, scrub-shrub wetlands, broadleaved deciduous, seasonally flooded (PSSIC). (Connected to Cape Charles harbor and Chesapeake Bay by surface flow through buried culvert.)

REQUIRED IMPROVEMENTS:

- ◆ Generally, eradication of extensive phragmites infestation throughout the visible 3-acre wetland pool, supplemental plantings on shoreline terraces of wildlife beneficial species of shrubs and small to medium trees.
- ◆ Construction and installation of a 10' X 12' treated timber, post-elevated view platform with H/C-accessible ramp and step system.
- ◆ Interpretive signage.

ENHANCEMENTS:

- ◆ Nesting boxes, wildlife observation blinds, etcetera.



P-7

P-8



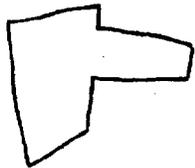


PHOTO INTERPRETATION

P-7: This view is taken from the road approximately 30' east of the viewing platform site, again looking in a southeast direction. The proximity of the phragmites invasiveness to the road is evident here. This is the view the visitor would experience after leaving the platform and walking along the roadway toward where the trail would enter the woodland.

P-8: This close-up view is of the wetland pool at flood tide, emerging from the culvert that traverses the road before ending in the harbor, under the southwest corner of fish processing building. This view is from the same location as P-7, only looking more directly downward. Again, note the density of phragmites infestation.

REQUIRED IMPROVEMENTS:

- ◆ Generally, selective pruning and removal of invasive vines. Priority phragmites eradication.
- ◆ A significant volume of debris evident in the near-road vicinity should be removed. Concurrent removal of significant large-scale debris at the other end of the culvert under the fish processing building.
- ◆ Protective rail adjacent to road to prevent slipping over culvert.

ENHANCEMENTS:

- ◆ Interpretive signage, tidal marker in clear view.

P-9



P-10



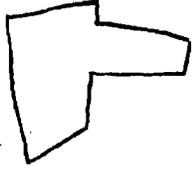


PHOTO INTERPRETATION

P-9: This photo is taken another 40' along the road, heading east, revealing now the distant break in the trees at the farthest extent of the wetland pool area. The broad expansions on both the east and west shorelines reveal excellent sites for wildlife viewing blinds at a similar pool width.

P-10: This photo shows the antenna guy wire access road for the north guy wire. While this approximately 400-foot access must be kept open for service and inspection, the entry to the road could be realigned to minimize visibility. Note the otherwise dense tree canopy and shaded understory on both sides. Somewhat out of sequence, this photo was taken about 350 feet east of the wetlands viewing platform where the access breaks the tree line. Identified invasives here include wysteria.

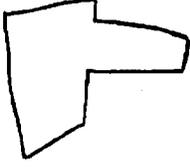
REQUIRED IMPROVEMENTS:

- ◆ Selective pruning and vegetative removal for vista gain (P-9).
- ◆ Careful re-routing of the initial 75 feet of the 250-foot access road would permit ready access, but with the benefit of significant screening for roadway site line. Visible impact of road surface could be reduced by grading for grass seed bed (P-10). Access gate and lock recommended.



PRV

PHOTO INTERPRETATION



- P-11:** This photo was taken from a point between the viewing platform and the guy wire access road, and just inside and into the forest cover. The photo reveals the lip of the wetland pool in the middle, and the woods and vegetation that characterize the "wet" portion of the tract. Note the extensive phragmites population just inside the lip where sunlight breaks through the upper canopy. Species present throughout the wetland and woodland include: red maple, black gum, swamp white oak, wild cherry, loblolly pine, American holly, sumac, sassafras, dogwood, and shadbush, as well as wetland fringe species.
- P-12:** Leaving the pool lip and moving through the woodland in an east and southeast manner, walking to the southwest corner of the landfill/disturbed area, this photo typifies much of the existing vegetation found in the margin area elevations. Clearly, this forest is a second generation woodland, having recovered from past timber removal activity throughout much of the site. Species that would provide significant understory and mid-level habitat value would include: persimmon, eastern red cedar, bayberry, hightide bush, groundsel bush, highbrush blueberry, black cherry, inkberry, winterberry, highbush cranberry, sumac, and blackhaw. Virginia DCR, Division of Natural Heritage site survey did not reveal the presence of identified rare or endangered species.

REQUIRED IMPROVEMENTS:

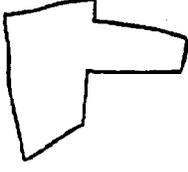
- ◆ Placement and access to constructed wildlife observation blinds is feasible only after phragmites eradication. Departing from the road shoulder and onto a stable and Handicap (H/C)-accessible trail surface will require site-specific grading and construction throughout the 8+-acre park woodlands. Selective small caliber tree removal may be unavoidable.
- ◆ Lower and medium height understory shrubs and wildlife beneficial small trees are needed to enhance these habitats for wildlife support, again, throughout the woodland areas of the park. (See species list page.)
- ◆ Interpretive signage to identify dominant or representative species.

P-13



P-14

PHOTO INTERPRETATION



P-13: This photo, taken from the existing road entrance near the northeast corner of the tract, clearly reveals the extent of the land disturbance that this portion of the tract has experienced. The site served as a dumpsite for decades; since the County landfill opened, this site has been used primarily for debris, including stone, concrete, timber, mulch, shredded bark, vegetative brush, stumps, and the like. Grading operations have pushed substrate material into perimeter bounds throughout the site, as is the case of the vegetated rubble pile in the middle-rear of this photo. The woods to the far left in this photo disguise and screen the presence of considerable extensive debris, which in many cases has been pushed into the wetland swamp drainage. Identified invasives here include multi-flora rose and tree of heaven.

P-14: This photo reveals a level of debris on site that is characteristic and typical throughout this open part of the parcel. A similar level of debris extends into the wooded area and well into the wetlands drainage.

REQUIRED IMPROVEMENTS:

- ◆ This 5 to 6+-acre disturbed landfill needs to be fully closed and reclaimed, regraded for restored flow to the wetland swamp system, tested and analyzed for leachate contamination, and resurfaced with topsoil. Extensive surface debris in and beyond the mounded perimeter berms must be removed, as should all surface debris and large metal objects beyond the open area in the wetlands swamp drainage.

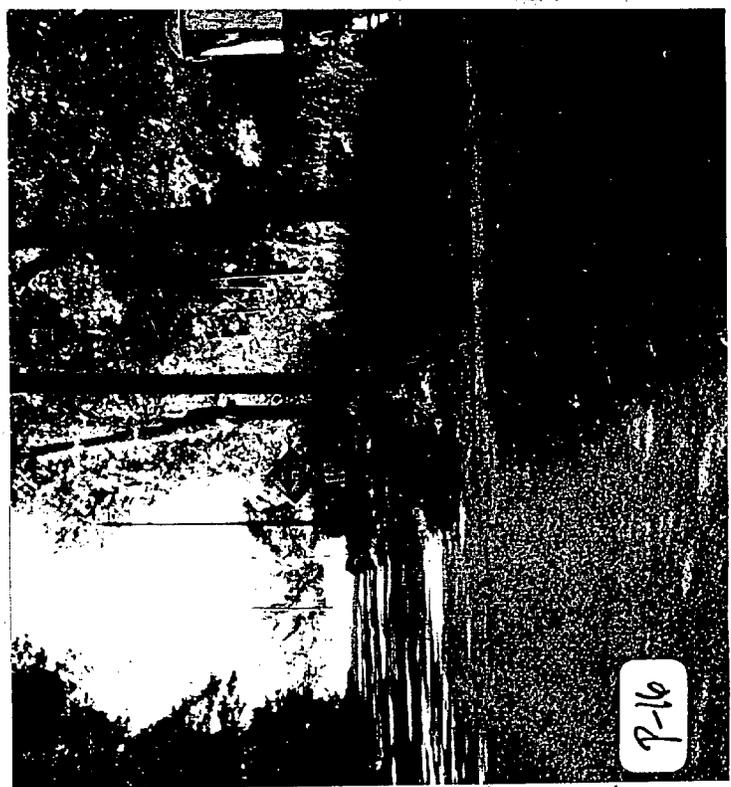
ENHANCEMENTS:

- ◆ An excellent candidate site for reforestation with wildlife beneficial species, identified with interpretive signage, perhaps with a small open meadow area. Site consideration for future Business Incubator and pedestrian trail link to African-American Heritage Center.

P-15

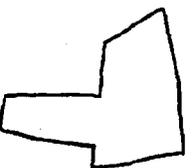


P-17



P-16

PHOTO INTERPRETATION



P-15: This photo is taken just north of Route 642's intersection with the road leading to the Coast Guard Station and Baysshore that skirts the parcel's north boundary (Route 1108). It reveals the dense woodland forest at this end of the property and suggests an ideal location for a park sign. The sign would identify the parcel and direct the visitor to either the wharf-side parking lot or to the parking area located at the African-American Heritage Center south, southeast of this point, approximately 600 feet south on Route 642.

P-16: This photo is taken at the approach to the existing north entrance to the old school, slated to become a potential interim business Incubator facility and, ultimately, the African-American Heritage Center. You can see that Route 642 turns sharply left, eastward toward its terminus at Route 184. Just to the right is the southeastern corner of the tract where a service road terminates at the Delmarva right-of-way and a farm lane continues south in the direction of Plantation Creek.

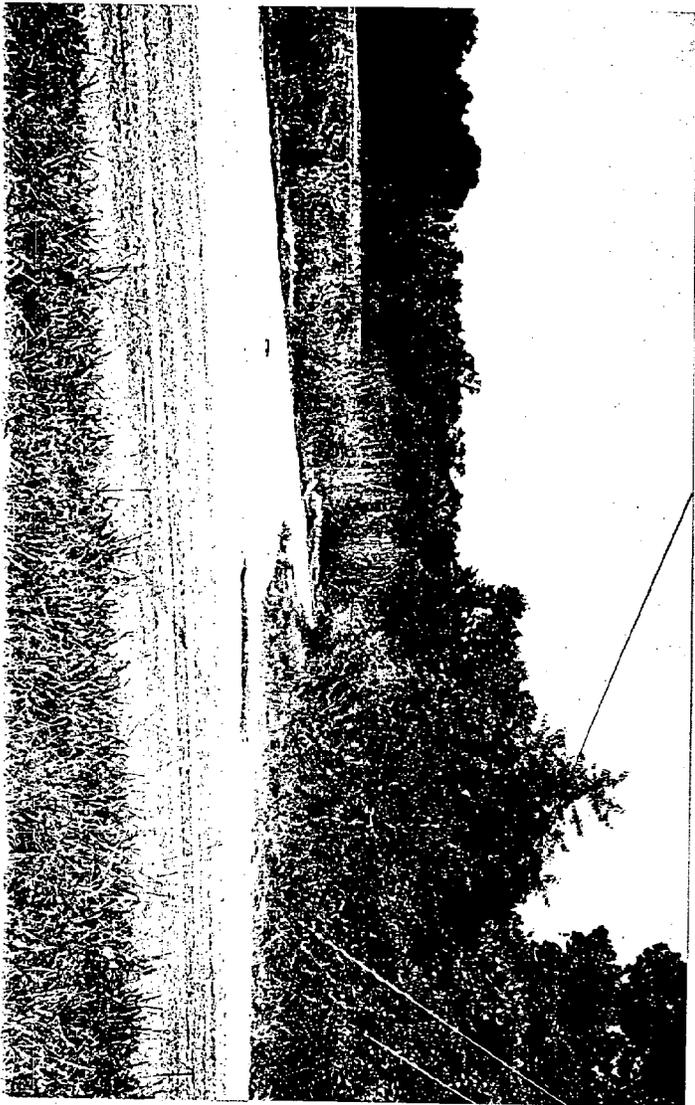
P-17: The reverse view from the location of photo P-16 looks back toward the parcel corner on the left, and up "the hump" where Route 642 crosses high above the railroad tracks. Beyond the far clump of trees on the right is an athletic field used by Town residents for ball games and active play.

REQUIRED IMPROVEMENTS:

- ◆ Primary park signage, directional and safety signage (P-15).
- ◆ Center identification signage, landscape management along roadside (P16).
- ◆ Right-hand road shoulder signage for visitors approaching from south (P17).
- ◆ Directional and identification signage to trail head.

ENHANCEMENTS:

- ◆ All aspects and perspectives in photos would benefit from the replacement of utility poles with buried cable service.

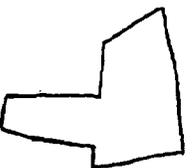


P19



P18

PHOTO INTERPRETATION

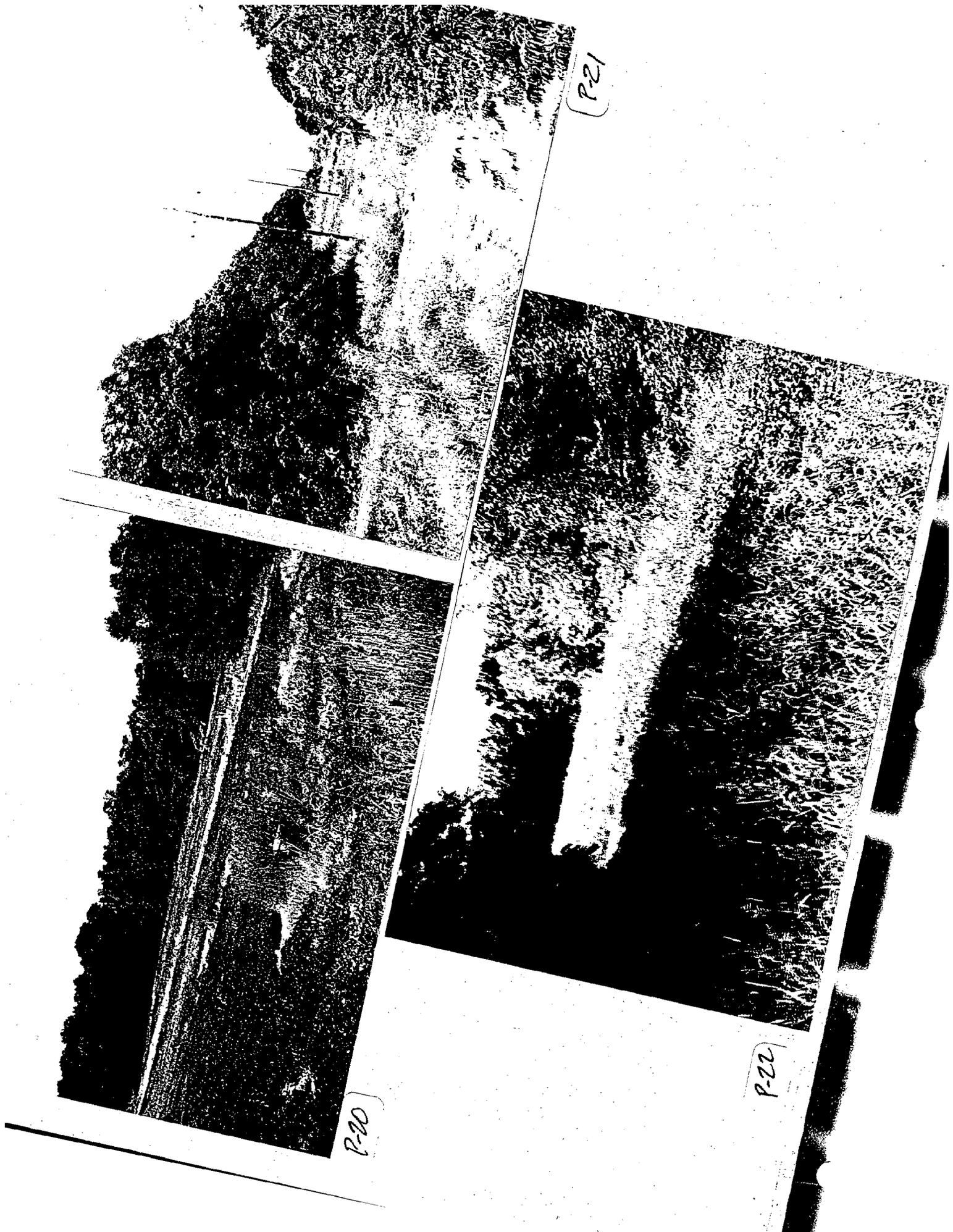


P-18: This photo is taken from the same location as P-16, but at a 12-foot elevation and with a wider lens setting. The old school, most recently used as commercial refrigeration facility, is shaded by trees planted in front of the building along Route 642. The 2.8-acre area, that in this photo is undergoing cleanup activity, has been open and abandoned for a long period of time and is cluttered with debris of every sort, including farm machinery, automobile remnants, and a previously-burned mobile home. The wooded area behind the building, beyond the reddish-brown tree stand, still evidences dump and landfill debris that has spilled into the nearby wetland swamp drainage.

P-19: This end of the property described in P-16 is the farthest southeast corner under consideration for the Park, and like the school property and the radio antenna, represents a small outparcel that must be acquired, leased, or placed under management. Again, this corner represents a viable sign location.

REQUIRED IMPROVEMENTS:

- ◆ Restore 100-foot road forest buffer along Route 642 immediately north of the driveway. Delineate parking, road circulation, connection to trail at trail head, trail link to adjacent open/disturbed area site for future business incubator.
- ◆ Extensive debris removal, including into the tree margin west of structure.
- ◆ Essential safe closure or adaptive redevelopment of structure must accompany access to this site by the public.
- ◆ Extensive landscape plantings of native species throughout the site with interpretive signage. Careful site planning could yield a unique cold winter ice-skating site in and throughout the system of wetland swamp meanders behind the Center.

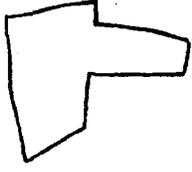


P-21

P-22

P-20

PHOTO INTERPRETATION



- P-20:** Upon turning the corner, in the distance to the left is a small 1.1-acre crop field, flanked on the south by a small forest tract and on the west by a stream drainage tree buffer. (Beyond the buffer is more cropland on the west side.) You can see the farm lane that continues south in the middle of the photo.
- P-21:** This photo is taken from the same location as P-20, only facing due west toward the Bay. This entrance to the 2.6-acre Delmarva utility corridor is slightly more narrow here, but the corridor widens quickly where the hidden crop field meets the corridor area. The crop field begins between the first two utility poles. Primarily a grassland, you can see (even at this distance) how the grass gives way to larger shrubs and small trees.
- P-22:** This view is south, looking to the end of the smaller crop field where the field meets a stand of forest. The tree to the left is a remnant from an old homestead. The tree line on the right is a buffer strip along the headwaters stream that drains into the wetland swamp and, ultimately, to the harbor and Bay.
- REQUIRED IMPROVEMENTS:**
- ◆ Irregular and undulating road surface of the 2.6+-acre utility corridor is not currently suitable for pedestrian traffic. The two primary drainages that occur between utility poles must be bridged by truck-capable structures. The first drainage that connects the headwaters stream to the wetland swamp requires that flow be restored by an adequate sized culvert and significant grading. Invasive phragmites must be eradicated (P-21).
 - ◆ A southernmost trailhead will be required at the end of the wooded area south of the smaller crop field. Extensive interpretive, directional, and safety signage.
- ENHANCEMENTS:**
- ◆ The small crop field is suitable for a demonstration reforestation site featuring native species.

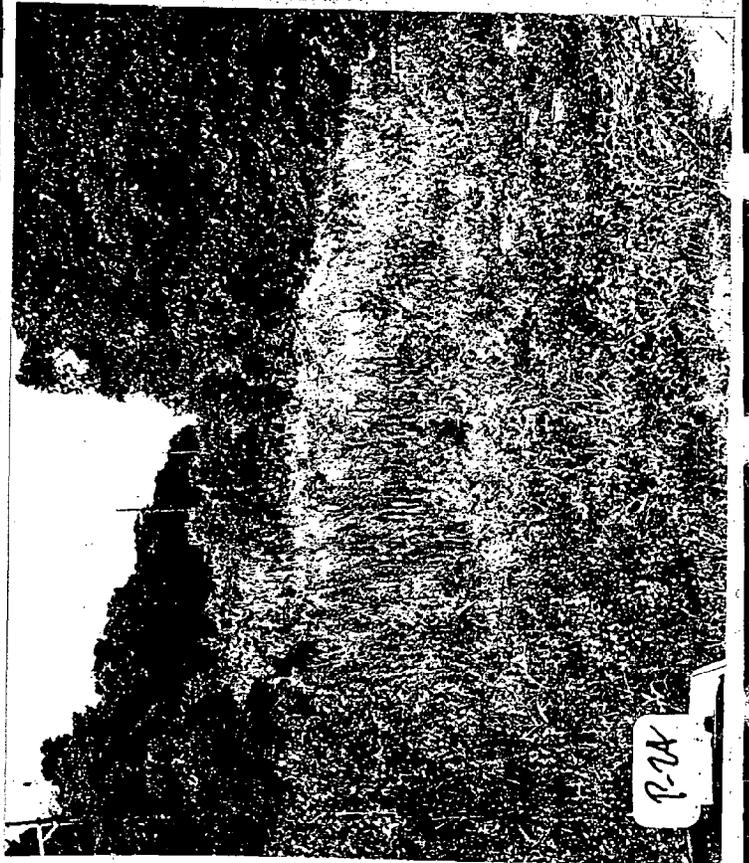
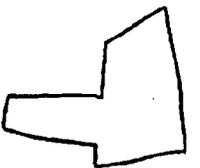


PHOTO INTERPRETATION



P-23: This photo looks back (to the east) down the utility corridor, and to the right, down the length of the 5.6-acre larger crop field. The tree line that dominates the middle of the photo is the stream buffer again, only in this view we see the east side.

P-24: Taken from the P-23 photo location, looking eastward. The larger shrubs and trees in the utility corridor can be seen here, as can changes in the elevation.

P-25: Continuing west along the 50-foot utility corridor approximately 250 feet, the southeast guy wire corridor slices through the woodland. You can see not only the tower, but the service building behind it to the left, on the south side.

REQUIRED IMPROVEMENTS:

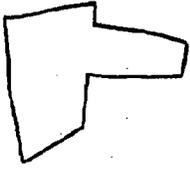
◆ Crop removal from utility corridor and grassland cover restored (P-23). Defined trail location and regraded stable surface essential for H/C accessible use on trail system through corridor (P-24). Rerouted entry for access to guy wire maintenance corridor could permit effective vegetative screening of objectionable views. Post construction debris (metal, wood) must be removed.

ENHANCEMENTS:

◆ Improved trail surface could be maintained within a larger dedicated vehicle roadbed for service or emergency access by Delmarva. Alternatively, separate trail and road surfaces system could be implemented. Medium sized transition trees and shrubs could enhance wildlife "edge" benefit on both sides of utility corridor.



PHOTO INTERPRETATION



- P-26:** This is the view due north from the tower service building. The previous north antenna corridor left this opening in the tree cover, shading the wetland swamp drainage that seeks to connect with the wetland pool, out of this picture, to the far left.
- P-27:** Approximately 300 feet farther westward along the utility corridor is located the service road to the radio tower and service building. Power service to this facility is by poles. Here, you can see the radio tower in the center of the picture, some 200 feet from the utility corridor. This view is looking back somewhat northeast from the edge of the utility corridor.
- P-28:** Looking westward from the P-27 location, the uphill grade toward the end of the parcel emphasizes the undulating terrain throughout. It is at the top of the hill that the corridor road meets the proposed new Industrial Park road and the perimeter linking trail that leads back to the wharf site.
- P-29:** Within approximately 200 feet of the tower road is the grassed berm that separates the western park from the plant's overflow lagoon and treatment plant equipment. A logical trail surface, this pathway accesses a couple of suitable locations on the western edge of the wetlands pool to locate and access wildlife observation blinds. The northwest end of this pathway returns the visitor to the wetlands overlook. (Alternatively, one can continue to follow the utility corridor as well.)
- REQUIRED IMPROVEMENTS:**
- ◆ Placement, construction, and installation of the radio tower, the 200' access road, and the guy wire corridors, and timber removal operations have contributed to the disturbance of the flow of water downstream into the tidal pool. Restoration of the flow requires grading and revegetation at this location (P-26). The service road entry should be screened from view, as well as the tower (P-27).
 - ◆ Roadbed (service) and trail system option should be continued to the intersection with the new road and perimeter trail that run adjacent to the west fence line of the wastewater treatment plant (P-28).
- ENHANCEMENTS:**
- ◆ Wetland restoration site may be suitable as a feature trail stop, with interpretive signage (P-26). Replacement of utility poles with buried cable would permit effective landscape screening here (P-27).
 - ◆ Trail identification and directional signage should be carried to the distant intersection and continue to the beach and secondary dune preserve (P-28).
 - ◆ This 800' grassed berm crown, serving as the final return leg on the trail along the western edge of the tidal pool provides good access to wildlife observation blind sites. This segment of the trail is suitable for a meandering trail, sweeping through a canopy of shade trees and shrub planted edges.



SUMMARY OF EXISTING CONDITIONS

The approximately 30-acre site under consideration for development into a Wetlands Park, and as a core element to the planned Ecological Infrastructure System for the Sustainable Technologies Industrial Park at Cape Charles, represents both a unique restoration opportunity and a significant implementation challenge.

Decades of injurious land use and neglect have taken their toll, but not to the extent that recovery and restoration should be dismissed. Virtually every urban U.S. community as old as Cape Charles contains a former landfill that needs to be reclaimed, sealed and closed or, at least, cleaned up. Few, however, can justifiably be reclaimed and put to a new and beneficial use for community residents and visitors, let alone boast a comparably rich combination of wetlands, woodlands, farmlands, and fields. Even fewer are sited in the middle or "at the crossroads" of an innovative, world-class, cutting edge experiment in sustainable technology and development, such as is the case here in historic Cape Charles in 1995.

Viable recovery for this precious land resource is entirely feasible and worthy of the effort. The effort required will prove to be sobering in scope, comprehensive and laborious in execution, and certainly rewarding to those upon whose shoulders the task will fall. It is difficult for this visitor to imagine a more compelling and satisfying community service project for the residents and citizens of Cape Charles and Northampton County.

THE PROPOSED WETLANDS PARK - A CONCEPTUAL PLAN

The plan for the new Wetlands Park as presented here is a conceptual plan. As such, the plan attempts to describe a range of activities, experiences, views, and vistas, informative exhibits, and interpretive education that this site can support and deliver. Perhaps more importantly, this plan is intended to stimulate and energize the imagination of the people of Cape Charles.

A final plan for the Wetlands Park can be developed following significant input, debate, and discussion between citizens, neighbors, senior citizens, town councilors, town staff and employees, civic leaders, and business leaders. This then is the beginning of a process to design a community asset for Cape Charles, and only a beginning.

The Plan

- ◆ *Imagine a 30-acre woodland natural area with a 2-mile-long walking trail network, open year-round for exercise, nature enjoyment, bird watching, wildlife watching, and quiet retreat.*
- ◆ *Imagine this network of trails as the crossroads, or hub, at the center of a 400-acre high-tech and innovative industrial park, with a mid-day stream of workers breaking for a shady lunch spot or a brisk walk.*
- ◆ *Imagine ice skating under the stars on a crisp, cold night through a winding, meandering stream course, in a community park, a safe 10-minute walk from the middle of Cape Charles.*

These experiences and more will greet the resident and visitor to this special place. The proposed Wetlands Park is essentially designed around three resource restoration success stories — a reclaimed landfill, a restored forest buffer along a stream, and of course, a dramatically restored wetlands system. An interconnecting set of generous and comfortable trails guide the visitor on a tour of tidal wetlands, forested wetlands, upland forests, a meadow, grasslands, a hardwood swamp, and a small-scale farm. Along the way, visitors encounter numerous educational exhibits, including tree, shrub, and vine identification, wetlands and woodland ecology lessons and exhibits, a sunny wildflower meadow with its dancing butterflies, and more. Wildlife observation blinds, elevated viewing platforms, foot bridges, nesting boxes, and bird houses add excitement and promise to the trail experience.

A new African-American Heritage Center is planned for the old school on Route 642, and nearby, a new Business Incubator facility to help newly arrived industrial park tenants and businesses — both facilities accessible by the trail network and, to limited extent, by vehicle.

Innovative, specialty small-scale sustainable agricultural practices can be observed at the mini-farm site, and the latest research in forest regeneration is to be displayed and demonstrated along the headwaters creek at the southern end of the park. Extensive edge habitats, where grasslands or crop land meet forest, provide excellent wildlife observation opportunities, particularly in early morning or late evening.

Against this backdrop of proposed landscape features, constructed physical improvements, and education exhibits, the new Wetlands Park promises to become a valued community asset for Cape Charles and Northampton County. As the first piece in the mosaic that will become the Sustainable Technologies Industrial Park, the Wetland Park signals an important step in setting the stage for the emergence of the new Port of Cape Charles.

**Table 7-8. Construction Cost Index
(Grogan, 1991)**

Year	Annual Average	Year	Annual Average
1975	2212	1984	4146
1976	2401	1985	4195
1977	2576	1986	4295
1978	2776	1987	4406
1979	3003	1988	4519
1980	3237	1989	4606
1981	3535	1990	4732
1982	3825	1991	4775
1983	4066	1992	4946

Note: *Engineering News Record (ENR)* builds the index as follows:

200 hours of common labor at the 20-city average of common labor rates, plus 25 cwt of standard structural steel shapes at the mill price, plus 22.56 cwt (1.128 tons) portland cement at the 20-city price, plus 1,088 board-feet of 2X4 lumber at the 20-city price.

Example: To compute a construction cost increase from 1985 to 1990
 (a) Divide 1990 index by 1985 index: $4732/4195 = 1.128$
 (b) Multiply 1985 cost by ratio: $1985 \text{ cost} \times 1.128 = 1990 \text{ cost}$.

a. Costs for "Low-Level" Restoration Projects

The two sources of wetland and riparian plants that should be used in restoration projects are seed and nursery-reared plant stock. Transplantation of wetland plant materials from other natural ecosystems is not recommended, but transplantation of young trees and shrubs growing in upland areas for riparian area restoration is acceptable, provided no other suitable source of plant stock is available. Transplantation of wetland plants is not recommended because digging up existing wetlands for removal of plant material can cause serious disturbance and dislocation of healthy systems. In addition, pests, disease, and contaminants can be carried along with the transplants and introduced into the area undergoing restoration. For this reason, even though it is possible to locate citations in the literature for transplantation costs, they are not included in the list below.

- (1) Costs for a 1982 tidal wetlands project in Chesapeake Bay, Maryland, included seeding and fertilizing salt marsh cordgrass at \$204.85 per acre (Earhart and Garbisch, 1983).

Cost in 1990 dollars \$253.42/acre

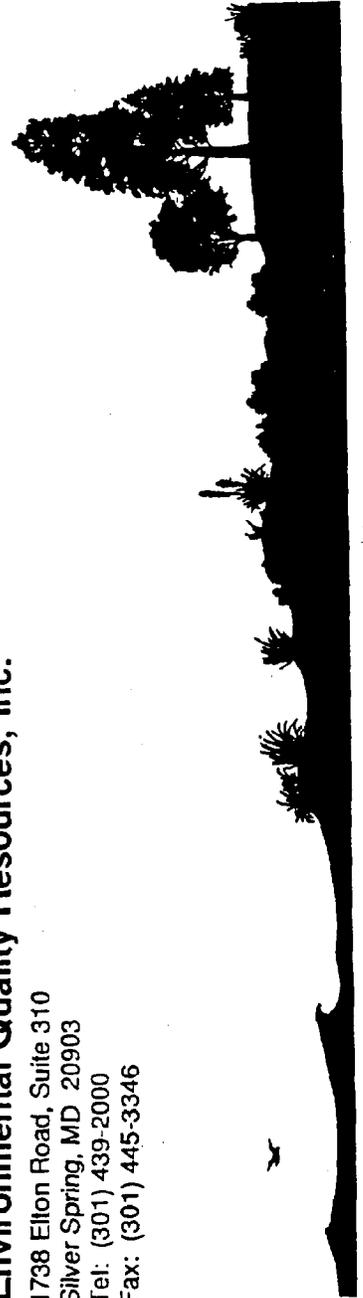
Natural Area Restoration - Cost Estimate Worksheet (1992-93)

Material Type	Description	Size	Avg. Cost Per Plant	Spacing Feet on Center	Number Per Acre	Cost per Acre	Maintenance Cost/Year/Acre	Total Cost Per Acre After 2 Years	Success Rating		
Wetland	Seeding	Dry with Sterile Straw	N/A	N/A	30lbs.	\$1,950.00	\$900.00	\$3,750.00	Poor		
		Hydroseed	N/A	N/A	30lbs.	\$3,600.00	\$500.00	\$4,600.00	Good		
		Pregermminated Hydroseed (EQR MIX)		(Includes watering)	30lbs.	\$6,300.00	\$250.00	\$6,800.00	High		
Wetland and Reforestation	Herbaceous	BR, Root, Tuber	\$2.50		2	13068	\$1,633.50	\$35,937.00	Good		
		Plugs, Pinf	\$3.00		2	13068	\$39,204.00	\$1,960.20	\$43,124.40	Good	
		Quart	\$7.00		3	6181	\$43,267.00	\$2,163.35	\$47,593.70	High	
	Woody	Seedling BR		\$2.00		8	700	\$1,400.00	\$500.00	\$2,400.00	Fair
		Whips BR		\$9.50		8	700	\$6,650.00	\$500.00	\$7,650.00	Fair
		1 gal 18"-24" Cont.		\$12.00		11	350	\$4,200.00	\$600.00	\$5,400.00	High
		2 gal 24"-30" Cont. Trees		\$19.50		11	350	\$6,825.00	\$600.00	\$8,025.00	High
		2 gal 24"-30" Cont. Shrubs		\$23.00		11	350	\$8,050.00	\$600.00	\$9,250.00	High
		1" Cal. BR Trees		\$35.00		15	200	\$7,000.00	\$800.00	\$8,600.00	Poor
		1" Cal. B&B Trees		\$45.00		15	200	\$9,000.00	\$800.00	\$10,600.00	Fair
1" Cal. Cont. Trees		\$45.00		15	200	\$9,000.00	\$800.00	\$10,600.00	High		
2" B&B Cal. Trees		\$100.00		20	100	\$9,000.00	\$800.00	\$11,600.00	Fair		
2" Cal. Cont. Trees		\$100.00		20	100	\$10,000.00	\$800.00	\$11,600.00	High		

Prices are to be used to roughly estimate costs for proposed activities. Costs include material and labor for installation. Maintenance includes, replacements, watering if required and pest management. Does not include design, engineering, permits, sediment control, grading, topsoil etc.

Environmental Quality Resources, Inc.

1738 Elton Road, Suite 310
 Silver Spring, MD 20903
 Tel: (301) 439-2000
 Fax: (301) 445-3346



RECOMMENDED PLANTINGS - SPECIES LIST

TREES (6):

1. Eastern Red Cedar, *Juniperus virginiana*
2. Loblolly Pine, *Pinus taeda*
3. American Holly, *Ilex opaca*
4. Red Maple, *Acer rubrum*
5. Sassafras, *Sassafras albidum*
6. Persimmon, *Diospyros virginiana*
7. Dogwood, *Cornus florida*
8. Bald Cypress, *Taxodium distichum*
9. Sweetgum, *Liquidambar styraciflua*
10. Shadblow, *Amelanchier canadensis*
11. Cockspur hawthorn, *Crataegus crus-galli*
12. Hackberry, *Celtis occidentalis*
13. Ironwood, *Carpinus caroliniana*
14. Black Cherry, *Prunus serotina*
15. Blackgum, *Nyssa sylvatica*

SHRUBS (7):

1. Wax Myrtle, *Myrica cerifera*
2. Inkberry Holly, *Ilex glabra*
3. High-tide Bush, *Iva frutescens*
4. Groundsel Bush, *Baccharis hamifolia*
5. Highbush Blueberry, *Vaccinium corymbosum*
6. Bayberry, *Myrica pennsylvanica*
7. Black Chokeberry, *Aronia melanocarpa*
8. Winterberry, *Ilex verticillata*
9. Swamp Azalea, *Rhododendron viscosum*
10. Sweet Pepperbush, *Clethra alnifolia*
11. Blackhaw, *Viburnum prunifolium*
12. Sumac, *Rhus copallina*
13. Snowberry, *Symphoricarpos orbiculatus*
14. Elderberry, *Sambucus canadensis*
15. Red Chokeberry, *Aronia arbutifolia*

Trees and shrubs listed above are intended to provide wildlife benefit, mid-story and understory structure, protective cover, and seasonal interest. Samplings of these plantings should be located at or near the trail for interpretive and identification signage.

PLAN IMPLEMENTATION - PRIORITIES & SEQUENCE

PROJECT PLANNING:

1. Review and Acceptance of Conceptual Plan (IDA)
2. Public Input - Review and Comment (Community)
3. Develop Final Park Plan (IDA)
4. Establish Development and Maintenance Budgets (IDA)
5. Funding Commitment and Source(s) (IDA)

PRE-CONSTRUCTION:

Land Transfer (Brown & Root Donation)
Land Acquisition (Robberecht & Thibodeaux)
Management Agreement (Sinclair)
Landfill Closure (per EPA Protocol/Criteria)
Initiate Phragmites Eradication (2-3 Yr. Schedule)
Eradicate Invasive Plants
Misc. Remaining Debris Removal (to 36" Below Surface)
Utility Lines Relocated / Poles Removed
Develop Specifications (Grading, Drainage, etc.)
Establish Contractor Performance Standards
Draft and Distribute Request for Proposals (RFP) and/or Bids
Evaluate Bids / Bid Acceptance / Contract Award

CONSTRUCTION:

Secure Site (Gate & Post) and E&S Controls
Grading Operations (per Engineering Specifications)
Construct/Install Culverts, as Required
Construct/Install Vehicle Bridges (per NPS)
Construct/Install Foot Bridges (per DCR/VSP)
Construct and Install Trail Network (per TNC)
Construct and Install Trail Handrail (per TNC)
Construct and Install All Signage (per STI Park)
Landscaping Operations (Trees, Shrubs, etc., per AAN)
Final Road Grading (On-site, per VDOT)
Inspection and Acceptance

POST-CONSTRUCTION:

Reconcile Budgets and Expenditures
Initiate Maintenance Program (per Plan)
Develop Promotional Literature/Publicity
Dedication
Open Park for Use by Community
Regional Promotion

PLAN IMPLEMENTATION - SCHEDULES

PROJECT PLANNING:

1. Review and Acceptance of Conceptual Plan (IDA)
2. Public Input - Review and Comment (Community)
3. Develop Final Park Plan (IDA)
4. Establish Development and Maintenance Budgets (IDA)
5. Funding Commitment and Source(s) (IDA)

TARGET TIME FRAME:

Fall 1995
Fall 1995
Winter 1995/96
Winter 1995/96
Winter 1995/96

PRE-CONSTRUCTION:

- Land Transfer (Brown & Root Donation)
- Land Acquisition (Robberecht & Thibodeaux)
- Management Agreement (Sinclair)
- Landfill Closure (per EPA Protocol/Criteria)
- Initiate Phragmites Eradication (2-3 Yr. Schedule)
- Eradicate Invasive Plants
- Misc. Remaining Debris Removal (to 36" Below Surface)
- Utility Lines Relocated / Poles Removed
- Develop Specifications (Grading, Drainage, etc.)
- Establish Contractor Performance Standards
- Draft and Distribute Request for Proposals (RFP) and/or Bids
- Evaluate Bids / Bid Acceptance / Contract Award

Spring 1996
Spring 1996
Spring 1996
Summer 1996 (begin)
Spring 1996 (begin)
Spring 1996
Summer 1996
Fall 1996
Fall 1996
Fall 1996
Fall 1996
Fall 1996
Fall 1996

CONSTRUCTION:

- Secure Site (Gate & Post) and E&S Controls
- Grading Operations (per Engineering Specifications)
- Construct/Install Culverts, as Required
- Construct/Install Vehicle Bridges (per NPS)
- Construct/Install Foot Bridges (per DCR/VSP)
- Construct and Install Trail Network (per TNC)
- Construct and Install Trail Handrail (per TNC)
- Construct and Install All Signage (per STI Park)
- Landscaping Operations (Trees, Shrubs, etc., per AAN)
- Final Road Grading (On-site, per VDOT)
- Inspection and Acceptance

Fall 1996
Late Fall 1996
Late Fall 1996
Late Fall 1996

POST-CONSTRUCTION:

- Reconcile Budgets and Expenditures
- Initiate Maintenance Program (per Plan)
- Develop Promotional Literature/Publicity
- Dedication
- Open Park for Use by Community
- Regional Promotion

Winter 1996/97
Winter 1996/97
Winter 1996/97
Spring 1997
Spring 1997
Spring 1997

PLAN IMPLEMENTATION - DEVELOPMENT GUIDELINES

Development of the Wetlands Park should occur in a manner that is consistent with the principles that have shaped the Sustainable Technologies Industrial Park (STIP) concept to date.

Specifically, design specifications for all STIP and Wetlands Park elements, such as directional and informational signage, must be uniform and consistent. Paint colors, fonts, sign shapes, textures, and overall geometry should serve to complement each of the development activities and sites throughout the STIP, even though they may be as distinctly different as a wetlands park trail, a newly constructed road, a tree planting in Town, or even the renovation of a building under way.

Similarly, a single standard of construction should apply to foot bridges, vehicle bridges, elevated viewing platforms, dune crossings, exhibit kiosks, etcetera. This plan proposes to emulate the standard of construction at Kiptopeke State Park to the extent possible, and envisions that standard extended to the secondary dune habitat site and the Ecological Infrastructure System.

Native species of trees, shrubs, vines, and groundcovers will be the standard for landscape plant material selection to the extent possible.

The Industrial Development Authority is to set the standards referenced above in a timely manner and within the guiding principles that arose from the Cape Charles Design Charette. It will be from those standards of performance and development-related protocol for application throughout the STIP, that final specifications may be determined and budgets and costs derived for implementing the final Park plan.

DEVELOPMENT RECOMMENDATIONS -

IMPLEMENTATION STRATEGY

There are numerous advantages to putting the development of the Wetlands Park on a "fast track": sustaining the momentum of the project pace to date, enhancing local and regional credibility for the STIP project, considerable price benefit in spending today's dollars, etcetera. It is also important that the IDA be viewed in the context of "beginning to get things under way" by citizens of both Cape Charles and the County. The Wetlands Park can deliver that signal.

But perhaps more importantly, the Wetlands Park lends itself to providing an opportunity for hands-on and instant gratification involvement by community citizens, students, and volunteers of every stripe. With the exception of land acquisition, engineering studies, herbicide applications, and heavy machinery use, there are numerous productive and important tasks that can be performed by volunteers, and that can result in significant cost reductions for development of the Wetlands Park. In fact, much of the debris cleanup requires hand work, and machines would be more destructive than beneficial.

Recommendation:

Following acceptance of the concept plan for the Wetlands Park by the Town Council and the IDA, a workshop and field day should be convened to solicit the input of the community. A brief morning presentation at Town Hall could be followed by a brisk walk to the Park site by participants. Beginning from a location behind the old school, a "walk about" through the woods along the proposed trail should proceed, with stops along the way to explain and interpret views, proposed exhibits, resources, habitats, and impacts. Throughout the walk-about, participants would be instructed to evaluate and appreciate the potential for the Wetlands Park, and to what extent they might indicate interest in making the park happen by rolling up their sleeves and getting to work. Upon returning to the old school, refreshments would be provided as well as a much needed rest. Walk-about leaders might then ask for input from participants, soliciting ideas, surfacing concerns, and asking for volunteers to assist in establishing the Park. Assuming that a few speak up in earnest support, a volunteer group could be nurtured and motivated to participate as project managers for various aspects of the proposed development.

With volunteer commitment in place, IDA representatives could actively solicit and anticipate support from both the public and private sectors to develop the Wetlands Park, and sustain critical momentum for the Sustainable Technologies Industrial Park at the same time.

Ultimately, funding for the project must be viewed as a priority if the IDA is to capitalize on the volunteer resource it will have energized into action.

LINKAGE TO THE ECOLOGICAL INFRASTRUCTURE SYSTEM

The Wetlands Park should be viewed as an important component of the planned Ecological Infrastructure System (EIS), but at the same time, its integration into the planning for the Sustainable Technologies Industrial Park strategy is critical.

Concurrent with the development of the conceptual plan for the Wetlands Park is a concerted effort to establish a secondary dune beach preserve just south of BayShore, and yet another coordinated effort has been set in motion to enhance and restore critical habitat for migratory species of birds within the forest land that surrounds the Industrial Park.

Planners and project managers from Virginia's Coastal Program, the Virginia Department of Conservation and Recreation, and The Nature Conservancy are coordinating their efforts to produce a world-class result and a model worthy of duplication elsewhere.

It follows that the Wetlands Park can serve as a crossroads or intersection for the movement of people and water and wildlife throughout the Industrial Park. In the development of the final implementation plans for the Wetlands Park, linkage to the balance of the Ecological Infrastructure System must be factored and duly accommodated at every turn.

APPENDICES

1. Range of Functions of Wetlands and Riparian Areas (EPA)
2. Outdoor Recreation Plan - Virginia's Eastern Shore: Kiosk
3. Outdoor Recreation Plan - Virginia's Eastern Shore: Wayside Exhibits, Boardwalk
4. Outdoor Recreation Plan - Virginia's Eastern Shore: Interpretive Panels, Handrail
5. Cross Section, Stabilizer Trail Surface, Construction Detail, Cedar Handrail (TNC)
6. Kiptopeke State Park, Elevated Walkway/Platform, Elevation (VA-DCR-SP)
7. Kiptopeke State Park, Elevated Walkway Plan View, Section (VA-DCR-SP)
8. Kiptopeke State Park, Elevated Walkway Handrail, Section (VA-DCR-SP)
9. Trees: The Bay's Best Friend?, American Forest, July 1995
10. Phoenix Plans Wetlands Project, CH2M Hill Article, Water World, Tulsa, OK

Table 7-2. Range of Functions of Wetlands and Riparian Areas
(adapted from National Research Council, 1991)

Function	Example
Flood conveyance	Riverine wetlands and adjacent floodplain lands often form natural floodways that convey floodwaters from upstream to downstream areas.
Protection from storm waves and erosion	Coastal wetlands and inland wetlands adjoining larger lakes and rivers reduce the impact of storm tides and waves before they reach upland areas.
Flood storage	Inland wetlands may store water during floods and slowly release it to downstream areas, lowering flood peaks.
Sediment control	Wetlands reduce flood flows and the velocity of floodwaters, reducing erosion and causing floodwaters to release sediment.
Habitat for fish and shellfish	Wetlands are important spawning and nursery areas and provide sources of nutrients for commercial and recreational fin and shellfish industries, particularly in coastal areas.
Habitat for waterfowl and other wildlife	Both coastal and inland wetlands provide essential breeding, nesting, feeding, and refuge sites for many forms of waterfowl, other birds, mammals, and reptiles.
Habitat for rare and endangered species	Almost 35 percent of all rare and endangered animal species either are located in wetland areas or are dependent on them, although wetlands constitute only about 5 percent of the coterminous United States.
Recreation	Wetlands serve as recreation sites for fishing, hunting, and observing wildlife.
Source of water supply	Wetlands are important in replacing and maintaining supplies of ground water and surface water.
Natural products	Under proper management, forested wetlands are an important source of timber, despite the physical problems of timber removal. Under selected circumstances, natural products such as timber and furs can be harvested from wetlands.
Preservation of historic, archaeological values	Some wetlands are of archaeological interest. Native American settlements were sometimes located in coastal and inland wetlands, which served as sources of fish and shellfish.
Education and research	Tidal, coastal, and inland wetlands provide educational opportunities for nature observation and scientific study.
Source of open space and contribution to aesthetic values	Both tidal and inland wetlands are areas of great diversity and beauty, and they provide open space for recreational and visual enjoyment.

BEACHES, ISLANDS, MARSHES, AND WOODLANDS

OUTDOOR RECREATION PLAN ON

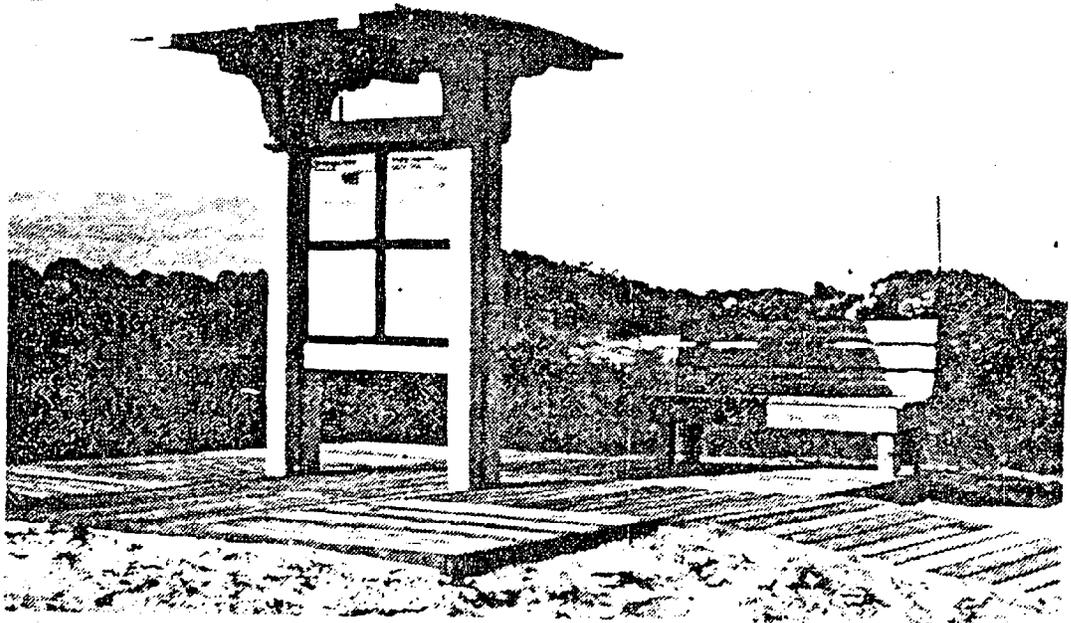
VIRGINIA'S EASTERN SHORE

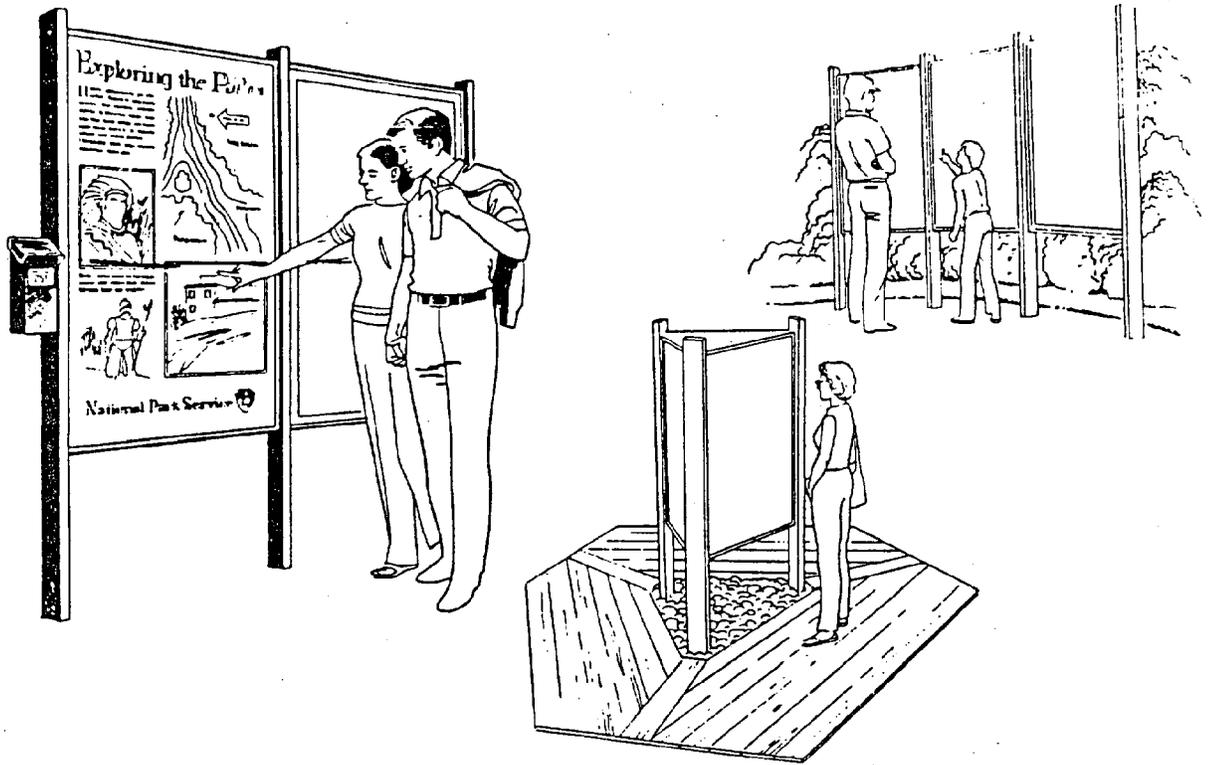
Prepared for

DEPARTMENT OF CONSERVATION AND HISTORIC RESOURCES
DIVISION OF PARKS AND RECREATION

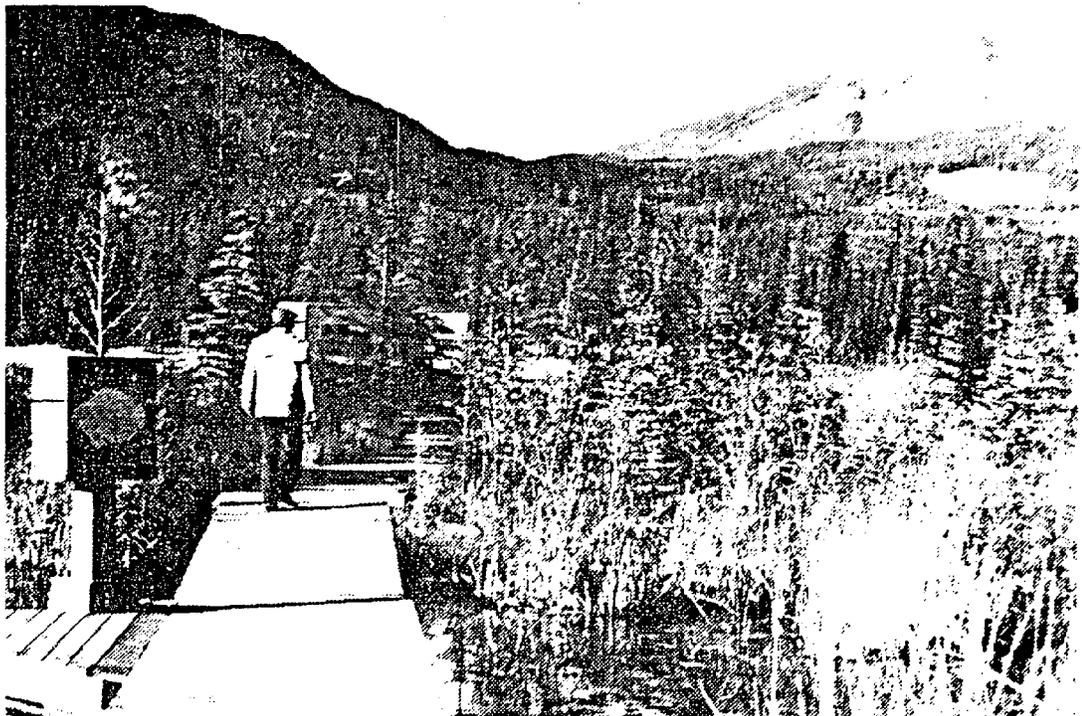
NORTHAMPTON COUNTY

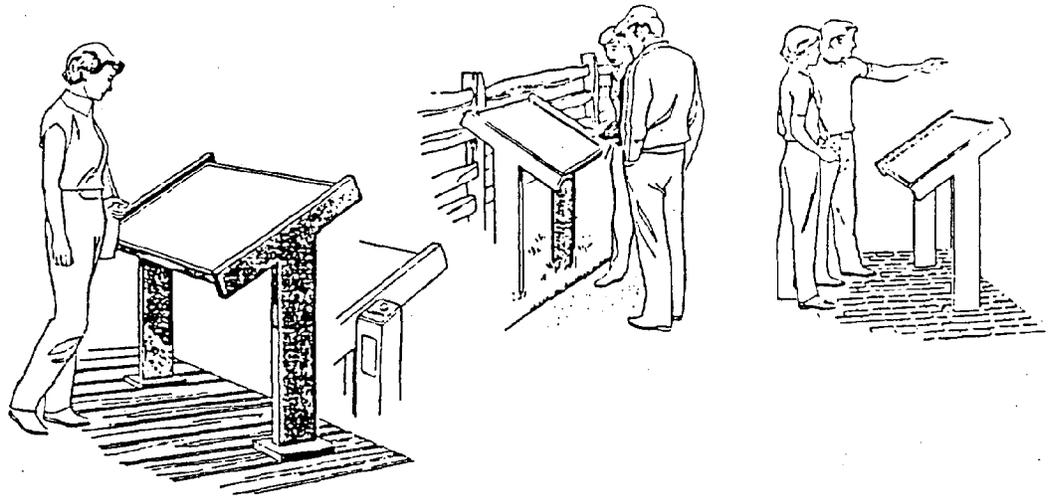
Information kiosks,
such as this one at Assateague National Seashore,
should be durable and attractively designed.



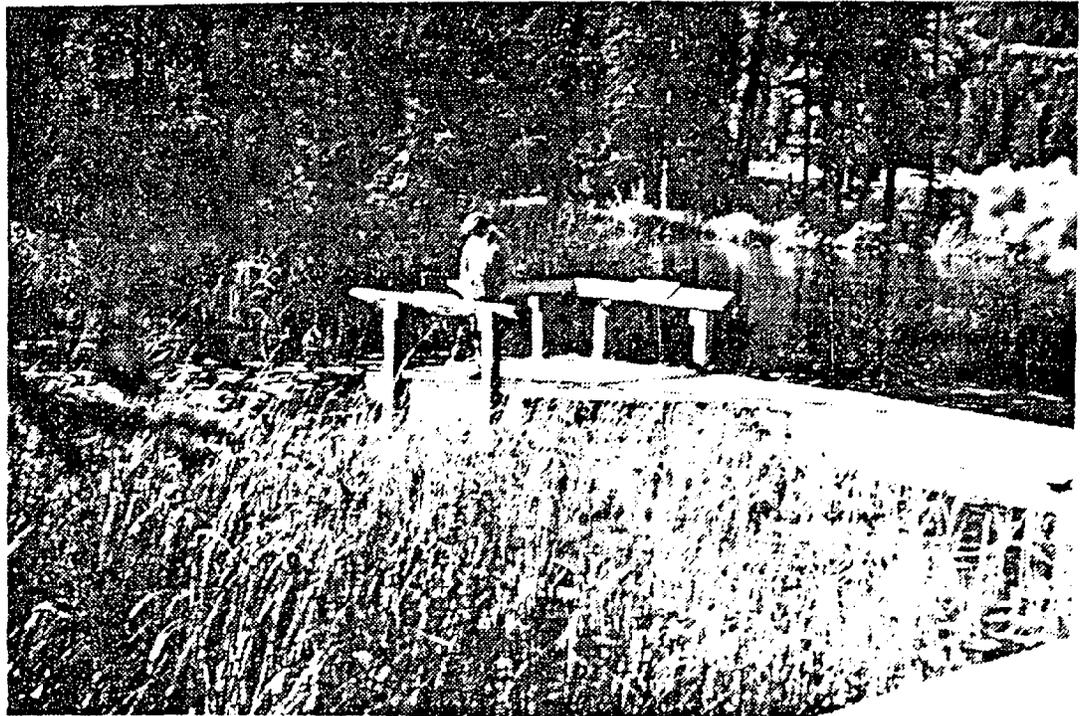


A boardwalk leads past an interpretive sign to a bird-watching blind, all harmoniously designed.

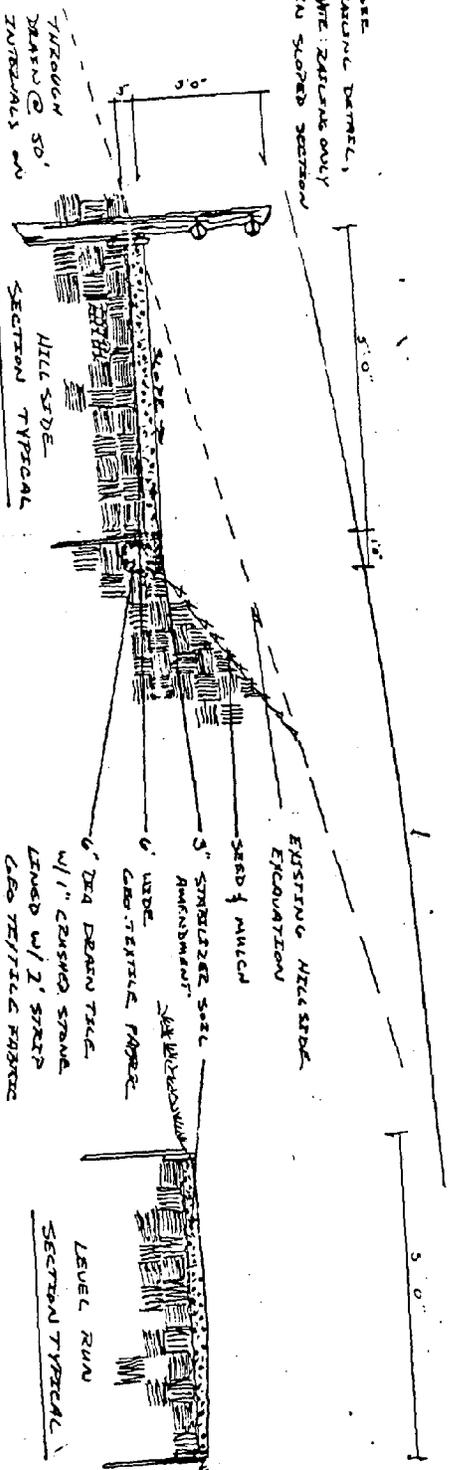




A boardwalk trail lays lightly on the landscape and provides access to interpretive panels incorporated in the handrail at this wetland.



SEE
 RAILING DETAIL,
 NOTE: RAILING ONLY
 IN SLOPED SECTION



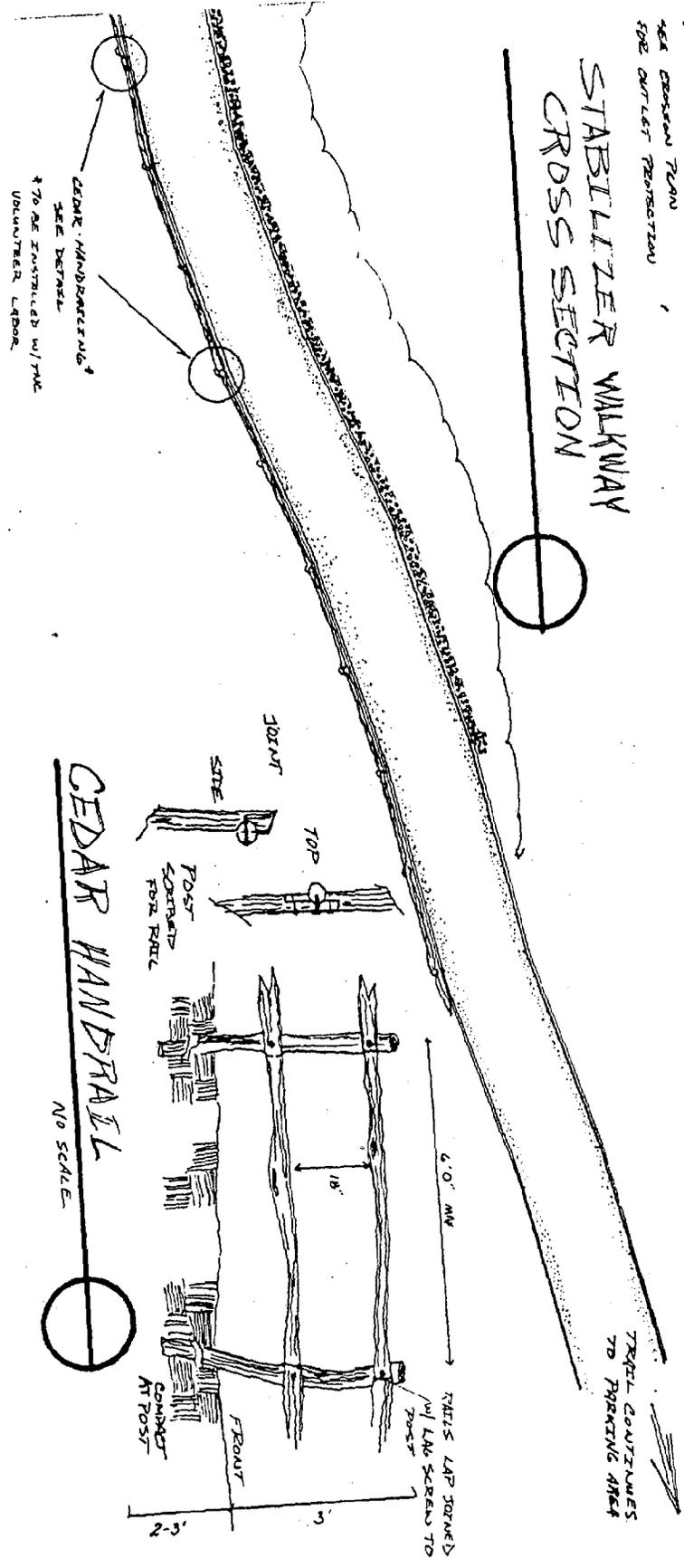
HILL SIDE
 SECTION TYPICAL

LEVEL RUN
 SECTION TYPICAL

EXCAVATE EXISTING
 SOIL & ORBLANK
 COMPACT SUB BASE
 TO 95% DENSITY

2 1/2" EXPOSURE
 NAIL TO 2 1/4" SIRE

STABILIZER WALKWAY CROSS SECTION

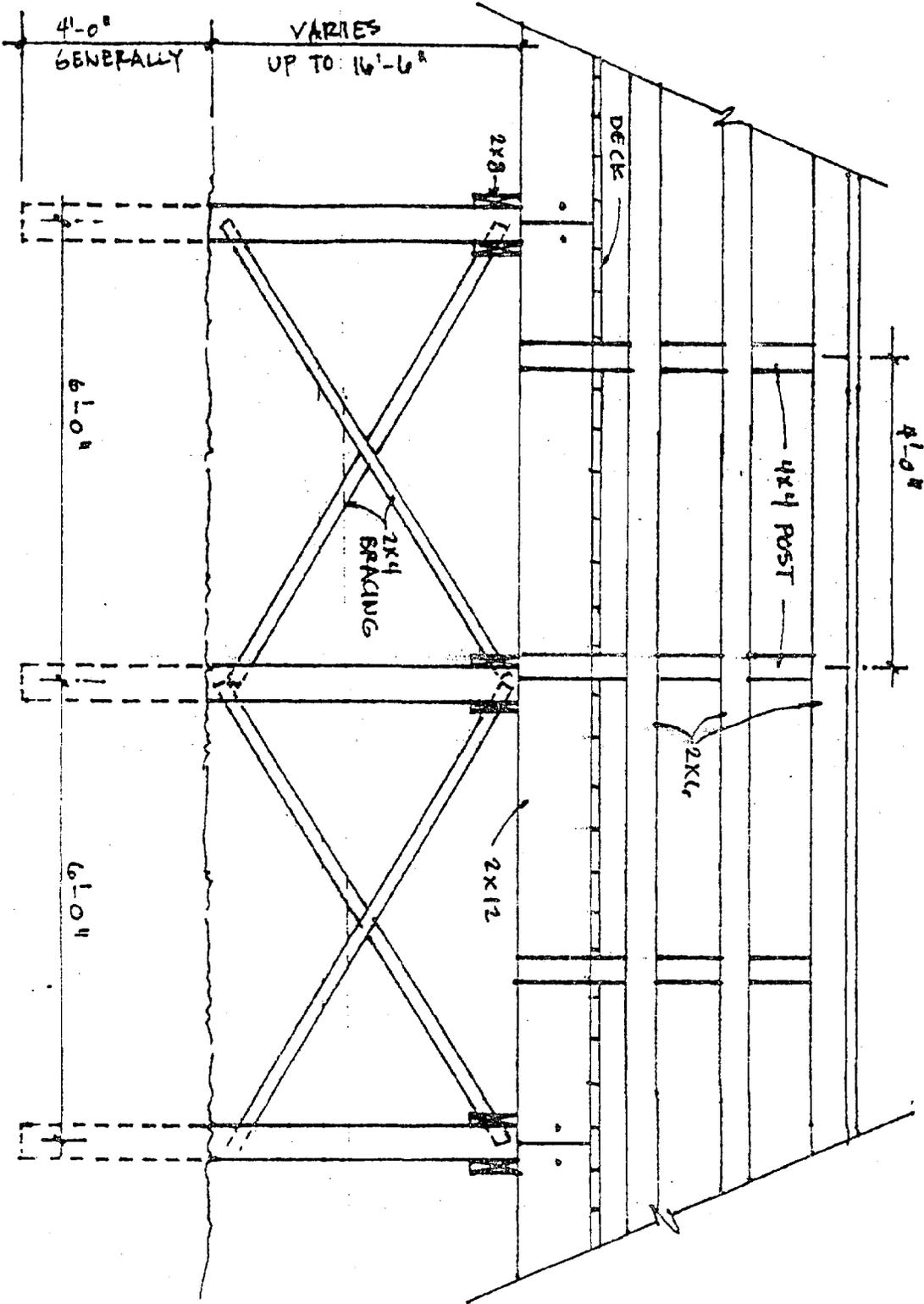


CEDAR HANDRAIL NO SCALE

CEGAR HANDRAILING
 SEE DETAIL
 TO BE INSTALLED W/ TAIL
 JOINTS IN LAPS

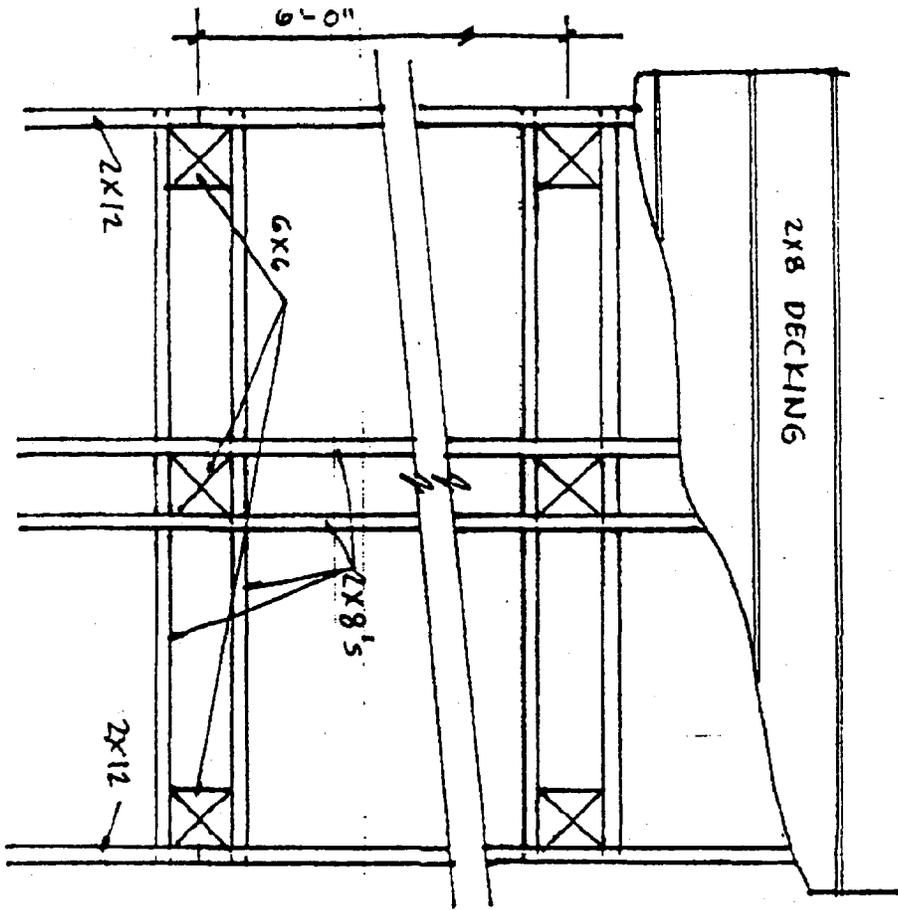
RAILS CONTINUE
 TO PARKING AREA

RAILS LAP JOINED
 W/ LAG SCREWS TO
 POST

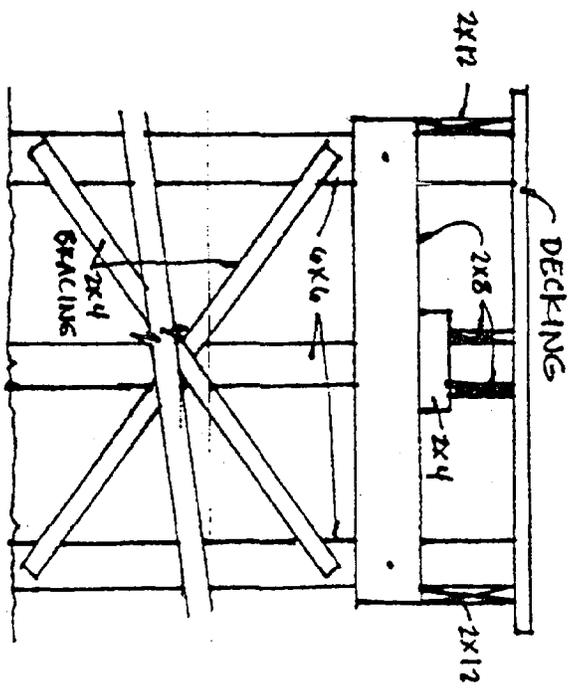


ELEVATION VIEW

1/2" = 1'-0"

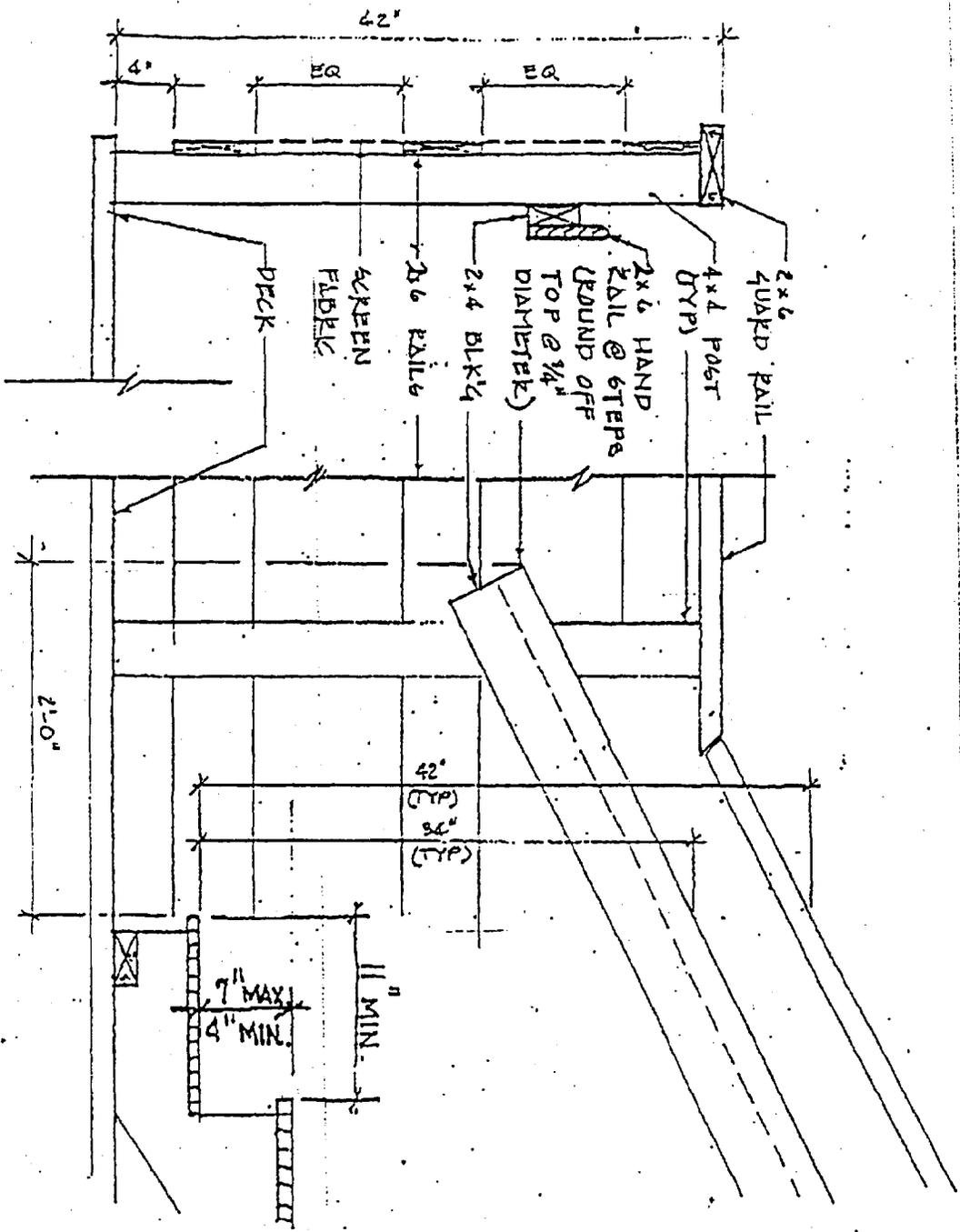


PLAN VIEW
 $\frac{3}{4}'' = 1'-0''$



SECTION
 $\frac{1}{2}'' = 1'-0''$

HANDRAIL SECTIONS



rotten spot.

few hours of measuring and
the trees, and extracting slender
each with a boring device to
examine the annual growth

Baugh had several
v maybes, and one
lity.

they came to The

said anything.

Clear even to a
this was superior to
ey had looked at.
massive, straight and
I make a mast and
It was growing less
t from where the
d state champion
ad.

Mr. Baugh asked
son. Hundred and

Hutcheson laughed,
in. Baugh's ethics
around there.

ll go 250 probably."

ugh looked at Mr.
osely. The forester,
he clear, was also a
ved trees. He had
d favorites, and
ometimes I have to
and say, 'Hey, quit
ow beautiful it all is
to work.' "

going to cut this
n't take it?" Mr.

not this one." Mr.
plied.

pany had told the
Bay Foundation
three-fourths of its
ld longleafs would

se of the southern pine bark
infests and kills older trees. A
n beetles ravaged lots of big,
ber, and Mr. Hutcheson was
other cycle of damage.

ugh began asking questions. In
ion would the forest giant be
t it be easy to get it to a truck

He started at the tree a good long
while and turned to Mr. Hutcheson.

"Let's keep looking."

As they left for another part of the
forest, Mr. Hutcheson noticed a longleaf
he'd overlooked before. It was leaning

It then had just purred in the
Alabama bearing three massive pine
donated by Mr. Schutt. The Chesape
Bay Foundation will use the best for a m
and saw the others into planking for
skipjack.

After each log is tested
density and strength, one is
clear winner, but it's not a
tree Mr. Baugh recalled pickin
A call to Wilmon explains
mystery.

They had decided to
The Tree. They wanted
Baugh to get the very best
possible, having come all t
way, says a manager reached
telephone in Alabama.

"I'm kind of sorry to
any tree that nice killed." B
Baugh now says, philosophic
ly. "On the other hand, I th
we may have one of the b
masts put in a skipjack in t
century."

The night before they'd
Alabama, the stars had twink
like fireflies through the top
the big pines limned black
massive against the sky—I
the stars one recalled shin
through the sails of the Stan
Norman as it plunged throug
Chesapeake night.

Perhaps it is as close to
as a felled tree can come aga
being incorporated into t
mast and deck and planking o
wooden sailing vessel. wind s
ing through the rigging n
instead of the boughs.

And the thousands of k
who will board the Stanley
years to come . . . well, t
mighty mast is always one of
first things to draw their atte

TREES: THE BAY'S BEST FRIEND?

The Chesapeake Bay does not generally conjure up
images of lush forests, but research indicates that trees
are one of its best "natural" friends. Healthy forests,
particularly those along streams, filter out sediments, nutri-
ents, and pesticides that would otherwise degrade water qual-
ity in the Bay and its tributaries.

Recognizing this fact, the Chesapeake Bay Program—an
EPA-led, interstate partnership that includes federal, state,
and local agencies, and non-governmental organizations,
from Maryland, Virginia, Pennsylvania, and the District of
Columbia—has developed policy to "maintain and restore"
streamside forests throughout the Chesapeake Bay water-
shed. Other critical forested areas, including wetlands and
adjacent uplands, should also be protected and restored.

AMERICAN FORESTS and the U.S. Fish & Wildlife Service have
joined forces to assist in the restoration effort. Projects to
restore streamside forests, forested wetlands, and critical
uplands will be carried out on private lands and protected
through long-term agreements with landowners. Private lands
have been targeted because 90 percent of the streamside
properties and many other critical habitats in the Bay's water-
shed are privately owned. AMERICAN FORESTS and Fish &
Wildlife Service are seeking promotional and funding part-
ners among the Maryland business community and other insti-
tutions to initiate this program at the heart of the Chesapeake.
To discuss, contact AMERICAN FORESTS at 202/667-3300, ext. 228.

—KURT REDENBO

badly. He would definitely be cutting it.

It wasn't nearly the tree they'd just
looked at, but the lean disguised the fact
that it was actually pretty straight. It
appeared to be 165 years old, maybe more.

It would do, Mr. Farley said.

A Giant's Legacy

tion, Mr. Baugh says.

Perhaps some fine stories and so-
lively ethics debates will spring from t
search for a magical wood to transfer its
force into a magical boat. AF

Phoenix Plans Wetlands Project

By **JAMES LAUGHLIN**
Editor

A \$3 million pilot wetlands project is under construction in Phoenix to determine the effectiveness of constructed wetlands in providing final polishing of wastewater effluent.

Phoenix is considering the construction of a wetlands project that would cover 1,000 to 2,000 acres and be able to handle 100 mgd with 2.5 to 5 days of retention time. The pilot project will treat from 0.8-

3 mgd, with retention times ranging from 2 to 8 days.

The pilot project will use a three-phase system modified to meet the conditions of the Phoenix metropolitan area. Water for the wetlands will have been treated to the advanced secondary stage at Phoenix's 91st Avenue Wastewater Treatment Plant.

Water discharged from the treatment plant currently has a BOD and TSS level of 5-6, and a turbidity of 2-3 NTU. Most of the effluent goes into the Salt River channel and provides the only normal

water flow in the "river."

The initial phase of the wetlands treatment process will be a shallow marsh. The second will be a deep pool to collect flow from the first marsh and to provide open-water habitat for waterfowl. The third will be a second shallow marsh to provide final polishing.

A variety of vegetation will be used in each of the three phases to help remove harmful bacteria, chemicals and nutrients.

See PHOENIX on page 3

PHOENIX

continued from page 1

Bulrush varieties to be used include *Scirpus californicus*, *S. validus*, *S. actus* and *S. paludosus*. Submerged aquatic plants, rooted in the bottom of the marshes, will also be used. They include members of the pondweed family — *Potamogeton nodosus*, *P. foliosus*, *P. crispus* — and horwort, *Ceratophyllum demersum*.

The pilot program will include two wetland sites covering a total of about 8 acres. One is a riparian area while the second is in the normally dry river channel. Water from both test sites will flow into the river channel after leaving the wetlands.

The wetlands will be surrounded by footpaths and have observation mounds allowing the public to view the wildlife that is expected to use the site.

Water leaving the wetlands would probably be suitable for groundwater recharge or even diversion into a drinking water treatment plant, but will be used for agriculture and landscaping.

CH2M Hill provided final design for the project. Phoenix engineers are managing the construction project, with CH2M Hill providing inspection and testing.

The U.S. Environmental Protection Agency has given Phoenix a \$350,000 grant to develop criteria for permits for use of wastewater effluent in the wetlands. The grant uses funds from the Environmental Technology Initiative Program.

EPA's grant and \$16,000 matching funds from Phoenix will be used to help learn how the wetlands, and others like it, must be operated to comply with current environmental regulations and what regulatory changes are needed to encourage other innovative technologies.

The wetland's project is one of four alternatives Phoenix is considering to meet more stringent discharge standards expected in a new National Pollution Discharge Elimination System (NPDES) permit to be issued in 1997.

Other options include installing additional processes at its treatment plant, selling the plant's effluent to a water broker, or using all of the effluent for a recharge and recovery project.

The wetlands project is seen as one way to attain compliance while keeping costs down. One option for Phoenix would be to eliminate discharges into the Salt River and avoid having an NPDES permit. That would leave the river dry most of the year, however, and could create a public backlash since effluent flow in the river has created a habitat for fish, frogs and waterfowl.

Bing Brown, a spokesman for the City of Phoenix, said he envisions a balanced approach where some of the water is

reused or sold but some continues to flow into the river.

"I think the environmentalists would have a legitimate gripe if we took it all. I can't imagine us putting all the effluent in the river year round, day after day. It's just too valuable," he said.

Phoenix, Glendale, Mesa, Scottsdale, Tempe and the U.S. Bureau of Reclamation are involved in the project. The cities will pay \$1.5 million of the project's cost, the Bureau will pay \$1.5 million and the Arizona Department of Water Resources will pay \$150,000.

WV

WaterWorld

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