Cape-Wide Site Screening Criteria

Criteria for **Constructed Wetlands - Wastewater Treatment**: Parcels selected could accommodate constructed, fresh-water wetlands that ***do not intersect*** with the water table, (typically meant to treat collected wastewater that is introduced to the wetland through an engineered system):

The following are primary criteria for siting constructed wetlands – wastewater treatment:

- Greater than 2 acres – a minimum size to accommodate a constructed wetland to support wastewater treatment. Smaller parcels could also be used, but for smaller projects.
- Outside 100 year floodplain to salt water – constructed wetlands should not be sited where there is the risk of salt water inundation.
- Have depth to groundwater greater than 4 ft – important for treatment and construction requirements
- Not Article 97 protected open space – want to identify any parcel that is not protected open space as an opportunity
- Not developed residential properties

The following are secondary criteria for siting constructed wetlands – wastewater treatment:

- ✓ Have clay soils[1] – best for water treatment
- ✓ Have disturbed soils[2] – identify disturbed sites, sites where re-use may be a possibility
- ✓ Have the 50-100 ft buffer to wetlands – this criterion does not recommend siting constructed wetlands within this buffer area, but identifies parcels that have this buffer. There is an opportunity to site constructed wetlands adjacent to these buffer areas on parcels with adequate acreage.
- ✓ Municipally owned (and not protected open space) – municipally owned parcels that are not protected open space provide an added opportunity
- ✓ Adjacent to protected open space

Criteria for **Constructed Wetlands – Groundwater Treatment**: Parcels selected could accommodate constructed, fresh-water wetlands that ***intersect*** with the water table, where projects could be designed to enhance natural attenuation of nitrogen in areas bordering fresh water bodies:

The following are primary criteria for siting constructed wetlands – groundwater treatment:

- Greater than 2 acres – a minimum size to accommodate a constructed wetland to support groundwater treatment. Smaller parcels could also be used, but for smaller projects.
- Have depth to groundwater less than 4 ft – natural hydrology is an essential element for these wetland types.
- Not developed residential properties

The following are secondary criteria for siting constructed wetlands – groundwater treatment:

- ✓ Not protected open space – ideally the site is not protected open space; but at the same time, protected lands could be an opportunity for these types of projects.
- ✓ Parcels include 100 year floodplain adjacent to freshwater ponds, and non-tidal sections of streams and rivers
- ✓ Have hydrologic soils C or D – best for water treatment
- ✓ Have disturbed soils – identify disturbed sites, sites where re-use may be a possibility
- ✓ Municipally owned (and not protected open space) – municipally owned parcels that are not protected open space provide an added opportunity
- ✓ Greater than 5 acres – larger parcels offer economies of scale for treatment
- ✓ Adjacent to protected open space – these sites provide opportunities to optimize the Cape's green infrastructure

Criteria for **Saltwater Wetland expansion/migration/restoration**: Parcels selected could accommodate projects that would enhance natural attenuation of nitrogen in areas bordering salt water bodies:

The following are primary criteria for siting saltwater wetland expansion/migration/restoration:

- Greater than 2 acres – a minimum size to accommodate a saltwater wetland expansion, migration, or restoration project. Smaller parcels could also be used, but for smaller projects.
- Parcels include 100 year floodplain adjacent to estuaries (tidal sections of streams and rivers) and embayments.
- Have depth to groundwater less than 4 ft – natural hydrology is an essential element for these wetland types
- Not developed residential properties

The following are secondary criteria for the siting of saltwater wetland expansion/migration/restoration:

- ✓ Not protected open space – ideally the site is not protected open space; but at the same time, protected lands could be an opportunity for these types of projects.
- ✓ Have disturbed soils – identify disturbed sites
- ✓ Municipally owned (and not protected open space) – municipally owned parcels that are not protected open space provide an added opportunity
- ✓ Greater than 5 acres – larger parcels offer economies of scale for treatment
- ✓ Adjacent to protected open space – these sites provide opportunities to optimize the Cape's green infrastructure

Criteria for **phyto-technology**: Parcels selected could accommodate projects where phyto-technology could enhance nitrogen attenuation:

The following are primary criteria for the siting of phyto-technology:

- Greater than 2 acres – a minimum size to accommodate phyto-technology. Smaller parcels could also be used, but for smaller projects.
- Outside 100 year floodplain – phyto-technology projects should not be sited where there is the risk of salt water inundation.
- Have hydrologic soils A or B – best for root growth and access to groundwater
- Have depth to groundwater **less** than 10 ft – important for plant growth/intersection with groundwater to be treated
- Not Article 97 protected open space – want to identify any parcel that is not protected open space as an opportunity
- Not developed residential properties

The following are secondary criteria for the siting of phyto-technology:

- ✓ Have disturbed soils – identify disturbed sites, sites where re-use may be a possibility
- ✓ Have the 50-100 ft buffer to wetlands – this criterion does not recommended siting constructed wetlands within this buffer area, but identifies parcels that have this buffer. There is an opportunity to site phyto-technology adjacent to these buffer areas on parcels with adequate acreage.
- ✓ Municipally owned (and not protected open space) – municipally owned parcels that are not protected open space provide an added opportunity
- ✓ Have depth to groundwater less than 4 ft – sites where groundwater is close to surface grade provide better opportunities for treatment
- ✓ Greater than 5 acres – larger parcels offer economies of scale for treatment
- ✓ Adjacent to protected open space– these sites provide opportunities to optimize the Cape's green infrastructure

Criteria for **permeable reactive barriers – injection well**: Selects parcels which meet the following criteria (this screening could be used if/when/in locations where installation of trench-style permeable reactive barriers along roads is overly complicated by the presence of utilities):

The following are primary criteria for siting injection well permeable reactive barriers in areas other than roads:

- Priority TMDL removal areas
- Low in the watershed (i.e. close to the receiving estuary or embayment)
- Not developed residential properties

The following are secondary criteria for siting injection well permeable reactive barriers in areas other than roads:

- ✓ Municipally owned (and not protected open space) – municipally owned parcels that are not protected open space provide an added opportunity
- ✓ Not Article 97 protected open space –parcels that are not protected open space may be an opportunity
- ✓ Parcels include 100 year floodplain adjacent to estuaries (tidal sections of streams and rivers) and embayments
- ✓ Have hydrologic soils A or B –
- ✓ Have depth to groundwater less than 4 ft – sites where groundwater is close to surface grade provide better opportunities for treatment

Criteria for **permeable reactive barriers - trench**: Selects *parcels* which meet the following criteria (this screening could be used if/when/in locations where installation of permeable reactive barriers along roads is overly complicated by the presence of utilities):

The following are primary criteria for siting permeable reactive barriers in areas other than roads:

- Greater than 5 acres
- Have depth to groundwater **less** than 20 ft – important for construction requirements
- Priority TMDL removal areas
- Low in the watershed (i.e. close to the receiving estuary or embayment)
- Not Article 97 protected open space – want to identify any parcel that is not protected open space as an opportunity

- Not developed residential properties

The following are secondary criteria for siting permeable reactive barriers in areas other than roads:

- ✓ Municipally owned (and not protected open space) – municipally owned parcels that are not protected open space provide an added opportunity
- ✓ Located within Zone IIs
- ✓ Have disturbed soils – identify disturbed sites, sites where re-use may be a possibility
- ✓ Have depth to groundwater less than 4 ft – sites where groundwater is close to surface grade provide better opportunities for treatment

Criteria for **permeable reactive barriers - trench**: Selects *roads/road sections* which meet the following criteria:

The following are primary criteria for siting permeable reactive barriers along roads:

- Have depth to groundwater **less** than 20 ft – important for construction requirements
- Roads running perpendicular to groundwater flow.
- Priority TMDL removal areas
- Low in the watershed (i.e. close to the receiving estuary or embayment)

Note that the screening for this technology opportunity was not automated through GIS queries, but required the analyst to scan for roads meeting the other criteria identified.

The following figure summarizes the criteria considered for each of the technologies and approaches:

Siting Criteria	Constructed Wetlands			Permeable Reactive Barriers		Phyto Technology
	Waste water	Ground water	Salt water	Parcels	Roads	
Not developed residential properties	1	1	1	1	1	1
Not protected open space	1	2	2	1	2	1
Adjacent to protected open space	2	2	2			2
Outside 100 year flood plain to salt water	1					1
Within 100 year flood plain		2	1		2	
100 – 50 ft buffer to wetland	2					2
Zone IIs – Wellhead protection Areas				2		
Soils: disturbed	2	2	2	2		2
Soils: well drained (hydrologic A or B)					2	1
Soils: poorly drained (hydrologic C or D)		2				
Soils: very poorly drained (hydrologic D)	2					
Depth to Groundwater >4 ft	1					
Depth to groundwater <4 ft		1	1	2	2	2
Depth to groundwater <10 ft						1

Depth to groundwater <20 ft				1		
Parcels >5 acres		2	2	1		2
Parcels >2 acres	1	1	1			1
Constraints:						
Priority habitat	✓	✓	✓	✓	✓	✓
Opportunities:						
Municipally owned, not protected open space	✓	✓	✓	✓	✓	✓

Primary criteria
Secondary criteria
Constraints
Opportunities

[1] **Hydrologic soil types C or D:**
AmA Amostown
BfC, BgC Nantucket
BoA, BoB Boxford
CoB, CoC, CoD Hinesburg
Fm Freetown
Fs Freetown
Fs Swansea
Ft Freetown
HnA, HnB, HnC Hinesburg
ImA Ipswich, Pawcatuck
ImA Matunuck
MaA Maybid
MbA Maybid Variant
NaB, NaC, NsB, NsC Nantucket
Pyd Nantucket
ScA Scitico
WvA Walpole

[2] **Disturbed soil types:**
Urban and Udipsamments