Introduction

THE REGIONAL POLICY PLAN

The Regional Policy Plan ("RPP") has been drafted to align directly with the goals and purposes of the Act. Specifically, this RPP adopts goals and corresponding objectives under each goal to guide and plan for the future of the region in a manner consistent with the vision and growth policy of the Commission.

The Goals and Objectives in Section 6 of the plan are the measures by which the Cape Cod Commission will make its determination whether a Development of Regional Impact ("DRI") is consistent with the RPP; for purposes of DRI and other regulatory reviews undertaken by the Commission, consistency with applicable goals and objectives constitutes consistency with the RPP.

The Commission determines the applicability and materiality of the RPP's goals and objectives to a project on a case by case basis. As the RPP has broad, general application to DRIs and other regulatory matters of regional significance, not every goal or objective may apply, be material, relevant or regionally significant, or apply in the same way or with the same focus or extent to every project or designation, given the specific facts and circumstances present in any given project.

THE ROLE OF TECHNICAL GUIDANCE IN REGULATORY REVIEW

Separate from, but in support of this RPP, the Commission has developed Technical Guidance. The Technical Guidance contains Placetype Maps, Technical Bulletins and references to resource areas mapped by federal, state and local governments. There is a Technical Bulletin for each of the goals of the RPP. The primary application of the Technical Guidance is during DRI or other regional regulatory review, and its primary purpose is to assist the Commission in its determination of whether a project is consistent with applicable RPP goals and objectives, and alternatively, to detail how an applicant could design and pursue its project to meet the applicable RPP goals and objectives. The Technical Bulletins detail methods by which the goals and objectives of the RPP may be met. Except where otherwise specified in the Technical Bulletin, the methods by which goals and objectives of the RPP are met are not prescriptive, but rather are examples of methods that further the goals and objectives of the RPP and assist in evidencing consistency with the RPP. There are some methods that are considered essential to achieving a particular goal and objective and therefore are required to be implemented; these methods are these are noted within the text of the applicable Technical Bulletin, and are indicated in that method by the term "must" in the summary of methods table in the text of that applicable Technical Bulletin. Applicants may also work with the Commission to develop alternative methods of evidencing RPP consistency.

THE ROLE OF CAPE COD PLACETYPES IN REGULATORY REVIEW

Cape Cod Placetypes is an organizing principle that informs the Commission's regulatory review. The applicability of goals and objectives may vary based on how projects are classified by Placetype. The means for achieving consistency with these goals and objectives may vary from site to site and project to project, typically depending on the relevant Placetype and whether certain sensitive resources are present on a given project site.

The Placetypes are determined in two ways; some are depicted on a map contained within the RPP Data Viewer located at www.capecodcommission.org/RPPDataViewer adopted by the Commission as part of the Technical Guidance for review of DRIs, and the remainder are determined using the character descriptions set forth in Section 8 of this plan and the Technical Guidance. The Placetype for a given project is established at

the outset of DRI review and provides the lens through which the Commission will review the project under the RPP.

THE ROLE OF THE RESOURCE AREAS IN REGULATORY REVIEW

Also contained within the Technical Guidance are Resource Areas which illustrate resources such as Zone II water supply areas, rare species habitat, flood hazard zones, and wetland resource areas. These areas are identified throughout the Technical Guidance and are also used as a lens by which DRI review is conducted when identified. Placetype and Resource Areas may be amended from time to time as new information becomes available.

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Water Resources

This guidance is intended to clarify how the Water Resources Goal and Objectives of the Regional Policy Plan (RPP) are to be applied and interpreted in Cape Cod Commission Development of Regional Impact (DRI) project review. This technical bulletin presents specific methods by which a project can meet these goals and objectives.

Water Resources Goal: To maintain a sustainable supply of high quality untreated drinking water and protect, preserve or restore the ecological integrity of fresh and marine surface waters.

- ***Objective WR1*** *– Protect and preserve groundwater quality*
- ***Objective WR2*** *– Protect, preserve and restore fresh water resources*
- ***Objective WR3*** *– Protect, preserve and restore marine water resources*
- ***Objective WR4*** *– Manage and treat stormwater to protect and preserve water quality*
- ***Objective WR5*** *– Manage groundwater withdrawals and discharges to maintain hydrologic balance and protect surface and groundwater resources*

The applicability and materiality of these goals and objectives to a project will be determined on a case-by-case basis considering a number of factors including the location relative to Water Resource Areas (identified on page WR-4), context (as defined by the Placetype of the location), scale, use, and other characteristics of a project.

THE ROLE OF CAPE COD PLACETYPES

The RPP incorporates *a framework for regional land use policies and regulations based on local form and context* as identified through categories of Placetypes found and desired on Cape Cod.

The Placetypes are determined in two ways: some are depicted on a map contained within the RPP Data Viewer located at www.capecodcommission.org/RPPDataViewer adopted by the Commission as part of the Technical Guidance for review of DRIs, which may be amended from time to time as land use patterns and regional land use priorities change, and the remainder are determined using the character descriptions set forth in Section 8 of the RPP and the Technical Guidance.

The project context, as defined by the Placetype of the location, provides the lens through which the Commission will review the project under the RPP. Additional detail can be found in the Cape Cod Placetypes section of the Technical Guidance.

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NOTE ON APPLICATION MATERIALS AND WATER RESOURCE AREAS MAPS

Application materials should provide sufficient detail to demonstrate that the project meets the applicable goals and objectives, but typically include:

A. Project description including site location, applicable Water Resource Areas, and narrative of proposed wastewater, stormwater and drinking water systems
B. Site-wide nitrogen loading calculation
C. Site plan including applicable grading, drainage, and utilities
D. Stormwater treatment and capacity calculations
E. Operations and maintenance plan(s)

*These items may not be required for all projects. See guidance on page WR-31 for more information.

The Water Resource Areas, which are defined on page WR-33, can be viewed in the RPP Data Viewer, and include:

- Wellhead Protection Areas (WHPA)
- Fresh Water Recharge Areas (FWRA)
- Marine Water Recharge Areas (MWRA)
- Potential Public Water Supply Area (PPWSA)
- Impaired Areas

INTRODUCTION

Cape Cod's water resources include fresh and marine waters as well as natural and built systems. The Cape Cod Aquifer, which serves as the primary link between all of the water resources on Cape, is relied upon to provide drinking water and wastewater disposal capacity for the human population, plays an integral role in maintaining plant and animal habitat in marine and freshwater settings, and ultimately underlies many of the scenic and recreational opportunities that serve as the primary economic driver for the region. Consistent with the Cape Cod Area Wide Water Quality Management Plan (the "208 Plan), maintaining the integrity and health of the aquifer and the various systems connected to it while encouraging provision of water resource infrastructure and growth that is appropriate in form and location is the primary purpose of the Water Resources goal and objectives.

This Technical Guidance provides examples of various methods and strategies that DRI projects may use to satisfy the Water Resources Goal and Objectives of the RPP. Through implementation of these methods and strategies, DRI projects can support the protection of critical water resources through development that is consistent with the vision for the region. Although the majority of methods discussed in this Technical Guidance are intended to be flexible, certain methods will be required of all DRIs where a particular Water Resources objective is applicable.

SUMMARY OF METHODS

GOAL | WATER RESOURCES

To maintain a sustainable supply of high quality untreated drinking water and protect, preserve or restore the ecological integrity of fresh and marine surface waters.

OBJECTIVE WR1 – Protect, preserve and restore groundwater quality

METHODS

All DRIs must employ the following methods to meet Objective WR1:

- Project is limited to a maximum site-wide nitrogen loading concentration of 5 parts per million (ppm) except as provided below for Impaired Areas and Potential Public Water Supply Areas (PPWSA),
- No adverse impacts on downgradient existing or proposed drinking water wells.
- Septic systems and other sources of contamination are sited to avoid adversely impacting downgradient existing or proposed drinking water wells.

Additional methods to meet Objective WR1:

- Utilize site design and operational best practices to preserve groundwater quality
- Review existing Environmental Site Assessment(s) as available for previously developed properties and incorporate findings into project design

For projects in an Impaired Area outside of other mapped water resource areas (see RPP Data viewer):

- If proposed site-wide nitrogen loading concentration exceeds 5 ppm, demonstrate no adverse impact on ponds, wetlands, marine waters, public or private drinking water supply wells, and potential water supply wells.

For projects in Potential Public Water Supply Areas:

- Site wide nitrogen loading must be less than 1 ppm.

All projects proposing private wastewater systems designed for flows greater than 2,000 gallons per day (gpd) and requiring greater treatment efficiency than specified by Massachusetts Department of Environmental Protection (MassDEP) permit or approval letter must:

- Enter into an Operation, Monitoring, and Compliance agreement with the Cape Cod Commission and local Board of Health.

All Wastewater Treatment Facility DRIs must:

- Consistently achieve 5 ppm or lower total nitrogen in wastewater effluent or in groundwater at downgradient property boundary.

Additional methods for wastewater treatment facility DRIs to meet Objective WR1:

- Utilize wastewater treatment facilities including private treatment facilities to protect and/or restore ground water quality provided that such facilities will not adversely impact water or other natural resources.

All DRIs within Wellhead Protection Areas (WHPA) or Potential Public Water Supply Areas (PPWSA) (see WHPA and PPWSA layers in the RPP Data Viewer) must employ the following methods to meet Objective WR1:

- All development, construction, clearing, and staging occurs at least 400 feet from identified future well sites.
- Projects with a high risk of contaminating groundwater, such as fleet storage, vehicle maintenance areas and loading docks, include a mechanical shut-off valve or other flow-arresting device in stormwater systems between the stormwater capture structures and the leaching structures.

Additional Methods for DRIs within WHPA and/or PPWSA's to meet Objective WR1:

- Do not use, treat, generate, handle, store or dispose of Hazardous Materials or Hazardous Wastes, except for Household Quantities by the following:
    - Redevelopment projects reduce the quantity of hazardous materials on the project site from the prior use and adequately document that reduction

    - Permanently eliminate the same or greater quantity of Hazardous Materials or Wastes at another facility, project, or site within the same WHPA or PPWSA and adequately document that reduction
- Does not discharge effluent from private wastewater treatment facilities, unless private wastewater treatment facilities remediate existing water quality problems in the water supply area.
- Non-residential development and redevelopment employs integrated pest management and/or biorational landscape management practices protective of water quality
- Roadway and parking area designs and materials minimize impervious surfaces

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OBJECTIVE WR2 – Protect, preserve and restore fresh water resources

METHODS

All DRIs within a Freshwater Recharge Area (FWRA) must employ the following methods to meet Objective WR2:

- New development prevents loading of nutrients and other contaminants to fresh water resources.
- Redevelopment maintains or reduces loading from nutrients and other contaminants to fresh water resources.
- Maintain or enhance vegetated buffer zones along shorelines to ponds and lakes

All projects within a FWRA where wastewater disposal is proposed must maintain a 300 foot buffer to the high water level of a freshwater pond unless they demonstrate that phosphorus transported by groundwater does not discharge into the pond or its tributaries.

Discharges of wastewater effluent over 2,000 gallons per day proposed anywhere in the watershed to a freshwater pond must evaluate the impact of phosphorus transported by groundwater on the pond.

OBJECTIVE WR3 – Protect, preserve and restore marine water resources

METHODS

All DRIs in a Marine Water Recharge Area (MWRA) where a critical nitrogen load has been determined through either a Total Maximum Daily Load or Massachusetts Estuaries Project (MEP) Technical Report must employ the following methods to meet Objective WR3:

- Not add nitrogen to a MWRA watershed unless:
    - There is a MassDEP Watershed Permit or locally adopted nutrient management plan, deemed consistent with the 208 Plan by the Cape Cod Commission, in the sub-watershed in which the project is proposed, and the approved nutrient management plan calls for initiation of nutrient reduction actions or strategies sufficient to offset nutrient contribution(s) from the project within five years of project approval; or
    - the project is in an area with available sewer connections, or is in a Placetype where nitrogen additions may be offset through a monetary contribution to address water quality problems in the affected surface waters.
- Further the goals of a local nitrogen management plan in areas subject to a MassDEP-approved wastewater or watershed permit.

All DRIs in a MWRA where there are water quality problems that are scientifically documented and a critical load has not been determined must employ the following methods to meet Objective WR3:

- Maintain or reduce nitrogen loading relative to existing levels.

OBJECTIVE WR3 AREAS OF EMPHASIS BY PLACETYPE

Natural Areas | Development is discouraged in Natural Areas and monetary N-offsets are not permitted.

Rural Development Areas | Sewer is generally not anticipated in rural areas, therefore monetary N-offsets are not permitted.

Suburban Development Areas | Monetary N-offsets may be permitted at Commission's discretion.

Historic Areas | Monetary N-offsets may be permitted in Historic Areas at Commission's discretion.

Maritime Areas | Monetary N-offset are permitted in Maritime Areas where sewer is not yet available.

Community Activity Centers | Monetary N-offsets are permitted in Community Activity Centers where sewer is not yet available.

Industrial Activity Centers | Monetary N-offset are permitted in Industrial Areas where sewer is not yet available.

Military and Transportation Areas | Monetary N-offset are permitted in Military / Transportation Areas where sewer is not yet available.

* The nitrogen offset rate is based on cost efficiencies associated with wastewater collection and municipal treatment as described in Appendix C.

OBJECTIVE WR4 – Manage and treat stormwater to protect and preserve water quality

METHODS

All DRIs, with the exception of redevelopment projects as discussed below, must employ the following methods to meet Objective WR4:

- Provide a stormwater management system that prevents adverse impacts to water resources and other natural resources.
- Prevent discharge of untreated stormwater to marine and fresh surface water and natural wetlands by treating runoff from development, including areas located outside the jurisdiction of the Massachusetts Wetlands Protection Act
- Provide storage and treatment capacity sufficient to store, treat, and infiltrate all runoff from parking areas and roadways onsite
- Locate new infiltration to maintain a minimum two-foot separation between points of infiltration and the maximum high water table.
- Design stormwater systems according to the Massachusetts Stormwater Handbook to:
    - accommodate the 25-year 24-hour storm
    - remove at least 80% total suspended solids (TSS)
    - provide water quality treatment capacity for the first inch of stormwater runoff using biofiltration, bioretention, or other Treatment BMPs as detailed in the Stormwater Handbook

For redevelopment projects:

- Reduce impervious area coverage and improve site conditions to enhance stormwater retention, water quality treatment, and recharge over existing conditions.
- Include natural areas in stormwater system design.

Additional methods to meet Objective WR4:

- Manage and directly infiltrate roof runoff separately where site constraints limit capacity for water quality treatment, unless there is an identified rooftop water quality concern requiring additional treatment or management.
- Design stormwater systems to remove at least 44% total suspended solids prior to discharge into subsurface leaching facilities.

OBJECTIVE WR4 AREAS OF EMPHASIS BY PLACETYPE

Natural Areas and Rural Development Areas | Prioritize protection of mature trees and wooded areas and utilize natural drainage features to manage stormwater. Minimize construction footprint, land disturbance during and after construction, and impervious area creation to maintain natural filtration and recharge processes. Use LID features that provide water quality treatment during storm events and environmental or recreational function at other times, and optimize BMPs for nitrogen removal.

Suburban Development Areas | Cluster development to maximize contiguous natural areas. Minimize stormwater runoff by reducing road/driveway widths and using permeable features to break up large impervious areas.

Historic Areas and Maritime Areas | Utilize permeable material choices when designing roadways, parking, and walkways where land area and subsurface access may be limited. Employ rainwater re-use techniques in ways that maintain local character. Explore opportunities for development of off-site shared district or community scale stormwater treatment.

Community Activity Centers | Prioritize inclusion of green space that can provide treatment and infiltration capacity for redevelopment / infill projects. Utilize subsurface storage and infiltration measures where site constraints limit above ground treatment capacity. Where applicable maintain or improve gray infrastructure to support development of shared off-site district or community scale stormwater treatment.

Industrial Activity Centers and Military and Transportation Areas | Prioritize inclusion of green space that can provide treatment and infiltration capacity for

redevelopment / infill projects. Utilize permeable material choices when designing lower traffic roadways, parking, and walkways, and subsurface storage and infiltration measures where site constraints limit above ground treatment capacity. Where applicable maintain or improve gray infrastructure to support development of shared off-site district or community scale stormwater treatment. Design sites to minimize exposure of stormwater runoff to hazardous materials, hazardous wastes, and other potential contaminants. Design stormwater systems to treat higher potential pollutant loads and contain runoff via flow arresting device or otherwise in the event of a spill / release.

OBJECTIVE WR5 – Manage groundwater withdrawals and discharges to maintain hydrologic balance in a way that is protective of surface and groundwater resources

METHODS

All DRIs must employ the following methods to meet Objective WR5:

- Design water withdrawals and wastewater discharges in a manner that protects surface water and wetland habitat from groundwater pumping and, in the case of effluent disposal from water table mounding issues (e.g., breakout, flooding, water table separation).

For projects proposing to withdraw >20,000 gallons of water per day from the site must:

- Provide a groundwater study that demonstrates the project will not have adverse impacts on groundwater levels or adjacent surface waters and wetlands.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE WR1

Objective WR1 *– Protect and preserve groundwater quality*

NITROGEN LOADING

Protection of Cape Cod's groundwater resources is critical for the protection of human health. The Cape Cod aquifer was designated as a Sole Source Aquifer (47 FR 30282) by the US Environmental Protection Agency (USEPA) in 1982, recognizing the complete dependence of the population on groundwater as its source for drinking water. The aquifer is primarily recharged by precipitation but also receives discharges of wastewater and stormwater, which can introduce contaminants into Cape Cod's primary source of drinking water. Nitrate-nitrogen (NO_3-N) is a primary contaminant of concern due to its potential human health effects, for which USEPA has established a maximum contaminant level (MCL) of 10 parts per million (ppm). In addition, high NO_3 concentrations in groundwater have also been correlated with higher concentrations of drinking water contaminants (e.g., volatile organic compounds and compounds of emerging concern). For these reasons the nitrogen loading requirements must be met by all DRIs.

Detail on the methods for meeting Objective WR1 is provided below:

For all projects

Under the Safe Drinking Water Act, public supply wells which exceed 5 ppm NO_3-N are subject to additional monitoring requirements, and wells that exceed the MCL (10 ppm NO_3-N) cannot obtain variances or exemptions, thus requiring expensive treatment or being removed from operation. In aerobic subsurface environments like Cape Cod's unconfined aquifers, nitrate is highly persistent with natural chemical reactions providing minimal removal. Consequently, limiting the amount of nitrogen introduced to the aquifer is the most effective way to reduce NO_3-N concentrations in groundwater and protect Cape Cod's drinking water.

5 PPM NITROGEN LOADING STANDARD

The Cape Cod Commission has adopted a loading standard of 5 ppm NO_3-N which based on a statistical analysis is designed to keep violations of the USEPA MCL for NO_3-N to less than 1 in 10 samples, while maintaining an additional margin of safety during

times of simultaneous low recharge (i.e., drought conditions) and high loading (summer peak season). This standard is designed to protect human health, as well as current and potential future drinking water resources. A site-wide nitrogen loading calculation takes into account all sources of nitrogen from the project site post-development and divides this cumulative nitrogen input by the water input (recharge) for the entire project site. Instructions on the information required and method for calculating site-wide nitrogen loading are available in Appendix A – Nitrogen Loading. Applicants seeking to reduce site-wide nitrogen loading may do so by providing advanced treatment of wastewater flows to remove additional nitrogen, reducing the volume of wastewater flows, increasing natural area on-site, decreasing fertilized lawn area, and incorporating stormwater Best Management Practices (BMPs) optimized for nitrogen removal.

IMPACTS OF DEVELOPMENT ON LOCAL DRINKING WATER WELLS

The 5 ppm nitrogen loading standard is designed to protect the Cape Cod aquifer as a whole, but localized impacts of a project on the groundwater resources also need to be considered. As nitrogen and other wastewater constituents will follow the flow of groundwater, the direction of groundwater flow at the project site will determine where wastewater effluent travels. The location of septic and other wastewater disposal systems, direction of groundwater flow, and proximity of public or private drinking water wells at the site and on neighboring parcels must be examined, as applicable, to verify that a project even when complying with site-wide loading standards is not contaminating nearby drinking water resources. Applicants must identify existing or proposed drinking water wells within 400 feet of project boundaries, when this method is applicable. Groundwater flow direction should be determined using a water table map, which may be generated from groundwater elevation data (possible sources might include the United States Geological Survey, Massachusetts Department of Environmental Protection, or the town). The direction of groundwater flow should be used to locate wastewater treatment systems (including septic) appropriately so that effluent does not flow directly into downstream drinking water sources.

SITE ASSESSMENTS FOR PREVIOUSLY DEVELOPED PROPERTIES

Sites that have been previously developed, particularly those with uses that historically have used/generated hazardous materials or hazardous wastes (e.g., gas stations, auto repair facilities, dry cleaners, manufacturing facilities) may contain contaminated soil or

groundwater even if site assessment and remediation activities have been conducted under the Massachusetts Contingency Plan (MCP). To prevent the unintentional mobilization of contaminants into groundwater, documentation of all Environmental Site Assessments and remedial actions must be supplied for Commission review when this method is utilized to ensure the best available information regarding surface and subsurface site conditions is considered when evaluating the project design.

BEST DEVELOPMENT PRACTICES FOR SITE DESIGN

Low impact development is the practice of using innovative stormwater management systems that are modeled after natural hydrologic features. Low impact development techniques manage rainfall at the source using uniformly distributed decentralized micro-scale controls, and small cost-effective landscape features located at the lot level. They also facilitate compact, clustered development and minimize impervious surfaces.

Environmentally sensitive site design incorporates low impact development techniques to prevent the generation of stormwater and non-point source pollution by reducing impervious surfaces, disconnecting flow paths, treating stormwater at its source, maximizing open space, minimizing disturbance, protecting natural features and processes, and/or enhancing wildlife habitat.

Additional resources regarding site design best practices are available from the United States Environmental Protection Agency (https://www.epa.gov/sites/production/files/2015-11/documents/region3_factsheet_lid_esd.pdf), the Metropolitan Area Planning Council (https://www.mapc.org/resource-library/low-impact-development-toolkit/), and other State and regional environmental and planning agencies (e.g. https://growsmartmaine.org/wp-content/uploads/2015/08/Enviro_Sensitive_Design-Final-21-Nov-06.pdf).

USE OF SHARED INFRASTRUCTURE

Shared wastewater treatment utilizes a single system to treat wastewater from multiple units of development. This practice can facilitate higher density development, reduce environmental impacts and treatment costs, and enhance open space preservation as it only requires a single location for wastewater disposal and may require less total area for disposal. In cases where a parcel is subdivided or residential lots are to be sold

individually, a covenant will need to be entered into by the homeowners for operation and maintenance of a shared system in order to meet Objective WR1 via this method.

Multi-unit development is also encouraged to include community or public water supplies as alternatives to multiple private wells, in order to avoid potential impacts from wastewater disposal and challenges of siting and associated setback requirements for multiple water supply wells.

For Projects Proposing Private Wastewater Systems

OPERATION, MONITORING, AND COMPLIANCE AGREEMENTS

When a wastewater system of sufficient capacity (greater than 2,000 gallons per day design flow) is proposed to operate with greater removal efficiency than currently certified by MassDEP permit or letter of approval in order to meet Water Resources objectives, an Operation Monitoring and Compliance (OMC) Agreement is required to ensure treatment goals are met. The OMC agreement should be entered into between the applicant, Cape Cod Commission, and the local Board of Health, and generally consists of:

- Treatment specifications
    - Wastewater flow limit
    - Effluent quality limits
- Monitoring requirements
    - Sampling locations
    - Analyses required
    - Sampling frequency
- Reporting requirements
    - Frequency of reporting
    - Enforcement actions
- Operations and maintenance plan and staffing

For Projects Proposing Wastewater Treatment Facilities

WASTEWATER TREATMENT FACILITIES

Wastewater collection and treatment systems that have a design flow of greater than 10,000 gallons per day are considered a wastewater treatment facility (WWTF).

LOCATION OF WASTEWATER TREATMENT FACILITIES

WWTFs are likely to play a role in many towns' nutrient reduction strategies, therefore it is important that public and private facilities are deployed in a coordinated and strategic manner. Nutrient reduction strategies may be laid out in a town's Comprehensive Waste Management Plan (CWMP), a Targeted Watershed Management Plan (TWMP) that may involve several towns, or in other planning documents. When a nutrient reduction strategy has been deemed consistent with the Cape Cod Area Wide Water Quality Management Plan Update (208 Plan Update) by the Cape Cod Commission, private WWTFs that are not owned or operated by a town, municipality or district may be located in areas where a) no public WWTF is proposed within five years of the proposed project construction date under the nutrient reduction strategy, or b) where the nutrient reduction strategy relies upon the proposed private WWTFs to achieve nutrient reduction goals. In areas where an approved nutrient management plan is not yet in place, private WWTFs are an encouraged strategy for maintaining or improving groundwater quality.

5 PPM NITROGEN CONCENTRATION LIMIT IN EFFLUENT OR AT DOWNGRADIENT BOUNDARY

Projects proposing WWTFs are required to maintain nitrogen at 5 ppm or lower when measured at the downgradient property boundary. As it can be assumed that nitrogen discharged to groundwater will flow advectively without dilution to the property boundary, nitrogen concentrations generally remain constant or decrease slightly following discharge. WWTF effluent nitrogen is monitored as part of a MassDEP groundwater discharge permit (GWDP), and projects with 5 ppm nitrogen or less in effluent are deemed to have met this requirement. Projects proposing to discharge nitrogen at concentrations greater than 5 ppm may use a groundwater model, or groundwater monitoring data to demonstrate that nitrogen concentration in groundwater at the downgradient property boundary will not exceed 5 ppm and the results must be submitted to the Commission for review and confirmation.

For Projects within Wellhead Protection Areas (WHPAs) and Potential Public Water Supply Areas (PPWSAs)

PROTECTION OF EXISTING AND FUTURE DRINKING WATER WELLS (WHPAS AND PPWSAS)

As additional development on land areas that contribute (or may contribute in the future) to drinking water wells will directly impact drinking water quality, certain additional protections are required to prevent excessive nutrient loading and minimize the risk of contamination.

Lands receiving precipitation that contribute to the recharge of public drinking water supply wells are considered Wellhead Protection Areas (WHPA). These include MADEP approved Zone IIs, interim wellhead protection areas, and certain town delineated water protection districts that extend beyond the Zone II limits.

Potential Public Water Supply Areas (PPWSAs) were first identified in the Priority Land Acquisition Assessment Project (PLAAP) as areas that may be suitable for future development of drinking water supplies. These land areas meet various requirements including minimum parcel size, surrounding land uses that are protective of groundwater quality, and the absence of incompatible upgradient or nearby land uses (e.g., landfills, hazardous waste sites or contaminant plumes, dense development).

Discharging effluent from private wastewater treatment facilities in WHPAs or PPWSAs may negatively impact those resources by degrading water quality and/or modifying natural hydrologic processes. Private wastewater treatment facilities may be proposed in a WHPA or PPWSA only when designed to specifically tie-in and treat existing sources of wastewater within that same water supply area.

HAZARDOUS MATERIALS LIMITATIONS

Any chemical or substance that when released into the environment will pose a significant contaminant threat to groundwater and drinking water supplies is considered a hazardous material. Examples include petroleum products, petroleum distillates, organic and inorganic solvents, oil-based paints, oil-based stains, insecticides, herbicides, rodenticides, and pesticides. Any Hazardous Waste, Universal Waste, or Waste as defined in the Massachusetts Hazardous Waste Regulations (310 CMR 30.010) are considered Hazardous Wastes. Hazardous Wastes do not include Hazardous

Materials or biomedical wastes regulated under the Massachusetts State Sanitary Code (105 CMR 480.00). Hazardous Materials do not include Hazardous Wastes, Articles, Consumer Products, or Cosmetics.

In order to minimize the potential risk of introducing contamination to existing or future water supplies, the following limits on hazardous materials / hazardous wastes apply in WHPAs and PPWSAs.

(a) 275 gallons of oil on site at any time to be used for heating of a structure, or to supply an emergency generator
(b) 25 gallons or equivalent dry weight, total, of Hazardous material(s) on site at any time (excluding oil as classified in part (a))
(c) 55 gallons of Hazardous Waste generated at the Very Small Quantity Generator level as defined in Massachusetts Hazardous Waste Regulations (310 CMR 30.000) and accumulated or stored on-site at any time.

Applicants should provide to the Commission an inventory which includes the identities and quantities of expected and potential hazardous materials/wastes that will be generated, used, or stored on site for the proposed use. Similar inventories should be provided for the previous use (when applicants propose to reduce the quantity of hazardous materials present on site through redevelopment) or for the proposed offset site (when applicants propose to eliminate the same or greater quantity of hazardous materials from another project, site, or facility within the same WHPA or PPWSA).

Certain types of development even when remaining within the above limits on hazardous materials and hazardous wastes may present a greater potential for contaminating groundwater. Stormwater systems serving areas used for fleet storage, vehicle maintenance, electrical transmission/generation. loading docks, waste handling, and any other use with greater potential for groundwater contamination must include a means to halt discharge from the stormwater system (flow arresting device) in the event of a spill, accident, or release of any source of contamination.

1 PPM NITROGEN LIMIT

PPWSAs are a finite and increasingly limited resource that require extra levels of protection to ensure they remain available to provide a stable drinking water system able to meet future water supply needs.

In order to maintain the suitability of PPWSAs to supply drinking water in the future, site wide nitrogen loading is limited to 1 ppm in these areas.

LANDSCAPE MANAGEMENT PRACTICES

Landscaping is an important part of development that may play a role in screening, stormwater treatment and overall visual aesthetics. Proper maintenance of landscaping is necessary to maintain its continued function, and several approaches are encouraged to minimize the environmental impacts presented by chemical fertilizer and pesticide usage during these activities. Additional detail regarding landscaping is provided in the Community Design Technical Bulletin.

Integrated pest management and biorational landscape management make use of an inspection and monitoring approach, along with a variety of pest control measures to maintain pest populations below levels that can cause significant damage or loss to installed landscaping. Soil nutrient and moisture testing should be employed with fertilization and irrigation methods tailored to the specific site conditions. Accurate identification of pests and monitoring of their populations should be used to determine rate and frequency for applying pest control (which may include chemical, cultural, and biological controls) to maintain pest population levels below identified thresholds. If no effective non-pesticide control measures are available, a key concept of integrated pest management is that selected pesticides should result in the lowest possible risk to health or the environment. The University of Massachusetts Extension provides a more detailed background and ongoing guidance regarding integrated pest management at (http://ag.umass.edu/integrated-pest-management).

ROADWAY AND PARKING AREA DESIGN

In WHPAs and PPWSAs, roadways and parking areas should be designed to minimize impervious area, with pervious construction materials used whenever possible to minimize the impact of stormwater on drinking water supplies.

PROJECTS IN IMPAIRED AREAS

Areas where water quality has been degraded by land uses such as high-density residential, commercial, or industrial development; landfills, septage, and wastewater treatment discharges; and areas downgradient of these sources that are similarly impacted are considered Impaired Areas.

Projects located in Impaired Areas that are outside other mapped water resource areas including WHPA's, PPWSA, MWRAs and FWRAs may use existing groundwater quality data, distance from existing natural or built water resources, and position upstream or downstream of those resources relative to groundwater flow direction to demonstrate that nitrogen loading above 5 ppm will not adversely impact those resources.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE WR2

Objective WR2 *– Protect, preserve and restore fresh water resources*

Prevent loading of phosphorous to fresh water resources

Phosphorous, unlike nitrogen, is attenuated in the subsurface through sorption to soil minerals or uptake during microbial or plant growth. Studies of phosphorous transport support regionally accepted use of a 300 foot buffer for purposes of protecting freshwater resources from wastewater discharges. Therefore, siting septic systems outside a 300 foot upgradient buffer to fresh surface waters, and maintaining or increasing the width of vegetative buffers with active plant growth will be protective of water quality. For projects with sufficiently large flows in pond recharge areas, the phosphorous load may exceed the attenuation rate of the soils and ultimately result additional phosphorous loading to the pond even when the discharge is located greater than 300 feet upgradient of the pond. In these situations, additional modeling which looks at groundwater flow, soil characteristics, and wastewater characteristics will be required to characterize the site and evaluate the expected extent of phosphorous transport, as appropriate.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE WR3

Objective WR3 *– Protect, preserve and restore marine water resources*

Prevent and mitigate loading of nutrients and other contaminants to marine water resources

Cape Cod's marine waters provide a variety of complex habitats necessary to support shellfish populations, marine fisheries, migratory birds, and many other plant and wildlife populations. Less than 25% of the Cape Cod land surface drains to open marine waters (e.g., Cape Cod Canal, Cape Cod Bay, Nantucket Sound, Atlantic Ocean). Instead, the majority of land surfaces discharge to estuaries or coastal embayments through groundwater flow in the Cape Cod aquifer. Marine Water Recharge Areas (MRWA) are defined as watershed areas that contribute to a marine embayment as defined by the topography of the water table.

As of 2018, the Massachusetts Estuary Project (MEP) has studied 40 of Cape Cod's 53 coastal embayments. MEP continues to study coastal embayments on Cape Cod to determine the critical nitrogen load for each embayment, which is the maximum amount of nitrogen input that can be assimilated without negatively impacting ecosystem function and provision of habitat. A total maximum daily load (TMDL) is the maximum amount of a pollutant that a waterbody can assimilate on a daily basis and still support a healthy ecosystem, which for Cape Cod's coastal embayments is determined by MassDEP based on the results of the MEP studies. Four of the embayments studied to date have been found to have assimilative capacity for nitrogen; therefore, no TMDL is necessary at this time. The remaining watersheds that have been studied require nitrogen reduction to achieve healthy ecosystem function.

Additional information about the MEP, embayment reports, and applicable TMDLs is available at the MassDEP website (https://www.mass.gov/guides/the-massachusetts-estuaries-project-and-reports).

The Cape Cod Section 208 Area Wide Water Quality Management Plan (208 Plan Update) was completed in 2015 in response to the need for a new approach to planning for and implementing nitrogen reduction plans and projects to achieve the critical nitrogen loads. The 208 Plan Update expands the available nutrient reduction strategies beyond source reduction to include remediation and restoration

approaches. This allows for a range of strategies to be employed, depending on the placetype and context within the watershed of the area where nitrogen reduction is needed (ex. in-embayment strategies, such as the use of aquaculture, may be used in watersheds where low density development causes inefficient source reduction from a cost perspective). The 208 Plan Update provides a framework for applying watershed based solutions to reduce nitrogen in impaired embayments. CWMPs, TWMPs, and other municipal nutrient management plans and projects deemed consistent with the 208 Plan Update and those that are permitted by MassDEP through a watershed permit determine the approach and timing of solutions within an individual watershed or sub-watershed, and development that conforms with the approved nutrient management plan is considered to meet Objective WR3.

Development is generally prohibited from adding nitrogen to areas that contribute to nitrogen-overloaded coastal waters. Embayments which have nitrogen loading greater than or equal to their critical nitrogen loads are considered nitrogen-overloaded and may or may not have a TMDL associated with them. Documented water quality problems may also exist (e.g., shellfish or beach closures, failure to meet Massachusetts Surface Water Quality Standards) in areas where a critical nitrogen load or TMDL has not yet been established, in which case projects are required to mitigate or offset any proposed nitrogen load as described below. Nitrogen additions from the proposed project may be mitigated by connecting existing development to an existing sewer system, by tying-in and providing wastewater treatment to existing development currently served by septic systems, or by other means that result in the overall nitrogen load within the (sub)watershed being maintained or reduced. Applicants proposing to use this form of mitigation should provide a calculation of the expected nitrogen load generated by the project, the existing nitrogen sources (number, type, estimated load) proposed for mitigation, and a detailed description of the means by which treatment of those sources will be implemented (which could include financing of sewer tie-ins, a contract to provide wastewater treatment, installation and operation of I/A systems at existing properties, or other means of demonstrating how the proposed mitigation will ultimately be achieved).

Projects proposed in Placetype areas where development is encouraged and infrastructure needed to meet nitrogen reduction requirements is lacking may provide a monetary offset of the project's nitrogen load which can be used to support expansion of wastewater treatment operations.

MONETARY NITROGEN OFFSET

Natural Areas | No monetary nitrogen offset available

Rural Development Areas | Monetary nitrogen offset available where appropriate

Suburban Development Areas | Monetary nitrogen offset available where appropriate

Historic Areas | Monetary nitrogen offset available where appropriate

Maritime Areas | Monetary nitrogen offset available

Community Activity Center | Monetary nitrogen offset available

Industrial Activity Center | Monetary nitrogen offset available

Military and Transportation Areas | Monetary nitrogen offset available

Activity centers may have existing sewer collection and treatment systems, or have sufficient density of development and other infrastructure to justify future connection to sewer systems. To promote the desired development density and facilitate future sewering, projects in Community Activity Centers, Maritime Areas, Industrial Activity Centers or Military and Transportation Areas without available sewer connections may contribute a monetary offset calculated as up to $8,290 per kilogram per year nitrogen load to be offset. The monetary offset is based on the cost of removing one kilogram of nitrogen per year for 20 years using a conventional sewer collection system and municipal wastewater treatment and applies to all project nitrogen sources (ie. wastewater, stormwater, fertilizer). The monetary offset is calculated based on reductions from 26.25 ppm, consistent with the MEP assumption for a standard septic system and with values used for planning purposes in watershedMVP. See Appendix C for further information on the methodology. An alternative analysis of per kilogram nitrogen costs may be submitted so long as it is consistent with a locally approved plan. The Commission may utilize a proposed alternative analysis to determine offset costs, as appropriate.

Patterns of development in Suburban Development Areas are generally too spread out to make centralized wastewater collection financially feasible, while Historic Areas may

present special challenges to sewering in terms of access below grade and age of existing infrastructure. For these reasons monetary offsets are allowed in limited circumstances at the discretion of the Commission in those Placetype Areas. Factors that will be considered in determining offsets in these placetypes might include, but are not limited to, existing development, business and community activity, a community's vision for the area as described in their Local Comprehensive Plan or other planning documents, and any plans for construction of infrastructure that will take place within five years.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE WR4

Objective WR4 *– Manage and treat stormwater to protect and preserve water quality*

Undisturbed natural areas generally slow the velocity of runoff, allowing natural processes to remove nutrients and contaminants and facilitating recharge so that rain largely stays where it falls. When natural areas are covered by impervious surfaces, the resulting stormwater runoff from rainfall or snow melt travels at higher velocities and in more concentrated flows, making both infiltration and removal of nutrients or contaminants more challenging. As rainfall amounts and patterns continue to change, the increased frequency of high intensity storms present challenges and risks to many forms of infrastructure. Stormwater systems designed to handle increased runoff in a distributed and decentralized manner should be an integral part of community planning for water quality, flood protection, climate resilience, and capital infrastructure. Across the Commonwealth of Massachusetts, untreated stormwater runoff is the single largest source of water body impairment. In order to maintain and improve the health of Cape Cod's water resources and the communities that depend on them, it is critical to manage both the quantity and quality of stormwater runoff that is generated by development.

Stormwater system design

To protect existing water resources and maintain safety by preventing flooding/ponding of water on roadways, stormwater systems must be designed to both capture and infiltrate rainfall from roadways, parking lots, and rooftops on the project site. Stormwater runoff collects sediment, bacteria, nutrients, and pollutants from the impervious surfaces it flows over, which negatively impact ground and surface water resources if not adequately treated. Properly designed and maintained treatment BMPs minimize the amount of these pollutants that are ultimately discharged to surface waters and groundwater. The Massachusetts Stormwater Handbook (https://www.mass.gov/guides/massachusetts-stormwater-handbook-and-stormwater-standards) provides guidance for designing stormwater structures to meet the water quality treatment and storage/infiltration aspects of Objective WR4. To best account for changing patterns in precipitation, updated projections for extreme precipitation events should be used whenever designing new stormwater systems. The Massachusetts Stormwater Handbook currently uses precipitation data from U.S.

Weather Service Technical Paper 40, which was published in 1961. Projections from the National Oceanic and Atmospheric Administration (NOAA Atlas 14, published 2015) and Northeast Regional Climate Center (Extreme Precipitation Analysis, http://precip.eas.cornell.edu/) utilize much more recent data than Technical Paper 40, and MassDEP currently recommends using the most conservative (largest) rainfall volume from among the three resources.

Applicants should provide a stormwater maintenance and operation plan certified by a Professional Engineer that details a schedule for inspection, monitoring, and maintenance; and identifies the party responsible for implementation. The applicant should also agree to provide a Professional Engineer certified letter that details inspection of the stormwater facilities one year after completion and certifies that the system was installed and continues to function as designed and approved.

SEPARATION FROM HIGH GROUNDWATER

A calculation of the high groundwater level is required to be performed when this method is applicable to ensure that stormwater facilities are designed to maintain the proper 2 foot separation from the water table under all conditions. Appendix B – Estimation of High Groundwater Levels describes a calculation that may be used to adjust water levels measured at discrete Cape Cod locations and estimate high groundwater levels at those same locations. The approach was developed in cooperation with the US Geological Survey and is based on historic long-term groundwater-level measurements at index wells located across Cape Cod.

TOTAL SUSPENDED SOLIDS REMOVAL AND WATER QUALITY TREATMENT VOLUME

Stormwater systems are required to be designed to remove 80% of Total Suspended Solids (TSS) and provide water quality treatment for the first inch of precipitation from all impervious surfaces on the site. An estimate of the TSS removal achieved in the stormwater treatment train(s) can be performed using MassDEP's TSS Removal Calculation Worksheet. (https://www.mass.gov/files/documents/2016/08/nn/tss.xls)

The required water quality treatment volume can be calculated using the following equation.

*WQ treatment volume (ft^3) = impervious area (ft^2) * (1 inch / 12 inches per foot)*

Storage/treatment volume provided by most stormwater BMPs can be calculated with a stage-storage table, where the incremental volume of each stage is given by

$$\textit{Incremental volume } (ft^3) = (elevation_2 - elevation_1) * ((area_2 + area_1)/2)$$

Table 1: Example stage-storage volume calculation

ELEVATION (FT)	SURFACE AREA (FT^2)	INCREMENTAL VOLUME (FT^3)	CUMULATIVE VOLUME (FT^3)
72.5	210	0	0
73	660	217.5	217.5
73.5	1,020	420	637.5
74	1,500	630	1267.5

The *Massachusetts Stormwater Handbook* contains detailed explanations, examples, and guidance for additional methods which may be used to calculate required volume(s) in Volume 3, Chapter 1 – Standard 4.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE WR5

Objective WR5 *– Manage groundwater withdrawals and discharges to maintain hydrologic balance in a way that is protective of surface and groundwater resources*

Projects that exceed 20,000 gpd withdrawals must provide adequate groundwater characterization to demonstrate that drawdown of the groundwater due to pumping will not negatively impact nearby surface waters and wetlands, which may be connected to and fed by groundwater. The study should include mapping of surface water morphology and comparison of existing and affected water-table fluctuations. In addition, wastewater discharges should provide adequate groundwater characterization to determine the maximum expected height of groundwater mounds and the potential for groundwater with this additional mounding to breakout above the land surface. Projects should provide a high groundwater estimation consistent with the methodology of Appendix B –Estimation of High Groundwater Levels to incorporate into modeling of potential mounding.

DETAILED WATER RESOURCES APPLICATION REQUIREMENTS

1. The project narrative should include a description of the site location and any applicable resource areas, existing site conditions, and how the proposed project will change those conditions during and after construction. Areas that should be considered include:
    a. Presence of existing and proposed drinking water wells within 400 feet of project boundaries
    b. Quantity of wastewater generation expected and proposed treatment
    c. Source of drinking water supply
    d. Changes in natural and impervious area cover
    e. Stormwater management and treatment
    f. for previously developed sites a description of historical site usage, and if a reportable release under the MCP has occurred at the project site or if a Site Release Tracking Number (RTN) has been assigned for the site by MassDEP, a Chapter 21E site assessment or other Environmental Site Assessment information is required to be submitted for Commission review when method is utilized.
2. A calculation of site-wide nitrogen loading should be performed using the method described in Appendix A.
3. The site design should specify the location of the proposed septic system or wastewater treatment facility and identify downgradient resources as described in WR1 – detailed methods.
4. The stormwater report should include a description of the proposed system (for small systems, the description in the project narrative may be sufficient) and the following information as necessary:
    a. Soil survey and / or boring logs
    b. Calculation of high groundwater level to ensure that stormwater facilities are designed with proper separation from the water table as described in WR4 – detailed methods.
    c. Estimate of TSS removal achieved in stormwater treatment train(s) using MassDEP's TSS Removal Calculation Worksheet (https://www.mass.gov/files/documents/2016/08/nn/tss.xls)
    d. Calculation of required water quality treatment volume and treatment volume provided as described in WR4 – detailed methods.

    e. Engineering design drawings or cut sheets for proposed stormwater system components

5. Operations and maintenance plans for all proposed water systems (drinking water supply, stormwater, and wastewater treatment) should be submitted for Commission review

DEFINITIONS

Best Management Practice (BMP) – structural or procedural control measures implemented to reduce the quantity and velocity of stormwater runoff, and improve water quality

Fresh Water Recharge Area (FWRA) – Watershed area that contributes to a fresh water pond as defined by the topography of the water table.

Hazardous Material – Any chemical or substance that when released into the environment will pose a significant contaminant threat to groundwater and drinking water supplies.

Hazardous Materials / Hazardous Wastes, Household Quantity of – quantities less than the following limits are considered Household Quantities:

(a) 275 gallons of oil on site at any time to be used for heating of a structure, or to supply an emergency generator
(b) 25 gallons or equivalent dry weight, total, of Hazardous material(s) on site at any time (excluding oil as classified in part (a))
(c) 55 gallons of Hazardous Waste generated at the Very Small Quantity Generator level as defined in Massachusetts Hazardous Waste Regulations (310 CMR 30.000) and accumulated or stored on-site at any time.

Hazardous Waste – Any Hazardous Waste, Universal Waste, or Waste as defined in the Massachusetts Hazardous Waste Regulations (310 CMR 30.010), not including Hazardous Materials or biomedical wastes regulated under the Massachusetts State Sanitary Code (105 CMR 480.00).

Impaired Area –Impaired Areas are where groundwater may have been degraded by point and non-point sources of pollution, including but not limited to areas with unsewered residential developments with an average lot size of less than 20,000 square feet; landfills, septage, and wastewater treatment plant discharge sites; and areas of high-density commercial and industrial development and those downgradient areas where groundwater may have been degraded by those sources.

Impervious Area – Land area that is covered by surfaces which do not permit precipitation to naturally recharge. Typically includes paved surfaces, roadways, parking areas, and rooftops.

Infill – Development of new housing, commercial, or other amenities on scattered or discontinuous sites within existing substantially built-up areas.

Marine Water Recharge Area (MWRA) – Watershed area that contributes to a marine embayment as defined by the topography of the water table, and determined by United States Geological Survey (USGS) modeling as part of the Massachusetts Estuaries Project (MEP)

Potential Public Water Supply Area (PPWSA) – Land identified as suitable for the development of public water supplies.

Wastewater treatment facility (WWTF) – Wastewater treatment and collection systems that are designed to treat flows greater than 10,000 gallons per day.

Wellhead Protection Area (WHPA) - Lands receiving precipitation that contribute to the recharge of public drinking water supply wells are considered Wellhead Protection Areas (WHPA). These include MADEP approved Zone IIs, interim wellhead protection areas, and certain town delineated water protection districts that extend beyond the Zone II limits.

REFERENCES

Cape Cod Commission, 1992. Estimation of High Groundwater Levels for Construction and Land Development, Technical Bulletin 92-001

Cape Cod Commission, 1999. Priority Land Acquisition Assessment Project – A guide to evaluating the suitability of land for future water supply sites

Cape Cod Commission, 2001. Priority Land Acquisition Assessment Project Phase II

Massachusetts Estuaries Project and Reports
https://www.mass.gov/guides/the-massachusetts-estuaries-project-and-reports

The Massachusetts Stormwater Handbook and Stormwater Standards (https://www.mass.gov/guides/massachusetts-stormwater-handbook-and-stormwater-standards)

National Weather Service, 1961. Technical Paper 40: Rainfall Frequency Atlas of the United States

National Oceanic and Atmospheric Administration, 2015. Atlas 14 Precipitation Frequency Data Server
https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html

Northeast Regional Climate Center, 2011. Extreme Precipitation Analysis.
http://precip.eas.cornell.edu/

USGS, 1986. Ground-Water Resources of Cape Cod, Massachusetts Hydrologic Investigations Atlas-692

United States Environmental Protection Agency, 2009. Incorporating Environmentally Sensitive Development into Municipal Stormwater Programs
https://www.epa.gov/sites/production/files/2015-11/documents/region3_factsheet_lid_esd.pdf

Metropolitan Area Planning Council, 2014. Low Impact Development Toolkit
https://www.mapc.org/resource-library/low-impact-development-toolkit/

Grow Smart Maine, 2015. Building "Smart": Environmentally Sensitive Design
https://growsmartmaine.org/wp-content/uploads/2015/08/Enviro_Sensitive_Design-Final-21-Nov-06.pdf

University of Massachusetts Extension, 2018. Integrated Pest Management Program
http://ag.umass.edu/integrated-pest-management

APPENDIX A: NITROGEN LOADING GUIDANCE FOR WATER RESOURCES

The Water Resource Goal of the Cape Cod Commission's Regional Policy Plan is "to maintain a sustainable supply of high quality untreated drinking water and protect, preserve or restore the ecological integrity of fresh and marine surface waters." The Water Resources Technical Bulletin contains five (5) Objectives that are distinguished by Water Resource Area and Placetype. The Water Resource Areas are: Wellhead Protection Areas, Fresh Water Recharge Areas, Marine Water Recharge Areas, and Potential Water Supply Areas. The Water Resources Technical Bulletin also recognizes Impaired Areas where water quality may have been impaired from existing development.

The applicant will need to know specific project information to complete a nitrogen loading calculation

A methodology has been adopted by the Commission for calculating groundwater nitrogen loading concentrations. The methodology is based on information and parameters describing wastewater flows; stormwater runoff volumes; lawn sizes, fertilization and leaching rates; respective nitrogen masses and concentrations attributable to these nitrogen sources, and precipitation dilution factors as described below and shown in the example calculations.

WORKSHEET INSTRUCTIONS

The applicant will need to know the information listed below to complete a Nitrogen Loading calculation:

Identify the Water Resource Area the project is located in, if any (RPP Data Viewer);

1. Upland area of site (square feet);
2. Wastewater flow rate (calculated pursuant to 310 CMR 15.203);
3. Actual Flow rate determined by occupancy rate;
4. Average residential flow rate, calculated from the Title 5 design + the Actual Flow rate
5. Type of septic system proposed (e.g. alternative design pursuant to 310 CMR 15.280);
6. Paved and roof areas (assumed 2,500 square feet for residential projects);

7. Proposed lawn area (assumed 5,000 square feet for residential projects);

A summary of Nitrogen Loading conversion factors and sample calculations are shown on the following pages.

A Nitrogen Loading and Mitigation Worksheet is available at www.capecodcommission.org/NitrogenWorksheet.

SUMMARY OF NITROGEN LOADING VALUES

TARGET CONCENTRATION: 5 ppm (milligram/liter) NO3-N

WASTEWATER

Residential Concentration: 35 ppm NO3-N
Flow: Title 5 (310 CMR 15.02)
Non-residential Concentration: 35 ppm NO3-N
Flow: Title 5 Design or actual documented flows

OCCUPANCY: Range (Actual town rate to 2 people per bedroom)

LAWNS

Area: 5,000 ft2
Fertilizer: 3 lbs/1,000 ft2 of lawn
Leaching: 25%

RECHARGE

From impervious surfaces: 40 inches per year

Concentrations
Road runoff: 1.5 ppm NO3-N
Roof runoff: 0.75 ppm NO3-N

Natural areas

Barnstable:	18 inches per year
Bourne:	21 in/yr
Brewster:	17 in/yr
Chatham:	16 in/yr
Dennis:	18 in/yr
Eastham:	16 in/yr
Falmouth:	21 in/yr
Harwich:	17 in/yr
Mashpee:	19 in/yr
Orleans:	16 in/yr
Provincetown:	16 in/yr
Sandwich:	19 in/yr
Truro:	16 in/yr
Wellfleet:	16 in/yr
Yarmouth:	18 in/yr

EXAMPLE RESIDENTIAL LOADING CALCULATIONS

Home (3 bedrooms)
Lot Size: 1 acre (43,560 ft²)
Impervious Surfaces: Roof Area: 2,000 ft²; Paving Area: 500 ft²
Natural Area: 41,060 ft²; Lawn Area: 5,000 ft²
Title V Flow: 110 gallons/day per bedroom

WASTEWATER

Title V (2 people per bedroom)

$$3 \text{ bedrooms} \left[\frac{110 \text{ gpd}}{\text{bedroom}}\right]\left[\frac{3.785 \text{ L}}{\text{gal}}\right] = 1{,}249.0 \text{ L/d} \quad \left[\frac{35 \text{ mg}}{\text{L}}\right] = 43{,}716.8 \text{ mg/d}$$

Actual (assume 2.5 people/unit average occupancy within the town)

$$3 \text{ bedrooms} \left[\frac{110 \text{ gpd}}{\text{bedroom}}\right]\left[\frac{3{,}785 \text{ L}}{\text{gal}}\right]\left[\frac{2.5}{6}\right] = 520.4 \text{ L/d} \quad \left[\frac{35 \text{ mg}}{\text{L}}\right] = 18{,}214.6 \text{ mg/d}$$

IMPERVIOUS SURFACES

$$2{,}000 \text{ ft}^2 \left[\frac{40 \text{ in}}{\text{yr}}\right]\left[\frac{\text{ft}}{12 \text{ in}}\right]\left[\frac{28.32 \text{ L}}{\text{ft}^3}\right]\left[\frac{1 \text{ yr}}{365 \text{ d}}\right] = 517.3 \text{ L/d} \quad \left[\frac{0.75 \text{ mg}}{\text{L}}\right] = 387.9 \text{ mg/d}$$

$$500 \text{ ft}^2 \left[\frac{40 \text{ in}}{\text{yr}}\right]\left[\frac{\text{ft}}{12 \text{ in}}\right]\left[\frac{28.32 \text{ L}}{\text{ft}^3}\right]\left[\frac{1 \text{ yr}}{365 \text{ d}}\right] = 129.3 \text{ L/d} \quad \left[\frac{1.5 \text{ mg}}{\text{L}}\right] = 194.0 \text{ mg/d}$$

LAWN

$$5{,}000 \text{ ft}^2 \left[\frac{3 \text{ lbs}}{1{,}000 \text{ ft}^2 * \text{yr}}\right]\left[\frac{1 \text{ yr}}{365 \text{ d}}\right]\left[\frac{454{,}000 \text{ mg}}{\text{lb}}\right]\left[0.25\right] = 4{,}664.4 \text{ mg/d}$$

NATURAL

$43{,}560 \text{ ft}^2 - 2{,}500 \text{ ft}^2 = 41{,}060 \text{ ft}^2$

$$41{,}060 \text{ ft}^2 \left[\frac{1.5 \text{ ft}}{\text{yr}}\right]\left[\frac{28.32 \text{ L}}{\text{ft}^3}\right]\left[\frac{1 \text{ yr}}{365 \text{ d}}\right] = 4{,}778.7 \text{ L/d}$$

SUMMARY

$$\text{Title V Flow} \quad \frac{43{,}716.8 + 387.9 + 194.0 + 4{,}664.4 \text{ mg}}{1{,}249.0 + 517.3 + 129.3 + 4{,}778.7 \text{ liters}} = \frac{48{,}963.1 \text{ mg}}{6{,}674.3 \text{ liters}} = 7.34 \text{ ppm}$$

$$\text{Actual} \quad \frac{18{,}214.6 + 387.9 + 194.0 + 4{,}664.4 \text{ mg}}{520.4 + 517.3 + 129.3 + 4{,}778.7 \text{ liters}} = \frac{23{,}460.9 \text{ mg}}{5{,}945.7 \text{ liters}} = 3.95 \text{ ppm}$$

Final Calculation $(7.34 + 3.95)/2 =$ **5.65 ppm**

EXAMPLE NONRESIDENTIAL LOADING CALCULATIONS

Office Building:

Lot Size: 5 acres (217,800 ft^2)
Impervious Surfaces: Roof Area: 15,000 ft^2; Paving Area: 30,000 ft^2
Natural Area: 172,800 ft^2; Lawn Area: 10,000 ft^2
Title V Flow: 75 gallons/day per 1,000 ft^2

WASTEWATER

$$15{,}000\ ft^2 \left[\frac{75\ gpd}{1{,}000\ ft^2}\right]\left[\frac{3.785\ L}{gal}\right] = 4{,}258.1\ L/d \qquad \left[\frac{35\ mg}{L}\right] = 149{,}034.4\ mg/d$$

IMPERVIOUS SURFACES

$$15{,}000\ ft^2 \left[\frac{40\ in}{yr}\right]\left[\frac{ft}{12\ in}\right]\left[\frac{28.32\ L}{ft^3}\right]\left[\frac{1\ yr}{365\ d}\right] = 3{,}879.5\ L/d \quad \left[\frac{0.75\ mg}{L}\right] = 2{,}909.6\ mg/d$$

$$30{,}000\ ft^2 \left[\frac{40\ in}{yr}\right]\left[\frac{ft}{12\ in}\right]\left[\frac{28.32\ L}{ft^3}\right]\left[\frac{1\ yr}{365\ d}\right] = 7{,}758.9\ L/d \quad \left[\frac{1.5\ mg}{L}\right] = 11{,}638.4\ mg/d$$

LAWN

$$10{,}000\ ft^2 \left[\frac{3\ lbs}{1{,}000\ ft^2 * yr}\right]\left[\frac{1\ yr}{365\ d}\right]\left[\frac{454{,}000\ mg}{lb}\right]\left[0.25\right] = 9{,}328.8\ mg/d$$

NATURAL

$$5\ acres \left[\frac{43{,}560\ ft^2}{acre}\right] = 217{,}800\ ft^2; \quad 217{,}800\ ft^2 - 45{,}000\ ft^2 = 172{,}800\ ft^2$$

$$172{,}800\ ft^2 \left[\frac{1.5\ ft}{yr}\right]\left[\frac{28.32\ L}{ft^3}\right]\left[\frac{1\ yr}{365\ d}\right] = 20{,}111.1\ L/d$$

SUMMARY

$$\frac{149{,}304.4 + 2{,}909.6 + 11{,}638.4 + 9{,}328.8\ mg}{4{,}258.1 + 3{,}879.5 + 7{,}758.9 + 20{,}111.1\ liters} = \frac{172{,}911.2\ mg}{36{,}007.6\ liters} = \boxed{4.80\ ppm}$$

DRAFT

Water Resources Nitrogen Loading and Mitigation Worksheet

See Technical Bulletin 91-001 for further details: http://www.capecodcommission.org/regulatory/NitrogenLoadTechbulletin.pdf

Project Nitrogen Load — ***Wastewater*** — ***Proposed development***

1.

Enter value — Project Title-5 wastewater flows: ____ gpd — **(a)**

Enter value — Actual wastewater flows: ____ * — **(b)**

Calculated value — Average wastewater flows: ____ gpd **(a)+(b) +2=** — **(A)**

* Title-5 flows prescribed by TB91-001 for commercial uses

Place √ in applicable box:

Yes	No	
☐	☐	Will the project be connected to sewer ?
☐	☐	Is project Title-5 wastewater flow 10,000 gpd or greater ? ***(If 'Yes', then the project must be reviewed for consistency with MPS WR6)***

Place √ in applicable box and multiply unsewered wastewater flow by applicable conversion factor:

☐	Standard Title-5 System (35-ppm-N)	x 0.048359	} Type of system: _____
☐	DEP-approved I/A System (25-ppm-N)	x 0.034542	
☐	DEP-approved I/A System (19-ppm-N)	x 0.026252	
☐	Groundwater Discharge (10-ppm-N)	x 0.013817	

Calculated value — Wastewater nitrogen load **(Title-5 flows)** = ____ kg-N/yr — **(B)**

Calculated value — Wastewater nitrogen load **(Actual flows)** = ____ kg-N/yr — **(C)**

Stormwater Runoff

Town: _____ Recharge rate for town (inches; for natural areas from Technical Bulletin 91-001): : ____ **(RECH)**

Enter value — Project site area: ____ acres — **(D)**

Enter value — Project site wetland area: ____ acres — **(E)**

Calculated value — Project site upland area: ____ acres — **(F)**

Calculated value — Pervious unpaved upland: ____ acres — **(G)**

Enter values — ____ % using LID — Paved area: ____ s.f. — **(H)**

Factor may be adjusted for employment of LID → x 1.4158E-04

Calculated value = ____ kg-N/yr — **(I)**

Enter value — Roof area: ____ s.f. — **(J)**

x 7.0792E-05

Calculated value = ____ kg-N/yr — **(K)**

Fertilizer

Enter value — Managed turf: ____ s.f.

x 3.4019E-04

Calculated value = ____ kg-N/yr — **(L)**

Total Nitrogen Load

Calculated value — Total project nitrogen load **(Title-5 flows)**: ____ kg-N/yr — **(M)= (B)+(I)+(K)+(L)**

Calculated value — Total project nitrogen load **(Actual flows)**: ____ kg-N/yr — **(N)= (C)+(I)+(K)+(L)**

Calculated value — Nitrogen load per acre **(Average)**: ____ kg-N/yr/acre — **(O)= (M)+(N) +2 +(F)**

Nitrogen Loading Concentration

Calculated value — Project nitrogen loading concentration (**Title-5 flows**): ____ ppm-N — **(P)=** $\frac{(M)}{(a)+723.76 + (G)x(RECH)+9.7286 + (H)+10,594 + (K)+0.75}$

Calculated value — Project nitrogen loading concentration (**Actual flows**): ____ ppm-N — **(Q)=** $\frac{(N)}{(b)+723.76 + (G)x(RECH)+9.7286 + (H)+10,594 + (K)+0.75}$

Calculated value — Project nitrogen loading concentration (**Average**): ____ ppm-N — **(R)= (P)+(Q) +2**

next page -->

Existing (if redevelopment)

Calculate (A') through (P') as w/ (A) through (P):

Title-5 wastewater flows: ____ gpd

Actual wastewater flows: ____ *

Ave. wastewater flows: ____ gpd — **(A')**

Place √ in applicable box:

Yes	No	
☐	☐	Is existing development on sewer ? (If 'Yes', then go to line 2.)

☐	Standard Title-5 System
☐	DEP-approved I/A System (commercial)
☐	DEP-approved I/A System (residential)
☐	Wastewater Treatment Facility (GWDP)

____ kg-N/yr — **(B')**

____ kg-N/yr — **(C')** wastewater offsets

Project site area: ____ acres — **(D)**

Project site wetland area: ____ acres — **(E)**

Project site upland area: ____ acres — **(F)**

Pervious unpaved upland: ____ acres — **(G')**

Paved area: ____ s.f. — **(H')**

Paving runoff offset: ____ kg-N/yr — **(I')**

Roof area: ____ s.f. — **(J')**

Roof runoff offset: ____ kg-N/yr — **(K')**

Managed turf: ____ s.f.

Fertilizer offset: ____ kg-N/yr — **(L')**

Existing nitrogen load (Title-5 flows): ____ kg-N/yr — **(M')**

Existing nitrogen load (Actual flows): ____ kg-N/yr — **(N')**

Nitrogen offset per acre: ____ kg-N/yr/acre — **(O')**

Existing nitrogen loading concentrations:

Title-5 flows ____ ppm-N — **(P')**

Actual flows ____ ppm-N — **(Q')**

Average ____ ppm-N — **(R')**

Resource/ Impact Based Criteria

Marine Water Recharge Areas

Yes No

2. ☐ ☐ Is the project in Marine Water Recharge Area (MWRA, Map WR3) with a nitrogen-loading limit OR in a MWRA that discharges to coastal waters with documented impaired water quality** ?
(If 'No', then go to line 3.)

Name of Marine Water Recharge Area sub-embayment
(*from RPP Water Resource Classification Map II*):

Enter value Fair Share nitrogen-loading limit** : ☐ kg-N/year/acre **(S)**

☐ ☐ Does project's nitrogen load **(O)** exceed the existing load **(O')** AND the critical nitrogen load **(S)** ?
(If 'No', then go to line 3.)

Calculated value Excess project nitrogen load to be mitigated: ☐ kg-N/yr **(T)=** LESSER OF **(O)-(S) x(F)** AND **(O)-(O') x(F)**

x 1,550

Calculated value = $ ☐ **(U)**

☐ Place √ in box if applicant intends to make this payment **(S)**
(If not checked, then the project must provide an alternative strategy for meeting its Fair Share nitrogen load pursuant to MPS WR3.4)

*** Fair Share nitrogen-loading limit is determined through either a Total Maximum Daily Load (TMDL), a Massachusetts Estuaries Project-accepted technical report, or specified by a Commission-approved comprehensive wastewater management plan pursuant to MPS WR3.1 & WR3.3. If a nitrogen-loading limit is unavailable and impaired water quality has been documented for the receiving coastal waters, the nitrogen loading limit shall be 0 kg-N/yr per acre pursuant to MPS WR3.2.*

Groundwater Quality

Yes No

3. ☐ ☐ Does the project's nitrogen loading concentration in groundwater **(R)** exceed the greater of **5 ppm** *or* the existing concentration **(R')** ?
(If 'Yes' and the project is located in a Water Quality Improvement Area (Map WR5), the project may need to provide an alternative strategy for meeting MPS WR1.1 and WR5.4)

Potential Public Water Supply Areas

Yes No

4. ☐ ☐ Is project in a Potential Public Water Supply Area (PPWSA, Map WR2) ?
(If 'No', then go to line 5.)

☐ ☐ Has the Town or local water district documented the release of the site from consideration as a PPWSA ?
(If 'Yes', then go to line 5.)

☐ ☐ Does the project's nitrogen loading concentration **(R)** exceed the greater of **1 ppm** *or* the existing concentration **(R')** ?
(If 'Yes', the project must provide an alternative strategy for meeting MPS WR2.6)

☐ ☐ Does the project use, treat, generate, store or dispose of hazardous materials in excess of the greater of a) household quantities or b) existing quantities ?
(If 'Yes', the project must provide an alternative strategy for meeting MPS WR2.2)

Wellhead ProtectionAreas

Yes No

5. ☐ ☐ Is project in a Wellhead Protection Area (WHPA, Map WR2) ?
(If 'No', then go to line 6.)

☐ ☐ Does the project's nitrogen loading concentration **(R)** exceed the greater of **5 ppm** *or* the existing concentration **(R')** ?
(If 'Yes' and the project is located in a Water Quality Improvement Area (Map WR5), the project must provide an alternative strategy for meeting MPS WR2.1)

☐ ☐ Does the project use, treat, generate, store or dispose of hazardous materials in excess of the greater of a) household quantities or b) existing quantities ?
(If 'Yes', the project must provide an alternative strategy for meeting MPS WR2.2)

Fresh Water Recharge Areas

Yes No

6. ☐ ☐ Is project wastewater disposed of within 300 feet of a stream or fresh surface water body (Map WR4)?
(If 'No', then go to line 7.)

☐ ☐ Is the project located hydraulically upgradient of a stream or fresh surface water body ?
(If 'Yes', the project must provide an alternative strategy for meeting MPS WR4.1)

Other Potential Impacts

Yes No

7. ☐ ☐ Will the project withdraw more than 20,000 gallons of water per day ?
(If 'Yes', then the project must provide documentation demonstrating that there will not be significant impacts to water levels, surface waters and wetlands)

8. ***The project must demonstrate compliance with MPS WR1 and MPS WR7, including use of Low Impact Development to mitigate impacts of stormwater runoff and O & M plans for maintaining stormwater infrastructure and landscaping.***

APPENDIX B: ESTIMATION OF HIGH GROUND-WATER LEVELS

The Water Resources Technical Bulletin Appendix B - Estimation of High GW is available at http://www.capecodcommission.org/resources/regulatory/HighGroundH20TechBulletin.pdf

APPENDIX C: MONETARY NITROGEN OFFSET

For projects that will not connect to sewer, monetary nitrogen offsets may be allowed in certain circumstances. The appropriate Placetypes and methods for providing a monetary nitrogen offset are generally set forth in the 2018 Water Resource Technical Bulletin.

Nitrogen Management Policy

The 2018 RPP encourages growth in certain areas, such as Community Activity Centers, and discourages growth in other areas, such as in Natural Areas. For that reason, the per kilogram nitrogen monetary offset may be applied up to the maximum amount of $8,290; however, a lesser dollar amount per kilogram of nitrogen ($0 to less than $8,290) may be applied in areas where growth is encouraged.

The maximum dollar per kilogram amount of $8,290 for nitrogen offsets is based on Capital and 20-year O&M costs for nitrogen removal by conventional sewering as derived from the Comparison of Costs for Wastewater Management Systems Applicable to Cape Cod, updated in 2014. The infrastructure and operational costs in the 2014 report have not been adjusted for inflation to present day costs. In this regard, the $8,290 per kilogram figure is a conservative estimate of actual costs in that todays costs will be higher.

Calculation of Monetary Nitrogen Offset

Calculated cost to remove nitrogen with a typical wastewater treatment facility:

Capital cost (assumed design flow of 1.5 mgd; 100 linear feet per parcel connected)

$181 million (present worth based on 2014 Cost Report numbers)

- Operations & Maintenance

$1.50 million per year (20-yr planning period)

- Total present worth based on 2014 Cost Report numbers (capital + O&M)

$206 million

- Load removed (20-yr planning period)

24,800 kg-N per year

- Cost efficiency

$8,290 / kg-N removed per year

EXAMPLE OFFSET

- 30-unit residential sub-division (mix of 2- and 3-bedroom)
- Actual flow: 125 gpd per unit; 3,760 gpd total
- Wastewater load to be offset: 136 kg-N/yr
- Calculation of monetary offset

$1.13 million = $206 million x 136 kg-N/yr / 24,800 kg-N/yr

= $8,290 / kg-N per year x 136 kg-N/yr

Ocean Resources

This guidance is intended to clarify how the Ocean Resources Goal and Objectives of the Regional Policy Plan (RPP) are to be applied and interpreted in Cape Cod Commission Development of Regional Impact (DRI) project review. This technical bulletin presents specific methods by which a project can meet these goals and objectives.

Ocean Resources Goal: To protect, preserve, or restore the quality and natural values and functions of ocean resources

- ***Objective OR1*** *– Locate development away from sensitive resource areas and habitats*
- ***Objective OR2*** *– Preserve and protect ocean habitat and the species it supports*
- ***Objective OR3*** *– Protect significant human use areas and vistas*

The applicability and materiality of these goals and objectives to a project will be determined on a case-by-case basis considering a number of factors including the location, context (as defined by the Placetype of the location), scale, use, and other characteristics of a project.

THE ROLE OF CAPE COD PLACETYPES

The RPP incorporates *a framework for regional land use policies and regulations based on local form and context* as identified through categories of Placetypes found and desired on Cape Cod.

The Placetypes are determined in two ways: some are depicted on a map contained within the RPP Data Viewer located at www.capecodcommission.org/RPPDataViewer adopted by the Commission as part of the Technical Guidance for review of DRIs, which may be amended from time to time as land use patterns and regional land use priorities change, and the remainder are determined using the character descriptions set forth in Section 8 of the RPP and the Technical Guidance.

The project context, as defined by the Placetype of the location, provides the lens through which the Commission will review the project under the RPP. Additional detail can be found in the Cape Cod Placetypes section of the Technical Guidance.

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INTRODUCTION

In 2008 the State enacted legislation enabling limited types of development activity within the State's ocean waters, including renewable energy facilities, sand mining, and cable and pipeline installation. In 2009 the Cape Cod Commission worked with Cape communities to develop the Cape Cod Ocean Management Plan, a plan that identified priorities for the protection of ocean based resources and uses. The RPP establishes those recommendations and priorities as goals and objectives. The guidance in this technical bulletin is intended to assist the proponent of offshore development projects in preparing an application for Development of Regional Impact (DRI) review.

The Cape Cod Commission Act requires DRI review for projects where an Environmental Impact Report is required under the Massachusetts Environmental Policy Act (MEPA). Applicants for offshore development projects within the Cape Cod planning area are encouraged to file for Joint Review with MEPA and the Cape Cod Commission, ideally preparing one development proposal document that addresses the requirements of the RPP and MEPA. Where possible, the methods within this bulletin have been designed to be consistent with state regulations to streamline the permitting process. Although the majority of methods discussed in this Technical Guidance are intended to be flexible, certain methods will be required of all DRIs where a particular Ocean Resources objective is applicable.

SUMMARY OF METHODS

GOAL | OCEAN RESOURCES

To protect, preserve, or restore the quality and natural values and functions of ocean resources

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OBJECTIVE OR1 – Locate development away from sensitive resource areas and habitats

METHODS

- Locate development away from designated rare species habitat
- Projects must locate development away from designated prohibited areas for ocean species as identified in Cape Cod Ocean Management Plan
- Locate development away from designated exclusionary areas as identified in the Cape Cod Ocean Management Plan

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OBJECTIVE OR2 – Preserve and protect ocean habitat and the species it supports

METHODS FOR ALL OCEAN RESOURCE AREAS

- Must not impact whales
- Must not impact rare species or their habitats
- Must not impact eelgrass unless there is no feasible alternative, there is a public purpose, and the impacts are minimized and appropriately mitigated.
- Must be designed or construction and operations are timed to protect benthic habitats from direct and indirect impacts, including construction impacts
- Must be designed or construction and operations are timed to protect significant fish resources and habitats, including fish runs
- Must be designed or construction and operations are timed to protect sea turtles from impacts
- Must be designed or construction and operations are timed to protect coastal waterbirds and sea ducks, and their habitats
- Must be designed or construction and operations are timed to protect marine mammals and their habitats
- Project impacts, when considered in conjunction with cumulative impacts of existing development activities, should not degrade ocean habitats and human use areas

- Must manage construction-related noise
- Project siting is coordinated with existing conduit routes in order to minimize damage to the environment.

OBJECTIVE OR3 – Protect significant human use areas and scenic resources

METHODS

- Provides buffers to navigation
- Protects aquaculture and commercial fishing from impacts
- Designed to minimize impacts to ocean-based recreational activities
- Site project to protect sensitive archaeological sites
- Locate and design project to avoid adverse visual impacts to the Cape's cultural, historic, and scenic resources

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DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE OR1

Objective OR1 *– Locate development away from sensitive resource areas and habitats*

Methods Applicable to All Projects in the Ocean

Locate Development Away from Rare Species Habitat

Applicants proposing development in the ocean should refer to mapped rare species habitat in project planning and siting. As a general practice, development should avoid mapped state or federal rare species habitat in order to protect these species from the adverse effects of development. Comments from the Massachusetts Natural Heritage and Endangered Species Program (NHESP) and/or National Marine Fisheries Service (NMFS) may be used to demonstrate that the project will not adversely impact rare species or their habitats (see also OR2 below, and WPH3).

Locate Development Away from Mapped Prohibited Areas

Projects proposed in the ocean should utilize the Cape Cod Ocean Management Plan (CCOMP), as well as state data resources found in MORIS (Massachusetts Ocean Resources Information System) and the Massachusetts Ocean Management Plan (MOMP) (see Resources) to help select suitable locations for development. The CCOMP identified prohibited areas for certain development activities. Sand Mining projects are not allowed within the CCOMP Map of Sand and Gravel Mining Prohibited Areas, and cable and pipeline installations are not allowed within CCOMP Cable and Pipeline Prohibited Areas. Maps of these prohibited areas are available through the Regional Policy Plan Data Viewer and should be consulted when developing project proposals. (Applicants should be aware that state mapping and criteria established through the MOMP will also apply through the state permitting process.)

Locate Development Away from Mapped Exclusionary Areas

The CCOMP also established exclusionary areas where ocean-based development activities are strongly discouraged. Allowable development activities (i.e., those limited development activities allowed through the Ocean Act of 2008, including renewable energy installations, sand and gravel mining, and cable and pipeline installations) may be permitted within these exclusionary areas if the applicant can demonstrate there is

no feasible alternative location, and all applicable methods for meeting the objectives OR1, OR2, and OR3 are met.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE OR2

Objective OR2 *– Preserve and protect ocean habitat and the species it supports*

Methods Applicable to All Projects in the Ocean

Protect Whales

Sand Mining operations and cable/pipeline installations are not permitted from January to May in North Atlantic Right Whale Critical Habitat (comprising all of Cape Cod Bay due north and east of the Cape Cod Canal, as designated by National Marine Fisheries Service (NMFS)). At other times of year, sand mining operations and cable/pipeline installations anywhere in Barnstable County must immediately cease if North Atlantic Right Whale(s) are observed within two (2) miles of such activities. The sighting must be reported to NMFS immediately. Activities may not recommence until such time that NMFS or a NMFS-approved environmental monitor provides written notification of their determination that operations may resume.

Sand mining operations and cable/pipeline installations are not permitted from January to May in the Exclusionary Areas that comprise expanded North Atlantic Right Whale habitat (see Cape Cod Ocean Management Plan Map of Exclusionary Areas). Sand mining operations and cable/pipeline installations may be permitted in these Exclusionary Areas at other times of year provided the applicant can provide clear and convincing evidence that the activity will not cause direct or indirect impacts to North Atlantic Right Whales, or other whale species.

To reduce the potential for vessel harassments or collisions with listed whales and sea turtles, all vessel and aircraft captains and project managers associated with the development activity should be familiar with the NOAA Fisheries Northeast Regional Viewing Guidelines, as updated, and MMS Gulf of Mexico Region's Notice to Lessee (NTL) No. 2007-G04 - Vessel Strike Avoidance and Injured/Dead Protected Species Reporting guidelines, http://www.nero.noaa.gov/prot_res/mmv/regs.html

The Commission will require the Applicant to verify it has incorporated these guidelines into the project manuals for operating and managing the development activity.

Protect Rare Species and their Habitats

Where a project is located within mapped state or federal rare species habitat, the proponent must submit the development proposal to the Massachusetts Natural Heritage and Endangered Species Program (NHESP), and in the case of marine mammals to the National Marine Fisheries Service (NMFS) for review and comment. As a matter of practice, development that would adversely affect habitat of local populations of rare wildlife is not permitted. However, development in mapped rare species habitat may be allowed if the NHESP and/or NMFS provides written comment that the work will not adversely affect rare species (or not result in a "take"). Comments from the NHESP and/or NMFS may be used to demonstrate that the project does not adversely impact rare species or their habitats (see also WPH3).

Project Must Not Impact Eelgrass

The general presumption is that work in the ocean must not have direct or indirect adverse effects on eelgrass beds, unless an applicant can demonstrate that there is no feasible alternative location or design for the project and the project is necessary to accomplish an overriding public purpose subject to a mitigation requirement. Sand mining operations and cable/pipeline installation should avoid impacts to areas of historic eelgrass beds to the maximum extent feasible, regardless of whether eelgrass is found in the historic eelgrass bed at the time of application. If a project adversely affecting eelgrass is permitted, appropriate mitigation, including eelgrass restoration, is required. Mitigation includes replanting eelgrass following disturbance and/or planting eelgrass in a suitable off-site location. The Commission may require a planting and monitoring plan to ensure that restoration of the disturbed eelgrass bed is successful. In cases where a cable or pipeline route is permitted through an eelgrass bed, directional drilling must be used to avoid any direct impacts on eelgrass (see also WET1).

Project Protects Benthic Habitats from Direct or Indirect Impacts

Development activities must not have any direct impacts on areas of biologically productive benthic habitats (e.g. Hard/Complex Seafloor as defined in the CCOMP). The applicant must demonstrate through field surveys that the resources are not present, and/or will not be impacted adversely.

Cable and pipeline installations must demonstrate that the project will not result in adverse impacts to benthic communities and their ecology, specifically, impacts to

finfish, shellfish, and migratory species resulting from sedimentation, erosion, scour, or barriers to migration.

Applicants for projects located within 500 feet of eelgrass beds or other biologically productive benthic habitats (e.g., Hard/Complex Seafloor) must provide an analysis of anticipated sediment dispersion resulting from the development activities. The results of the sediment dispersion modeling will be used to ensure that the design and siting of development activities avoids indirect impacts (e.g., turbidity) to eelgrass and other biologically productive benthic habitats (e.g. Hard/Complex Seafloor). Best construction practices (e.g, directional drilling) should be used to the extent feasible to minimize impacts.

Sand mining projects must be designed to minimize impacts to benthic resources and encourage recolonization. Projects must be designed to retain substrate in order to minimize impacts and promote recolonization of mined areas. Design practices that will facilitate recolonization include, but are not limited to, retaining refuge patches or strips through a sand mining site to promote recolonization of the postmining site to pre-mined benthic communities and related or dependent marine life.

Sand mining operations must demonstrate that the project will not change ocean currents or wave conditions in a way that results in adverse effects on existing coastal landforms (e.g., coastal bank erosion), infrastructure, navigation, and public/private property, including saltwater intrusion on landward freshwater resources.

The applicant must consult with Massachusetts Division of Marine Fisheries in determining whether restrictions should be placed on the timing or methods of construction for development activities to avoid temporary or permanent impacts to critical life history stages (e.g., spawning, and egg, embryo, and juvenile development) of marine species. Best management practices must be employed during Development activities to minimize turbidity and sedimentation impacts to sensitive benthic habitats, including eelgrass and other biologically productive benthic habitats (e.g., Hard/Complex Seafloor).

Applicants for sand mining operations and cable/pipeline installations must provide a site monitoring plan for Commission review and approval. In order to evaluate project impacts, including any changes in the areal extent and health of sensitive marine resources, the plan should identify (a) sensitive marine resources in the vicinity of the

construction site, (b) protocols to monitor turbidity, light penetration, dissolved oxygen and nutrient conditions in the proposed construction area, as well as within a buffer zone that extends to the furthest boundary of the potentially affected adjacent area (as determined by current/wave modeling), (c) monitoring schedules, and (d) contingency plans if turbidity conditions exceed identified thresholds.

Following the completion of construction activities, applicants for sand mining operations must provide a post-construction monitoring plan for Commission review and approval. The post-project monitoring plan must include provisions for monitoring the physical, chemical and/or biological conditions at the borrow site for a minimum of three years following development closure to evaluate recovery of the site to productive benthic habitat conditions. Where the intent of a development is to establish a long-term borrow site, the elements of a post-development monitoring plan may be modified at the Commission's discretion.

Protect Fish Resources and Habitats

Projects must protect important fish resources and habitat as classified by the Division of Marine Fisheries (DMF), including diadromous fish runs and shellfish habitat. Sand Mining operations and cable/pipeline installation may be permitted in Exclusionary or Provisional (undesignated on CCOMP map) areas, provided that the presumption of a site's importance to fish resources and habitat is overcome where the applicant can demonstrate to the satisfaction of the Commission through a site assessment that the resources do not exist, or the site is not significant to important fish resources and habitat. In addition, projects should avoid licensed commercial fishing or aquaculture installations (e.g., fish weirs, aquaculture pens, rafts, floats, etc.).

Protect Sea Turtles

Projects must protect sea turtles during construction or operations. The applicant must provide a species protection plan to the Commission for its review and approval that addresses and mitigates development activity that is proposed within sea turtle habitat or during times of year when turtles are present. The Commission may consult with the NMFS or DMF in review and approval of a species protection plan.

Protect Coastal Waterbirds and Sea Ducks

Projects must be designed to protect coastal waterbirds from the adverse impacts of sand mining or cable and pipeline installation and operations where these activities

would adversely impact the core habitats of Long-tailed Duck, Roseate Tern, Special Concern Tern species (Arctic, Least, and Common Terns), and important nesting habitats of colonial waterbirds and Leach's Storm Petrel (core habitat delineations as identified by the Massachusetts Ocean Management Plan). Development may be permitted where the proponent can demonstrate that the development will not adversely affect the habitat of these species. A species protection plan may be required as a condition of approval when development is permitted in these habitat areas.

Sand Mining operations should avoid directly or indirectly impacting important feeding, resting, staging, or overwintering habitat for sea ducks in waters less than 65 ft (20 meters) deep. Determination of whether an area supports sea duck habitat will be based on factors including but not limited to pre-construction site surveys, areas known to support large congregations of sea ducks, and/or seafloor mapping that confirms the presence of important benthic feeding habitat (MOMP mapping may be used to help make the determination of important sea duck habitat).

Protect Marine Mammals

In addition to requirements to protect marine mammals which are protected under state and federal law, projects should be designed or construction and operations are timed to protect all marine mammals from adverse impacts of development and construction. The Commission may consult with NMFS or DMF to determine whether projects are anticipated to have adverse impacts on marine mammals. A species protection plan may be required as a condition of approval.

Consideration of Cumulative Development Impacts

As part of an application for offshore development, the applicant must provide an assessment of cumulative impacts of any existing or permitted offshore renewable energy facilities, sand mining operations, and cables and pipelines within Barnstable County for consideration. The intent of this standard is for the Commission to determine whether the incremental addition of impacts from the project, when added to the impacts from existing and permitted development, will cumulatively adversely affect resources protected under the Act. Applicants should identify on a map all of the existing or permitted offshore renewable energy facilities, ongoing or prior Sand Mining operations, or cable or pipeline installations within Barnstable County. The Commission will determine whether the incremental addition of the proposed project will unduly

degrade ocean habitats or resources, or will conflict with human use activities to such an extent that those resources or activities are threatened.

The cumulative impact assessment should:

a. Define the boundary of the area that will be affected by the project (project impact zone).
b. List the resources that could be affected by the project. Establish baseline conditions for resources: are resources presently degraded, and to what extent?
c. Determine the geographic areas occupied by those resources outside of the project impact zone – (for example, if the project impacts whale habitat, the extent of critical whale habitat within the region).
d. Establish the timeframe of potential impacts.
e. Identify existing and proposed activities which may impact significant resources protected by the Act and the RPP. Significant resources for the purposes of this analysis should include any wildlife or supporting habitat resource, but may also include cultural, archaeological or historic resources.
f. Characterize the significant resources in terms of their response to the proposed change and their capacity to withstand the potential stress, i.e., will the activity fragment habitat or create barriers to normal life cycle activities for wildlife resources?
g. Characterize stresses in relation to the RPP goals and objectives.
h. Identify and describe cause and effect relationships between stresses and resources and/or ecosystems. Describe magnitude of effect, e.g., degradation of water quality, removal of benthic habitat, etc. and the temporal and spatial parameters of the impact
i. Identify modifications to reduce potential impacts.

Mitigate Construction Noise

Applicants must provide a Construction Noise Mitigation Plan to the Commission for review and approval. The plan must address issues to avoid or minimize construction noise impacts on marine mammals and sea turtles, including but not limited to an assessment of the construction noise impacts on marine life, a monitoring plan for tracking marine mammals and sea turtles entering the construction zone, and a mitigation plan, including time-of-year (TOY) restrictions on construction, to avoid or minimize construction noise impacts on marine mammals and sea turtles.

Coordinate Conduit Crossings

Applicants should locate conduit installations with existing cable or pipeline routes to the maximum extent feasible in order to minimize harm to the environment.

Demonstration of Public Purpose

Ocean resources are public resources. Applicants for ocean-based projects must demonstrate that the development furthers a substantial public purpose with respect to these coastal or ocean resources, including but not limited to, protection against storm damage, protection against sea level rise, flood control, protection of recreational beaches, restoration or improvement of habitat, utility-related reliability or necessary capacity improvements, or water quality improvement. The areal extent of these anticipated effects should be quantified, where possible, and the time period over which the public purpose is expected to persist.

Consistent with this purpose and the priorities established through the CCOMP, sediments derived from an offshore borrow site must be utilized within Barnstable County.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE OR3

Objective OR3 *– Protect significant human use areas and vistas*

Methods Applicable to All Projects in the Ocean

Provide Buffers to Navigation

Development activities should provide buffers to established ferry routes, navigational channels and commercial shipping lanes with adequate width to prevent accidents or irreconcilable conflict between different uses. Cable and pipeline installations may be sited coincident with established navigational routes provided an applicant can provide evidence that the proposed installation will not adversely impact established navigational uses.

Protect Aquaculture and Commercial Fishing

Applicants should avoid siting projects in areas of active or significant fishing use. The applicant and the Commission should refer to mapped data available through the MOMP (mapped data is available in MORIS, see Resources) and the CCOMP regarding areas used for recreational and commercial fishing and/or aquaculture.

Minimize Impacts to Ocean-Based Recreation

Projects should be sited and construction windows should be timed to minimize impacts to areas of high-use ocean-based recreation. The applicant should provide a current survey of activities in the project vicinity and should reference human use activity areas mapped in the MOMP as provided in MORIS (see Resources).

Protect Scenic Resources

Development activities should be sited and designed to avoid adverse visual impacts to the Cape's cultural/historic and Scenic Resources, including structures listed or eligible for listing on the National or State Register of Historic Places and Historic or Cultural Landscapes. Sand Mining operations less than 12 months in duration are presumed to have no adverse visual impact. Any development that is planned or designed to exceed 12 months in duration must provide an assessment to demonstrate that the project will not have adverse impacts on cultural/historic or scenic resources (see also Community Design Technical Bulletin).

Protect Archaeological Resources

Applicants should configure projects to avoid known archaeological sites or sites with high archaeological sensitivity as identified by the Massachusetts Board of Underwater Archaeological Resources, the Massachusetts Historical Commission and/or the Mashpee Wampanoag Tribe.

GENERAL APPLICATION REQUIREMENTS

This Technical Bulletin identifies required reports and analyses to characterize the existing environment, characterize and analyze the potential impacts, characterize the anticipated public purposes and cumulative impacts, and address the protection of sensitive resources.
The requested information must be submitted in a narrative report, on plans of an appropriate scale, and where indicated, as data files compatible with GIS. Plan preparation, data collection and analysis, and natural resource evaluations must be conducted by individuals qualified through academic credentials and experience. The Commission or its designee may waive application requirements where the required study or plan is deemed unnecessary to the review process or duplicative of requirements under state and/or federal authority.

I. List of Required permits and authorizations

Applicants proposing work in offshore ocean waters must provide a list of all permits and authorizations (not limited to the following) required by local, state, and federal regulatory agencies for the proposed activity in a format similar to the following example:

AGENCY	PERMIT/APPROVAL	INTENT/FOCUS
US Environmental Protection Agency	See 401 Water Quality Certification, below	
US Army Corps of Engineers	Programmatic General Permit (PGP), Category 2 pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. Included in this review is coordination with Federal agencies (National Marine Fisheries Service, US Fish and Wildlife, EPA), Massachusetts CZM, Massachusetts Historical Commission, and the Tribal Historic Preservation Office	To protect navigable waters of the U.S. from being obstructed or altered without government review
US Coast Guard	Notification for Notice to Mariners and information to be shared with the National Ocean Survey for updates to nautical charts.	

AGENCY	PERMIT/APPROVAL	INTENT/FOCUS
Federal Energy Regulatory Commission		
National Oceanic and Atmospheric Administration	Federal Consistency Review	
National Marine Fisheries Service	"Take" authorization under Marine Mammal Protection Act Biological Opinion under Endangered Species Act	To protect marine mammals from harassment, capture, killing
US Fish and Wildlife Service		
Massachusetts Coastal Zone Management	Federal Consistency Certification	To ensure coordination among state agencies of the protection of resources within the coastal zone
Mass. Department of Environmental Protection	Water Quality Certification pursuant to Section 401 of the Clean Water Act Chapter 91 Waterways License	To protect public health from discharges of dredged materials into waters of the commonwealth To protect public rights to fish, fowl, and navigate
Mass. Environmental Policy Act	Environmental Review	To ensure adequate analysis of project impacts has been collected for permitting by state regulatory agencies
Mass. Historical Commission Mass. Board of Underwater Archaeological Resources Tribal Historic Preservation Office	Determination of No Adverse Effect	
Local Conservation Commissions	Order of Conditions	To protect wetland resources
Local Planning Board, Board of Appeals, Building Inspector	Special Permit, Building Permit	Interests are individualized by town
Others? DPW	Road opening permit	

II. Characterization of Existing Environment

An application for DRI review must include a narrative description and map of environmental resources and human use areas potentially affected by the project. Site characterization should encompass sufficient data for establishing natural variability and a baseline from which to assess whether or not a resource is being affected by project activities. Site characterization should:

a. Define the project site

The application should include engineered plans at an appropriate scale showing all areas that may be physically affected by the proposed action. In the case of sand mining or conduit installation, the project site should include an area that incorporates the estimated full extent of disturbance, and for a wind turbine facility should include an area within an envelope that encloses all footings/foundations out to at least 200 meters[1].

b. Describe the existing physical environment including:
    i. Meteorology (seasonal patterns of temperature, wind direction and speeds, frequency and magnitude of storm events, precipitation, air quality)
    ii. Geology (bathymetry, seafloor and subsurface sediment types, geologic features and hazards)
    iii. Physical oceanography (temperature, salinity, density, tides and wave energy)
    iv. Chemical oceanography (nutrients, dissolved organic matter, chemical pollutants)
c. Describe the biological environment within the project site including:
    i. Pelagic, demersal and benthic organisms
    ii. Avifauna including ducks, seabirds and migrants
    iii. Endangered and threatened species
    iv. Fishery resources and habitat (including spawning, feeding and nursery habitat)
d. Characterize the socioeconomic marine environment, in both narrative form and on a plan, including:
    i. Employment, existing offshore and coastal infrastructure, commercial and recreational fisheries, including typical seasons, location and type
    ii. Cultural resources including subsistence resources and harvest practices
    iii. Archaeological resources

[1] (McCann, 2012)

iv. Vessel traffic, including recreational boating and commercial shipping, military activities
v. Other space/use conflicts

e. Context Map identifying resource areas and important seascape/landscape features within and surrounding the project location(s).

III. Analyses of Site Assessment, Construction, and Operational Impacts

DRI applications must provide a narrative analysis of the anticipated impacts from a project during different phases of project implementation. The discussion should reflect completion of analyses designed to assess impacts to different types of resources, as indicated below. Supporting evidence should be provided, as appropriate, including:

a. Physical resources

i. Anticipated changes in bathymetry, seafloor topography, sediment grain size characteristics, impacts of sediment suspension and turbidity on physical and biological resources through modeling. Evaluate impacts to a distance of at least 200 meters from project boundaries.
ii. Analysis of wave and tidal currents patterns and impacts in dredging footprint, affected nearshore/shorelines, etc.
iii. For Sand Mining operations, only:
1) Analyses of the movement and quantity of sediment at both the extraction and nourishment sites,
2) An analysis of the potential effects of the borrow pit on wave heights and the direction of wave propagation,
3) An analysis of the potential impact of the proposed project on regional sediment transport,
4) An analysis of the potential impacts to the form of ridge and shoal features, including alterations to the biological communities,
5) Analysis of alternative sediment removal design scenarios, e.g. removal in strips or patches, with the goal of encouraging recolonization of benthic resources,
6) Identification and mapping of sensitive natural and cultural resources potentially affected by the project (dredging and placement sites), including benthic habitats, shellfish beds, eelgrass beds, fish spawning and nursery areas and archaeological sites,
7) Identification of potential impacts to shore erosion or shoaling, navigation channels or marinas, landward freshwater resources,
8) Estimates of sand infill rates in borrow pit,
9) Utilization of sediment dispersion models to characterize sediment re-

suspension and dispersion during mining operations. The result of this modeling should be used to design mining operations, including "at sea" processing, to limit impacts of suspended sediment and turbidity on fishery resources and minimize the area affected.

iv. For Cable or Pipeline installations, only:
1) Site reconnaissance plan of proposed cable/pipeline route extending 100 meters on each side of the installation route to include bathymetry, substrate characteristics (grain size, sediment thickness), fisheries/benthic habitat classification, sensitive marine resources, potential/documented archaeological sites, high resolution scanning of seafloor using sidescan sonar, multi-beam bathymetry to acquire continuous data. Post-installation surveys should also be conducted,
2) Description of cable/pipeline installation methodology,
3) Pre- and Post-construction impacts to benthic wildlife, including habitat structure and function, specific focus on migratory and/or mobile species (e.g. horseshoe crabs) that may be affected by cable/pipeline.

b. Biological and ecological resources

i. Analysis of impacts to marine organisms, including fish, crustaceans, mollusks and benthic infaunal communities (consult with Division of Marine Fisheries (DMF))
ii. Analysis of impacts to habitat for marine organisms, including fish, crustaceans, mollusks, etc. (consult with DMF)
iii. Analysis of impacts to other biologically productive habitats (hard bottom, eelgrass, etc.)
iv. Analysis of impacts to Rare species (listed by the Mass. Div. of Fisheries and Wildlife, as published in the Code of Massachusetts Regulations) or their habitat,
v. Analysis of impacts to marine mammals and sea turtles, ducks, pelagic and sea birds
vi. For Wind Turbines, only: Analysis of impacts to both resident and transient/migratory birds and bats and potential impacts to migration corridors.

c. Recreational and commercial fisheries, including aquaculture

i. Analysis of displacement, competition for space and impacts from vessel traffic volume and transit routes
ii. Analysis of impacts of activity on inshore and offshore bottom and off-bottom aquaculture operations

d. Cultural resources and public viewsheds (historic districts, native American sites, parks, public beaches, coastal vistas)

e. Identify historic and cultural resources and public viewsheds within the project vicinity and within the project's viewshed. (contact MHC, Tribal Preservation Officer, and town staff; review town Local Comprehensive and Open Space plans.)

f. Archeological resources (shipwrecks, other)
   i. Identify onshore and underwater archaeological resources within the vicinity of the project area (contact MHC and MBUAR)

IV. Resource Protection Plans, required as may be determined necessary

Where the Commission finds that a proposed activity is consistent with the goals and objectives, conditional approval of the project will likely require the approval of resource protection plans. The applicant must prepare narrative and spatial plans to address mitigation and monitoring consistent with the following requirements.

a. Rare Species Protection Plan required where development is allowed in rare species habitat (e.g., terns, colonial water birds) but is demonstrated not to adversely affect such habitat. The applicant should consult with the National Marine Fisheries Service (NMFS), the Natural Heritage and Endangered Species Program (NHESP) and the Division of Marine Fisheries (DMF) in the preparation of this plan. Plans should include:
   i. Assessment of habitat characteristics, rare species population status (locally and within the region),
   ii. Maps showing location of rare species habitat within and adjacent to project site, as well as transportation routes to and from project site, and other potential conflicts,
   iii. Mitigation measures to avoid or minimize impacts to rare species and their habitat (i.e., time- of -year (TOY) restrictions; exclusion zones; training of vessel operators and key project personnel),
   iv. Contingency plan if project impacts rare species,
   v. Post-construction monitoring and reporting protocols

b. Marine Mammal and Sea Turtle Protection Plan, required when development is proposed within habitat for whales, sea turtles, and other listed species, or during times of year when these species are present. The applicant should consult with DMF, NMFS and NHESP in the preparation of this plan. Plans should include:
   i. Sampling and reporting protocols and information sources to determine presence/absence, seasonal variability and habitat utilization of marine mammals and sea turtles,

ii. Mitigation measures to avoid or minimize impacts to species (e.g., exclusion zones, TOY restrictions; training of vessel crew and other key project personnel; use of marine mammal observers),
iii. Methods for monitoring exclusion zone, monitoring schedule and contingency for poor viewing conditions,
iv. Contingency plan if whales, sea turtles or other listed species enter the exclusion zone, including waiting times, reporting protocol, etc.,
v. Best management practices to avoid, minimize or mitigate impacts to marine wildlife; (e.g., compliance with NOAA noise limits for marine mammals and turtles, use of noise control devices, etc.),
vi. Post-construction monitoring and reporting protocols

c. Fishery Resource and Habitat Protection Plan, required to determine the presence/absence of the resource, and if resource is present, to address potential impacts from the development. The applicant should consult with DMF on the significance of the habitat, development of the plan, and sampling protocols. Plan should include:
   i. Sampling protocol and information sources to identify and quantify spawning/feeding/nursery habitat for fish (including anadromous and catadromous species), shellfish and crustaceans,
   ii. Assessment methodology to determine species/habitat composition and distribution, habitat quality and key focus species/habitat types in and adjacent to the development activities,
   iii. Mitigation measures to avoid, minimize or mitigate impacts,
   iv. Post-construction monitoring and reporting protocols
d. Sea Duck Habitat Surveys for projects within 20m water depth or less[2] to determine whether site provides breeding, resting, staging, migration, overwintering habitat for sea ducks. A plan should include:
   i. Sampling protocol and information sources to identify presence, habitat utilization of area in and adjacent to proposed development activities,
   ii. Mitigation measures to avoid, minimize or mitigate impacts to sea ducks and their habitats
e. Protection Plan for Eelgrass and other biologically productive benthic habitats. Plan should demonstrate presence/absence and quality of eelgrass, or other productive benthic habitats such as hard/complex bottom. If resources are present, explain how they will be protected during development activities. Plan should include:

[2] The USFWS sea duck survey found that 75% of sea ducks observed were in less than 20 meters of water, within 4 nautical miles of shore and over bottom slopes of less than 1%.

i. Sampling protocol and information sources to determine presence/absence of the resource, including historic presence/absence of eelgrass, as well as habitat quality (sediment type, wind and wave energy, plant density and height, percent cover and eelgrass depth limit)
ii. Sediment dispersion modeling and pre-construction analysis if project is within 150 m. of eelgrass or other productive benthic habitat to ensure that design and siting of project avoids indirect impacts (e.g., turbidity) to eelgrass and other biologically productive benthic habitats
iii. Best management practices employed during development activities to avoid, minimize or mitigate for turbidity and sedimentation impacts to eelgrass habitat (e.g., TOY restrictions, installation methods, buffer zones)
iv. Short- and long-term monitoring plan for turbidity, suspended particulates, light penetration, dissolved oxygen and nutrient conditions near eelgrass before, during and after development activities, as recommended by DMF
v. Reporting protocol for monitoring and research activities
vi. Contingency plan if turbidity exceeds identified thresholds during development activities

f. Noise Mitigation and Monitoring Plan for Marine Wildlife

All project proposals should include a noise mitigation plan that includes:

i. An assessment of construction noise (dredging, boat traffic, tower installation, hydroplow, etc.) on marine wildlife, and a determination of the zone of influence by species
ii. A plan to monitor sound levels in the water column during construction operations
iii. A monitoring plan for tracking marine wildlife entering the construction zone (i.e., acoustic buoy array; trained observers onsite)
iv. A monitoring and contingency plan to avoid or minimize construction noise on marine wildlife, e.g. TOY restrictions, soft start, suspension of operations when endangered species are within zone of influence
v. Post-construction monitoring and reporting protocol.

g. Marine Archaeological Reconnaissance Survey and Protection Plan. All project proposals should include a survey of underwater archeological resources and protection plan, to be developed in consultation with MBUAR.

h. For Wind Energy Facilities only: The individual phases of wind energy facility development are characterized by different noise sources during the

different phases. The noise mitigation plan for wind energy facilities should address the following development-specific activities:

i. Initial surveys will increase small boat traffic in an area, adding to background noise.
ii. Construction of the facilities includes larger and more sustained ship traffic, turbine installation, dredging and other activities.
iii. Turbine operation introduces sound and vibration over prolonged periods while the facility is in use.
iv. Decommissioning of the facilities increases background noise from large vessel traffic, and noise sources from any removal of equipment.
v. A monitoring program should be in operation during pre- and post-construction as well as during decommissioning activities.

i. Avian and Bat Monitoring and Mitigation Plan, for Wind Energy Facilities only, to demonstrate that a WEF can be operated to ensure bird and bat safety during significant migratory events. Plan should include:
    i. Type, duration and frequency of pre-construction and post-construction monitoring
        1. Monitoring systems to gauge the presence/absence of birds and bats (e.g., acoustic bat detector surveys, avian acoustic monitoring, video monitoring, thermal animal detection systems (TADS) or other)
        2. Number of detectors, location, monitoring schedule, frequency/duration of observations, TADS design
        3. Telemetry tracking
        4. Avian surveys monitoring protocol: # of transects, survey timing (breeding, staging and migration seasons), etc.
    ii. Type of deterrents used to minimize avian presence in WEF area (e.g., anti-perching devices)
    iii. Reporting protocol
        1. Frequency of reporting (near-term, long-term), summary of previous results relative to monitoring objectives, effectiveness of monitoring techniques
        2. Reporting protocol to document collisions, mortality of listed and non-listed bird, bat species

j. Habitat Recovery Monitoring Plan, for Sand Mining only:
A monitoring plan should be initiated prior to mining and nourishment activities, continue through the project, and continue afterwards for a period to be determined in consultation with DMF. The key objective of monitoring

is to determine whether environmental conditions at both the mining and nourishment sites have recovered.

The monitoring plan should include sampling design and protocols for:

i. Biological resources, including the benthic community and fishery resources
ii. Wave monitoring and modeling
iii. Bathymetric and sediment surveys
iv. Shoreline monitoring and modeling
v. Reporting protocol for monitoring activities

Recovery is defined as return to within the 95% confidence interval for mean values of the pre-dredging condition.

V. Guidelines for submittal of spatial data associated with assessment and monitoring programs

Data should be provided as latitude and longitude points from GPS; however, geodatabases, shapefiles, and CAD drawings (in that order of preference) may be provided. CZM recommends that information be provided in formats compatible with ArcGIS, and that the data 1) relate horizontally to the Massachusetts State Plane Coordinate System Mainland Zone (NAD83, meters) and, where applicable, vertically to NAVD88, and 2) be completely compliant with, and thoroughly substantiated by Metadata, compliant with the FGDC Standard (see Content Standard for Digital Geospatial Metadata, FGDC-STD-001-1998, Sections 1-7, and the FGDC Geospatial Positioning Accuracy Standard, Parts 1-5, as appropriate).

REFERENCES AND RESOURCES

Cape Cod Ocean Management Plan (http://capecodcommission.org/CCOMP)

Massachusetts Ocean Management Plan (https://www.mass.gov/service-details/massachusetts-ocean-management-plan)

The Massachusetts Ocean Resource Information System (MORIS) has GIS data on a number of resources and uses of Massachusetts waters, including fishing grounds, special sensitive and unique resources, cultural resources, ferry routes and vessel traffic (http://www.mass.gov/czm/mapping/)

Designing site assessment and monitoring programs: J. McCann (2012). *Developing Environmental Protocols and Modeling Tools to Support Ocean Renewable Energy and Stewardship.* U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Herndon, VA., OCS Study BOEM 2012-082, 626 pp. (http://www.data.boem.gov/PI/PDFImages/ESPIS/5/5208.pdf)

Applicants should review the BOEMRE Guidelines for Providing Geological and Geophysical Hazards, and Archaeological Information Pursuant to 30 CFR Part 285 (http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Index.aspx) in the preparation of the application.

Applicants should consult with the Massachusetts Board of Underwater Archeological Resources (MBUAR) (http://www.mass.gov/czm/buar/) to determine whether marine archaeological surveys should be conducted, and if so, the appropriate survey protocol to follow.

Dibajnia, M. and R. B. Nairn. Investigation of Dredging Guidelines to Maintain and Protect the Geomorphic Integrity of Offshore Ridge and Shoal Regimes, U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Regulation and Enforcement, Herndon, VA., OCS Study MMS 2011-025. 150 pp. + appendices at: http://www.boem.gov/Non-Energy-Minerals/Marine-Mineral-Studies.aspx

CSA International, Inc., Applied Coastal Research and Engineering, Inc., Barry A. Vittor & Associates, Inc., C.F. Bean, L.L.C., and Florida Institute of Technology. 2009. Analysis of

Potential Biological and Physical Impacts of Dredging on Offshore Ridge and Shoal Features. Prepared by CSA International, Inc. in cooperation with Applied Coastal Research and Engineering, Inc., Barry A. Vittor & Associates, Inc., C.F. Bean, L.L.C., and the Florida Institute of Technology for the U.S. Department of the Interior, Minerals Management Service, Leasing Division, Marine Minerals Branch, Herndon, VA. OCS Study MMS 2010-010. 160 pp. + apps at: http://www.boem.gov/Non-Energy-Minerals/Marine-Mineral-Studies.aspx

Applicants should review the Massachusetts Department of Environmental Protection Guide to Best Management Practices for Beach Nourishment Projects with Technical Attachments, for information on recommended site surveys and general monitoring guidelines (http://www.mass.gov/dep/water/resources/bchbod.pdf and http://www.mass.gov/dep/water/resources/bchtech.pdf)

Applicants should consult with the Natural Heritage and Endangered Species Program (http://www.mass.gov/dfwele/dfw/nhesp/nhesp.htm), the Massachusetts Division of Marine Fisheries (http://www.mass.gov/dfwele/dmf/) and with the National Marine Fisheries Service (http://www.nmfs.noaa.gov/pr/) prior to design development. Proponents should ensure that projects are 1) not located in areas known to support endangered marine life, and 2) where project siting unavoidably conflicts with state or federally listed endangered species habitat, the project should be designed to minimize impacts to these species.

Applicants are encouraged to review the Mass. Division of Marine Fisheries 2010 publication, Technical Guidelines for the Delineation, Restoration and Monitoring of Eelgrass (*Zostera marina*) in Massachusetts Coastal Waters (http://www.mass.gov/dfwele/dmf/publications/tr_43.pdf) in developing a plan for delineating and monitoring eelgrass habitat.

For information on Essential Fish Habitat (EFH), designated under the federal fishery management plan development process, applicants should consult with the New England Fishery Management Council (http://www.nefmc.org/) and the National Marine Fisheries Service (http://www.habitat.noaa.gov/protection/efh/index.html)

Information regarding NMFS biological opinions for endangered marine mammals and sea turtles can be found at: http://www.nmfs.noaa.gov/pr/consultation/opinions.htm

Applicants are encouraged to view the Department of the Interior's Bureau of Ocean Energy Management (BOEM) guidelines for providing environmental information for offshore renewable energy projects (http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Index.aspx), particularly those associated with benthic habitat surveys and avian resource surveys.

Applicants can obtain information on sea ducks in this region in the 2012 USFWS Atlantic Coast Wintering Sea Duck Survey at http://seaduckjv.org/studies/pro3/pr109.pdf.

Applicants are encouraged to review OCS Report MMS 2001-089: Development and Design of Biological and Physical Monitoring Protocols to Evaluate the Long-Term Impacts of Offshore Dredging Operations on the Marine Environment (http://www.boem.gov/Non-Energy-Minerals/Marine-Mineral-Studies.aspx#Programmatic -#7 under Programmatic Studies under #3- Environmental Impact Investigations)

Applicants are encouraged to review the Mass. Division of Marine Fisheries 2010 publication, Technical Guidelines for the Delineation, Restoration and Monitoring of Eelgrass (*Zostera marina*) in Massachusetts Coastal Waters (TR-43) if developing a plan for delineating and monitoring eelgrass habitat http://www.mass.gov/eea/agencies/dfg/dmf/publications/technical.html

Additional Mapping Resources

The MarineCadastre.gov is an integrated marine information system that provides ocean data, offshore planning tools, and technical support to the offshore renewable energy community. It has three primary focus areas: Web map viewers and ocean planning tools; spatial data registry; and technical support and regional capacity building (www.marinecadastre.gov)

The National Oceanic and Atmospheric Administration (NOAA) Coastal and Marine Spatial Planning (CMSP) Data Registry is a collection of web-accessible NOAA geospatial data deemed essential for local, regional, or national-level CMSP processes (http://cmsp.noaa.gov/index.html)

The OBIS–USA (Ocean Biogeographic Information System) is a program of the United States Geological Survey (USGS) Core Science Analytics and Synthesis (CSAS). It is the U.S. national node of the Ocean Biogeographic Information System (OBIS). Meant to serve research and natural resource management needs, OBIS-USA brings together marine biological occurrence data in a standard format, with metadata, web-based discovery and download, and web service access for users and applications (http://www.usgs.gov/obis-usa/index.html)

The Northeast Regional Ocean Council (NROC) Northeast Ocean Data (http://northeastoceandata.org/)

Wetlands Resources

This guidance is intended to clarify how the Wetlands Resources Goal and Objectives of the Regional Policy Plan (RPP) are to be applied and interpreted in Cape Cod Commission Development of Regional Impact (DRI) project review. This Technical Bulletin presents specific methods by which a project can meet these goals and objectives.

Wetlands Resources Goal: To protect, preserve, or restore the quality and natural values and functions of inland and coastal wetlands and their buffers.

- ***Objective WET1** – Protect wetlands and their buffers from vegetation and grade changes.*
- ***Objective WET2** – Protect wetlands from changes in hydrology.*
- ***Objective WET3** – Protect wetlands from stormwater discharges.*
- ***Objective WET4** – Promote the restoration of degraded wetland resource areas.*

The applicability and materiality of these goals and objectives to a project will be determined on a case-by-case basis considering a number of factors including the location, context (as defined by the Placetype of the location), scale, use, and other characteristics of a project.

THE ROLE OF CAPE COD PLACETYPES

The RPP incorporates *a framework for regional land use policies and regulations based on local form and context* as identified through categories of Placetypes found and desired on Cape Cod.

The Placetypes are determined in two ways: some are depicted on a map contained within the RPP Data Viewer located at www.capecodcommission.org/RPPDataViewer adopted by the Commission as part of the Technical Guidance for review of DRIs, which may be amended from time to time as land use patterns and regional land use priorities change, and the remainder are determined using the character descriptions set forth in Section 8 of the RPP and the Technical Guidance.

The project context, as defined by the Placetype of the location, provides the lens through which the Commission will review the project under the RPP. Additional detail can be found in the Cape Cod Placetypes section of the Technical Guidance.

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NOTE ON APPLICATION MATERIALS, DEFINITIONS, RESOURCES AND REFERENCES

Application materials should provide sufficient detail to demonstrate that the project meets the applicable Objectives, but typically include an assessment of wetland resources on the project site and in the project vicinity as detailed on page WET-20.

Definitions of key terms, including Wetland Resources, are presented on page WET-21. For the purposes of this Technical Bulletin, wetlands are defined in accordance with the Massachusetts Wetland Protection Act and include both inland and coastal wetlands.

INTRODUCTION

One out of every four acres on Cape Cod is wetland. Freshwater wetlands include red maple swamps, Atlantic white cedar swamps, bogs, marshes, and wet meadows. Coastal resource areas include salt marshes, beaches, dunes, banks, and intertidal areas. These wetland resources are important to both the environment and economy of Cape Cod. Wetlands serve important natural functions including groundwater recharge and attenuation of pollutants. They protect water quality for shellfishing and provide wildlife and fisheries habitat. They serve as an attraction for residents and visitors seeking opportunities for outdoor recreational activities, including beach recreation, bird watching, and fishing. In addition, wetlands and their buffers often contain archaeological resources.

Wetland buffers serve important functions including stormwater recharge and filtration, sedimentation and erosion control, nutrient removal, and groundwater recharge. Buffer areas also provide critical habitat for wildlife species that depend on wetlands and their buffers for foraging, breeding, and nesting. Studies indicate that buffers 100- to 300-feet wide are needed to protect surface water bodies from sedimentation and to maintain wildlife habitat, and even greater buffer widths (300 to 1,000 feet) are needed to remove 50 percent to 90 percent of man-made nutrients.

The wetland goal and objectives recognize the irreplaceable value of natural wetlands, prohibit any further wetland degradation, and promote the restoration of previously degraded wetlands as a means to improving overall wetland performance. Most Cape communities have passed local wetlands bylaws that regulate activities within wetlands or require setbacks for construction activities. Although these bylaws are generally stricter than the state Wetlands Protection Act, many still do not provide adequate protections, such as a minimum 100-foot undisturbed buffer.

SUMMARY OF METHODS

GOAL | WETLANDS RESOURCES

To protect, preserve, or restore the quality and natural values and functions of inland and coastal wetlands and their buffers.

OBJECTIVE WET1 – Protect wetlands and their buffers from vegetation and grade changes

METHODS FOR ALL WETLANDS:

- Wetlands and their buffers must not be altered except in the limited circumstances identified in this Technical Bulletin and where the applicant can show that there is a public benefit, there is no feasible alternative to alteration, and that the impacts from the alteration are minimized and mitigated. Upon the required showing, the Commission may permit alterations to wetlands and buffers and approve mitigation for the following purposes:
    - Where development currently exists, provided that such proposed additional alterations either reduce impacts to or improve the functions of the wetland resources;
    - Installation of new utility lines;
    - Water-dependent structures and uses;
    - Vista pruning and pedestrian access paths.
- Provide vegetated, undisturbed buffer areas of at least 100 feet in width from the edge of coastal and inland wetlands including isolated wetlands, to protect their natural functions.
- Development activity proximate to wetlands does not change the vegetation, grade, hydrology, sun exposure, or nutrient inputs to wetland or buffer areas.

METHODS FOR COASTAL WETLANDS:

- Protect beaches, barrier beaches, dunes, coastal banks, salt marshes, and land under water bodies from alteration.
- Projects must not impact eelgrass unless no feasible alternative, there is a public benefit, and the impacts are minimized and appropriately mitigated.

- Redevelopment or water-dependent development in proximity to coastal wetlands accommodates their natural migration.
- For beach nourishment projects, the design must prioritize the natural functions of coastal resources and minimize impacts.
- For maintenance dredging projects, maintain footprint and depth of existing navigation channels and basins.
- Improvement dredging is not permitted except where it accomplishes a substantial public benefit and there is no feasible alternative.
- For water-dependent projects, including aquaculture, avoid and minimize impacts to fish, shellfish, and crustaceans.
- Restoration projects – see Objective WET4 below.

OBJECTIVE WET1 AREAS OF EMPHASIS BY PLACETYPE

For All Placetypes | Permittable development activities within wetlands and buffer areas do not vary by Placetype. Development is not permitted within wetlands and buffer areas except where noted above due to the specific water-dependent activity, the presence of existing development, installation of utility lines, or vista pruning or access paths.

OBJECTIVE WET2 – Protect wetlands from changes in hydrology

METHODS

- Stormwater runoff from development activities does not alter wetland hydrology

For projects proposing water withdrawals greater than 20,000 gallons per day:

- Projects involving water withdrawals in proximity to wetlands does not adversely impact wetlands.

OBJECTIVE WET3 – Protect wetlands from stormwater discharges

METHODS

- Projects should direct stormwater discharges away from wetlands and their 100 foot buffers.

OBJECTIVE WET4 – Promote the restoration of degraded wetland resource areas

METHODS

- Restore wetlands where wetland is shown to be degraded and the proposed restoration will improve the natural wetland functions, restore native vegetation, and/or improve habitat for native species.
- For coastal resource restoration, enhance natural coastal processes, functions, and sediment movement.
- Remove structures from flood hazard areas wherever possible.
- Remove invasive species from wetland resource areas where it will improve the natural functions of the wetland.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE WET1

Objective WET1 *– Protect wetlands and their buffers from vegetation and grade changes.*

Methods Applicable to All Wetland Areas

General Prohibition on Wetlands Alteration

Due to the regional importance of protecting wetland resources, as a matter of policy, the Commission has determined that, subject to the narrow exceptions discussed below, DRIs will not be permitted to alter the vegetation, grade, or hydrology of wetland resources and 100 foot buffer areas. In practice, meeting this objective means not proposing or conducting work within wetland resource or buffer areas. Wetlands are defined according to the Massachusetts Wetlands Protection Act (see definitions at end of bulletin, and reference to 310 CMR 10.00). Prior to filing an application for DRI review, applicants proposing work on sites with wetlands present should seek a determination of the resources present and their boundaries from the local conservation commission through the appropriate process under the wetland regulations.

Development Activity Proximate to Wetlands

Development activity adjacent to wetlands and their buffers should not adversely affect the vegetation, hydrology, sun exposure, or nutrient inputs to the wetland or buffer areas. Considerations include shading from structures, overland sheet flow from stormwater over steep topography, or nutrient inputs from fertilizer application or conventional septic systems. Wherever possible, septic systems should be located in excess of 300 feet from wetlands, ponds, and coastal embayments, and fertilizer application proximate to these resources is strongly discouraged. Studies have demonstrated that buffers of 300 – 1,000 feet are needed to attenuate 50 – 90% of manmade nutrients.

Exceptions to Prohibition on Wetlands Alteration

Under the limited circumstances described below, the Commission may permit a DRI that results in otherwise prohibited alteration of wetlands and/or buffer areas.

EXISTING DEVELOPMENT IN WETLANDS AND BUFFERS

In some cases, a DRI may propose changes to an existing development that is located within wetland and buffer areas. In these circumstances, the Commission may allow alteration of the wetland resources if the applicant can establish that the proposed changes reduce impacts to, or improve the functions of the wetland resources. Applicants seeking to alter wetlands at preexisting development sites should submit to the Commission a narrative that: identifies the portion of the wetland and buffer area affected by the new work; describes how impacts to the resources have either been reduced or improve the wetland and buffer function; demonstrates that the proposed alteration will not increase adverse impacts to that portion of the resource areas; and describes why there is no technically demonstrated feasible construction alternative. Any proposed work on preexisting development sites within wetland and buffer areas must be accompanied by a plan for restoration, including grading, hydrology, and native plant species (types, quantities, sizes).

In determining whether a DRI proposing work on an existing development located within wetland and buffer areas will reduce impacts to or improve functions of wetland resources, the Commission will consider the following factors: whether the extent of proposed impact exceeds the existing area of impact, whether there is an increase in impervious area, and whether (in coastal resource areas) the project is designed to accommodate the migration of coastal resources.

UTILITIES

Disturbance of wetlands and buffer areas for installation of new utility lines may occur where the Commission finds no feasible alternative to the proposed route for such utilities. Applicants should demonstrate that alternatives to work within the wetland area have been fully considered. In the event that utility installation in wetland areas must proceed, disturbance of wetland and buffer areas should be minimized and surface vegetation, topography, and water flow should be restored substantially to the original condition.

WATER-DEPENDENT STRUCTURES AND USES

Certain traditional uses of wetland resource areas, (especially coastal resources) may generate impacts to these resources. Recreational access, shellfishing, boating, or the Massachusetts public trust rights to fishing, fowling, and navigation, all require activity

which may directly or indirectly affect wetland resources. Occasionally, projects designed to achieve a public benefit such as water quality improvement may also require alterations to wetland resources. While the goal under this RPP is to protect all wetland resources from alteration, access to the water and water-dependent structures and uses are recognized as important and often necessary, and may result in impacts to wetland resources. Wherever possible, alterations for water-dependent structures should be avoided. Where alterations cannot be avoided, a public benefit should be demonstrated, development impacts should be minimized, and applicant must show there is no feasible alternative.

VISTA PRUNING AND PEDESTRIAN ACCESS PATHS

Vista pruning and pedestrian access paths may be permitted within wetland buffer areas where there is no other feasible alternative location. Pruning of branches from trees may be allowed to achieve a view to open water or wetlands, but may not always result in an unobstructed view. Removal of dead or diseased trees, which can provide important wildlife habitat, is discouraged unless they pose a threat to human health or safety. Pedestrian access paths may be established or maintained in wetland buffers provided the siting and design minimizes impacts on habitat and natural functions of the resource area.

ACCOMMODATING COASTAL RESOURCE MIGRATION

Water-dependent development activity in coastal resource areas has the potential to adversely impact the natural shifting of form and location of these resources. Wherever possible, alterations to beach, dune, coastal bank, salt marsh, and land under water bodies should be avoided. Recognizing that these resources are dynamic and change form naturally and continually, development in proximity to these resources should accommodate their natural migration through open foundations, piers, breakaway walls, and the like.

EELGRASS

The general presumption is that work in coastal resource areas will not have direct or indirect adverse effects on eelgrass beds, including mapped historic eelgrass beds, unless an applicant can demonstrate that there is no feasible alternative location or design for the project and the project is necessary to accomplish an overriding public benefit subject to a mitigation requirement. If a project adversely affecting eelgrass is

permitted, appropriate mitigation, including eelgrass restoration, will be required. Mitigation may include replanting of eelgrass following disturbance and/or planting eelgrass in a suitable off-site location. The Commission may require a planting and monitoring plan to ensure that restoration of the disturbed eelgrass bed is successful. In cases where work is permitted proximate to eelgrass bedsd, directional drilling should be used to avoid any direct impacts on eelgrass.

BEACH NOURISHMENT

As sea levels rise and coastal properties experience increased erosion, Cape Cod communities may seek to permit, or see more private requests to permit beach nourishment projects designed to provide protection from coastal hazards. The Massachusetts Ocean Act of 2008, the resulting Massachusetts Ocean Management Plan, and the Cape Cod Ocean Management Plan anticipated requests to permit and extract sediment from offshore ocean resources for use as hazard mitigation.

Applicants for any beach nourishment project, whether for hazard mitigation or beneficial reuse of sediments retrieved from dredging, should characterize the profile and sediment of the beach to be nourished, and demonstrate the compatibility of the grain size of the sediment source material and that of the receiving beach.

Where an applicant is seeking approval to conduct offshore sediment mining for hazard protection-type beach nourishment purposes, DRI application materials should demonstrate that site-specific wave climate and erosion rate conditions support the goal of the project.

Applicants also should provide a site monitoring plan that includes the following elements:

- A commitment to conduct seasonal beach profile surveys along the length of the project area during the first year, followed by annual beach profile surveys,
- Annual evaluation of survey data to determine whether the project is performing as designed (e.g., to re-introduce sediment to the littoral system, or to provide storm damage protection benefits, and is not resulting in down-stream adverse impacts to coastal resources), and
- Consistency with the guidelines in Beach Nourishment - MassDEP's Guide to Best Management Practices for Projects in Massachusetts (March 2007).

The Commission may require submission of monitoring reports after the first year of data collection, and up to two years thereafter.

DREDGING

Applicants seeking permits for maintenance dredging should provide prior permitting documentation, including permit numbers, dates of issuance and re-issuance, and documentation that clearly demonstrates the location, width, depth and length of the previously permitted project. Maintenance dredging projects should maintain the existing footprint and depth of existing navigation channels and basins. Clean sediments retrieved from dredging activities should be beneficially reused to nourish area beaches, provided there are not other resource protection conflicts.

Improvement dredging is prohibited except when necessary to accomplish a substantial public benefit and no feasible alternative exists. Improvement dredging proposed for water quality improvement should provide hydrologic/hydraulic analyses demonstrating that the proposed dredging activity will improve water quality, and may be approved where the applicant can demonstrate that there will not be adverse impacts to sensitive resources, including shellfish, finfish, and endangered species habitat.

FISH, SHELLFISH, CRUSTACEANS

Development and redevelopment should be designed and constructed to minimize direct and indirect adverse impacts to fish, shellfish, crustaceans and their habitat. The construction or expansion of docks and piers is strongly discouraged in significant shellfish habitat areas, as identified and documented by the Division of Marine Fisheries and/or local shellfish officials. Previously licensed private docks and piers more than 50 percent damaged or destroyed by storms may be replaced in accordance with federal, state and local regulations. In areas identified and documented as significant shellfish habitat, replacement structures should be designed to minimize adverse impacts to these resources. As a general practice, in order to reduce cumulative adverse impacts to coastal ecosystems, community docks and piers should be constructed in lieu of individual docks on private property.

AQUACULTURE

Coastal aquaculture should be designed to have no significant adverse impacts to water quality or marine habitat. Temporary structures may be allowed provided that they are:

- Permitted by DEP and all other appropriate regulatory agencies
- Designed to increase the productivity of land containing shellfish or to enhance marine fisheries and supported by the Division of Marine Fisheries, and
- Determined by the Army Corps of Engineers and local Harbor master to create no significant impact to public trust rights and navigation safety.

Mitigation for Wetland or Buffer Impacts

As detailed in this Technical Bulletin, wetland and buffer alteration is generally not permitted, with the limited exceptions noted herein for redevelopment, utility installation, or water-dependent projects. In rare instances the Commission may allow wetland and buffer alteration, but only where wetland resource values are not degraded, there is an overriding public benefit, and the impacts are minimized and mitigated.

Where the Commission may allow wetland alteration for non-water-dependent projects, mitigation provided should be at least 2:1 mitigation to impact, and possibly greater. Mitigation may include the permanent protection of wetlands and/or buffers, which could be on-site or off-site. Wetlands offered as mitigation should be of equal or greater habitat value to those being impacted, i.e. they should be of high quality, free of invasive species, not serving as stormwater management structures. Similarly, wetland buffers offered as mitigation should be naturally vegetated, free of invasive species (or will be incorporated into an invasive species management plan) and are not serving some other development-related purpose.

To allow the Commission to consider potential impacts to wetlands or wetland buffers, the Applicant should provide:

- Narrative discussing alternatives to the proposed alteration that were considered and discarded, and why,
- Narrative discussing how the proposed alteration minimizes impacts to wetlands, buffers, and the beneficial functions that they provide

- Narrative discussing the public benefits that derive from the project
- Proposed mitigation identifying preserved wetlands, 100 ft buffers, located on- or off-site, and in an amount equal to or greater than twice the area of impact. May be waived for most water dependent projects, except where eelgrass may be impacted.
- For wetland buffers, mitigation may also include protection of habitat areas that have an equal or greater habitat value than the wetland buffer affected. Examples of high value habitats include areas identified by the NHESP BioMap2 Core or Critical Natural Landscapes, mapped rare species habitat, vernal pools, Important Bird Areas, areas noted on the State Wildlife Action Plan as high value (Tier 1) or Key sites.

Taken together, the analysis must demonstrate that, with the proposed mitigation, the project will not degrade wetland resource values.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE WET2

Objective WET2 *– Protect wetlands from changes in hydrology.*

Stormwater management should not result in discharge of stormwater to wetland resource areas or within 100 feet of wetlands in order to protect the natural hydrology and water quality within the wetland resource area.

In situations where a project proposes new groundwater withdrawals exceeding 20,000 gallons/day in proximity to wetlands, the applicant should demonstrate that the withdrawal will have no adverse effect on surface water levels and wetland habitat. The applicant should provide hydrogeologic characterizations in sufficient detail to demonstrate that wetland and vernal pool resources are sufficiently separated from the drawdown cone around the well, or are protected by a confining layer of sediment such that the impacts of water level drawdown on the wetland are non-existent or negligible. Water withdrawals should have no impact on water levels in wetlands or surface water bodies which may be connected to and fed by groundwater. (see requirements of Water Resources Objective WR5)

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE WET3

Objective WET3 *– Protect wetlands from stormwater discharges.*

Rainfall contributes to the natural hydrology of wetlands, flowing over land or entering wetlands from streams and rivers. Stormwater runoff from the built environment typically contains nutrients and pollutants which may have adverse impacts on wetlands. Thus, stormwater management should not result in discharge of stormwater to wetland resource areas or within 100 feet of wetlands in order to protect the natural hydrology and water quality within the wetland resource area. More detail on meeting stormwater management objectives may be found in the Water Resources Technical Bulletin, Objective WR4.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE WET4

Objective WET4 *– Promote the restoration of degraded wetland resource areas.*

Wetland Restoration

The RPP encourages restoration of degraded natural habitats and natural communities. Centuries of development activity have adversely impacted many of our coastal and inland wetlands. Development activity has encroached on wetlands or their buffers, streams have been restricted or impounded, coastal erosion management has altered the natural flow of sediment along beaches and across salt marshes. Measures to restore altered or degraded inland and coastal wetlands, including nonstructural bank stabilization, revegetation, and restoration of tidal flushing are encouraged. Thin Layer Sediment Deposition may be allowed on salt marshes where there is evidence of restoration success. Cranberry bogs where cultivation has ceased are excellent opportunities for wetland restoration. Removing development within sensitive or significant habitats, including mapped estimated or priority habitat or BioMap2 habitats as identified by the Natural Heritage and Endangered Species Program, is encouraged. Restoration projects should demonstrate that the proposed work will improve the natural functions of the wetland or buffer area and improve habitat for native plant and wildlife species.

In agricultural areas where full restoration of wetlands and buffer areas may not be practical, management practices that improve water quality and conserve water are encouraged. The Natural Resources Conservation Service has recommendations for farmers that address these interests. (see reference below)

Significant portions of the floodplain on Cape Cod are developed. With sea level rise and changes in our climate bringing increased flooding, acting on opportunities to remove development from coastal floodplains is encouraged. The removal of development in V-Zones or of FEMA-designated repetitive-loss properties is particularly encouraged.

Invasive species pose a threat to the health and function of Cape Cod's wetlands. The current list of species classified as invasive in Massachusetts is provided in the Wildlife and Plant Habitat Technical Bulletin. The Commission may allow the alteration of wetlands in order to address invasive species invasions where the unwanted plants can be removed without adversely impacting native species and natural wetland functions. Applicants seeking to restore wetlands or buffers impacted by invasive species should provide a management plan as detailed in the Wildlife and Plant Habitat Technical Bulletin, a detailed site plan and narrative describing the proposed restoration, including species to be removed, methods for removal, and a plan for restoration, including grading, hydrology, and native plant species (types, quantities, sizes). The chemical treatment of invasive species in wetlands is discouraged but may be permitted only where an alternate method would result in adverse impacts to wetland resources.

GENERAL APPLICATION REQUIREMENTS

Applicants should provide the following materials to address consistency with the Wetland Resources Goal and Objectives.

- Site plan showing delineation of all wetland resources and the 100 ft buffer to those delineations.
- If development is proposed within wetland resource areas or buffers, plans detailing the development proposed should be provided, including site plans of existing and proposed conditions, and planting plan for restoration of the site.
- Narrative discussing the alternatives considered, and plans of the alternatives, as appropriate.
- Where beach nourishment or other coastal alterations are proposed, cross sections of proposed beach or dune profiles should be provided.

DEFINITIONS

Wetland – An inland area of 500 square feet or greater including wet meadows, marshes, swamps, bogs, and areas of flowing or standing water, such as rivers, streams, ponds, and lakes, or a coastal area including beaches, dunes, barrier beaches, coastal banks, intertidal areas, salt marshes, and land under the ocean. Wetlands may border water bodies or may be isolated. Wetlands are generally described in the Wetlands Protection Act and delineated in accordance with the boundary delineation methods set forth in the relevant sections of 310 CMR 10.00. These include 310 CMR 10.25(2), 10.27(2), 10.28(2), 10.29(2), 10.30(2), 10.31 (2), 10.32(2), 10.33(2), 10.34(2), 10.35(2), 10.55(2) with the exception of the —bordering requirement, and 10.56(2).

Vista Pruning – trimming or removal of selected branches from trees to provide a view to the water, a wetland, or other vista. Vista pruning which may be allowed within wetland buffers will not necessarily provide an unobstructed view.

Invasive species – List of species determined by Massachusetts Department of Agricultural Resources as noxious weeds. www.capecodcommission.org/MA-invasive

REFERENCES

Farming in Wetland Resource Areas – A Guide to Agriculture and the Massachusetts Wetlands Protection Act
https://www.harvard.ma.us/sites/harvardma/files/uploads/farming_in_wl_ra.pdf

See also the Regional Policy Plan Data Viewer

Wildlife and Plant Habitat

This guidance is intended to clarify how the Wildlife and Plant Habitat Goal and Objectives of the Regional Policy Plan (RPP) are to be applied and interpreted in Cape Cod Commission Development of Regional Impact (DRI) project review. This technical bulletin presents specific methods by which a project can meet these goals and objectives.

Wildlife and Plant Habitat Goal: To protect, preserve, or restore wildlife and plant habitat to maintain the region's natural diversity.

- ***Objective WPH1*** *– Maintain existing plant and wildlife populations and species diversity*
- ***Objective WPH 2*** *– Restore degraded habitats through use of native plant communities*
- ***Objective WPH 3*** *– Protect and preserve rare species habitat, vernal pools, 350-foot buffers to vernal pools*
- ***Objective WPH 4*** *– Manage invasive species*
- ***Objective WPH5*** *– Promote best management practices to protect wildlife and plant habitat from the adverse impacts of development*

The applicability and materiality of these goals and objectives to a project will be determined on a case-by-case basis considering a number of factors including the location, context (as defined by the Placetype of the location), scale, use, and other characteristics of a project.

THE ROLE OF CAPE COD PLACETYPES

The RPP incorporates *a framework for regional land use policies and regulations based on local form and context* as identified through categories of Placetypes found and desired on Cape Cod.

The Placetypes are determined in two ways: some are depicted on a map contained within the RPP Data Viewer located at www.capecodcommission.org/RPPDataViewer adopted by the Commission as part of the Technical Guidance for review of DRIs, which may be amended from time to time as land use patterns and regional land use priorities change, and the remainder are determined using the character descriptions set forth in Section 8 of the RPP and the Technical Guidance.

The project context, as defined by the Placetype of the location, provides the lens through which the Commission will review the project under the RPP. Additional detail can be found in the Cape Cod Placetypes section of the Technical Guidance.

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INTRODUCTION

Cape Cod is located within the southern Massachusetts Pine Barrens eco-region. Pine barrens are a globally rare habitat comprised of a unique assemblage of plants and animals that thrive in the nutrient poor soils and variable climate found on Cape Cod. The unique assemblage of plants that are known as Pine Barrens is comprised of an open canopy of pitch pines and a dense understory of scrub oak and huckleberry. There are many natural communities associated with the pine barrens, however, which together populate the matrix of habitats that define the eco-region, including thickets, shrub barrens, heathlands and grasslands, and various pond and wetland habitats. Though the entire natural landscape on Cape Cod was altered following European settlement, there remain pockets of mature woodlands containing beech, hickory, red maple, and birch. These woodlands have supported, and continue to support native species and traditional uses, providing important habitat diversity and value to the region.

Many of the plant and animal species found on Cape Cod are rare or declining in number. Seventy-five species of plants and wildlife are listed by the Massachusetts Natural Heritage and Endangered Species Program as endangered or threatened, and another 57 are special concern species that are declining in number or could easily become threatened. Additional species are on a watch list and could become listed in the future based on further review. Threatened and endangered species that are also on the US Fish and Wildlife Service federal list of threatened and endangered species include the northern long-eared bat, sandplain gerardia, northern right whale, piping plover, and roseate tern.

These species depend on undisturbed and healthy habitats for their survival. The Cape's woodlands provide important upland wildlife and plant habitat. Poorly planned development can harm species by fragmenting large tracts of forest and severing wildlife corridors and other ecological connections. The Cape's wetlands, vernal pools, and ponds also provide vital habitat for diverse rare and endangered species. These areas can be damaged not only by adverse impacts such as pollution and disturbance but also by groundwater withdrawals that can reduce water levels needed to support aquatic and shoreline species.

Accurate information about the nature, location, and extent of sensitive resources can result in improved project site selection and site design. Applicants are encouraged to

review available mapped information about sensitive resource areas and areas that are priorities for protection prior to selecting a development location. The Regional Policy Plan relies on several sources of mapped data based on existing natural resources and protected open space presently providing a network of wildlife habitats and corridors across the Cape. A compilation of many of these important resource areas is found in the Natural Areas Placetype Map. In addition, several other maps, including the Commonwealth's BioMap2 Core Habitat and Critical Natural Landscapes and the State's Wildlife Action Plan (SWAP), may provide guidance in selecting preferred locations for development. A list of mapped resources available for planning and regulatory review is available at the end of this technical bulletin. Maintaining wildlife corridors and large patches of existing heterogeneous habitat types is a first step toward maintaining the viability of wildlife habitat on Cape Cod.

Growth management approaches are needed to reduce the amount of land converted to development and to improve the design and performance of new development to ensure protection of valuable habitat. A renewed commitment to protect the most ecologically sensitive undeveloped lands through land acquisition and other permanent conservation measures is also warranted. Restoration and better land stewardship are needed to improve areas that have already been developed.

HABITATS FOUND ON CAPE COD

According to the State Wildlife Action Plan (SWAP), Cape Cod is defined by many habitat types: Large and Mid-sized rivers, Marine and Estuarine Habitats, Transition Hardwoods-White Pine Upland Forest, Pitch Pine-Oak Upland Forest, Large Unfragmented Landscape Mosaics, Small Streams, Shrub Swamps, Forested Swamps, Lakes and Ponds, Salt Marsh, Coastal Dunes, Beaches, and Small Islands, Grasslands, Young Forests and Shrublands, Vernal Pools, Coastal Plain Ponds, Peatlands and Associated Habitats, Marshes and Wet Meadows.

STRESSORS TO HABITATS ON CAPE COD

Habitats on Cape Cod may be adversely impacted or threatened by numerous stressors, including: residential and commercial development, agriculture and aquaculture, energy production and mining, transportation and service corridors, biological resource use, human intrusions and disturbance, natural system modifications, invasive and other problematic species, pollution, as well as other

stressors that are beyond the control of the typical applicant (i.e. geological events, climate change and severe weather - from a list adopted by the International Union for the Conservation of Nature, and incorporated into the SWAP). In order to protect the remaining habitat areas on Cape Cod, development introducing or expanding these stressors is discouraged, and is not permitted in certain significant habitats such as vernal pools and their buffers, and rare species habitat. The SWAP contains detailed information on the nature of the impacts these stressors may be expected to exert on each of the habitats on Cape Cod.

SUMMARY OF METHODS

GOAL | WILDLIFE AND PLANT HABITAT

To protect, preserve, or restore wildlife and plant habitat to maintain the region's natural diversity.

OBJECTIVE WPH1 – Maintain existing plant and wildlife populations and species diversity

METHODS FOR ALL WETLANDS:

All DRI's must, to the maximum extent feasible:

- Minimize clearing of vegetation and alteration of natural topography.
- Minimize fragmentation of wildlife and plant habitat and establish greenways/wildlife corridors to protect edge species and species that inhabit the interior forest.
- Maximize the protection of large, contiguous unfragmented areas, and cluster development away from the most sensitive areas of a site.

Additional Methods:

- Protect standing specimen trees.
- Plant native vegetation as needed to enhance or restore wildlife habitat.
- Provide opportunities for safe passage for wildlife through developments to maintain the integrity of wildlife corridors.
- Development, including fencing, should not be constructed so as to interfere with identified wildlife migration corridors.
- Avoid development in Key Sites as defined in the State Wildlife Action Plan, and BioMap2 Core Habitat and Critical Natural Landscapes as defined by the Massachusetts Natural Heritage and Endangered Species Program.

OBJECTIVE WPH1 AREAS OF EMPHASIS BY PLACETYPE

Natural Areas | New clearing is strongly discouraged.
Rural Development Areas | New clearing is minimized, does not conflict with rural character, preserves habitat connections
Suburban Development Areas | New clearing is minimized, preserves habitat

connections

Historic Areas | New clearing is minimized, does not conflict with character defining landscape

Maritime Areas, Community Activity Centers, Industrial Activity Centers, and Military and Transportation Areas | New clearing is minimized, preserves habitat connections

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OBJECTIVE WPH2 – Restore degraded habitats through use of native plant communities

METHODS

- Restore altered or degraded habitat areas where ecologically appropriate (for example, sandplain grasslands, pine barrens, etc.).

OBJECTIVE WPH3 – Protect and preserve rare species habitat, vernal pools, 350-foot buffers to vernal pools

METHODS

- Locate development outside of rare species habitat, wetlands, vernal pools and their buffers, and BioMap2 Core Habitat and Critical Natural Landscapes.
- Where a project is located within mapped rare species habitat, demonstrate that impacts to rare species have been avoided. Comments from the Natural Heritage and Endangered Species Program may be used to support demonstration that the project does not adversely impact rare species or their habitats.

For projects adjacent to a vernal pool:

- Locate development outside of certified or certifiable vernal pools.
- Provide a 350-foot undisturbed buffer to the vernal pool
- Locate new stormwater discharges a minimum of 100 feet from vernal pools.

OBJECTIVE WPH4 – Manage invasive species

METHODS

- Where invasive species have been identified on a project site, provide an invasive species management plan that helps to prevent the spread of invasive species on the site.
- Use Best Management Practices during construction to avoid introduction of invasive species.

OBJECTIVE WPH5 – Promote best management practices to protect wildlife and plant habitat from the adverse impacts of development

METHODS

- Use building envelopes to limit the extent of site alteration and disturbance to the minimum areas needed for the project.
- Use erosion control barriers during construction to prevent gullying.
- Use fencing to protect plants and wildlife from harm during construction.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE WPH1

Objective WPH1 *– Maintain existing plant and wildlife species populations and habitat diversity.*

NATURAL RESOURCES INVENTORY

Applications for Developments of Regional Impact that propose to alter undeveloped areas should include a natural resources inventory (NRI) as detailed below (see application materials). The NRI should identify the presence and location of wildlife and plant habitat, including vernal pools, and serve as a guide for the layout of the development.

RESOURCE AREAS: IMPORTANT BIRD AREAS, ACECS, AND DCPCS

In addition to the more broadly distributed significant resources such as rare species habitat and BioMap2 habitats discussed in more detail below, several areas on Cape Cod have been designated as significant for more comprehensive resource protection interests. Applicants should review the mapped boundaries of these resources when planning a development activity, and take appropriate steps to address the resource protection interests of each, if applicable:

Important Bird Areas (IBA) are key sites for the conservation of bird species, identified by a set of internationally-accepted, standardized criteria. The sites are small enough to be conserved in their entirety, often form part of a protected-area network, and typically are different in character or habitat or ornithological importance from the surrounding area. Cape Cod hosts several IBAs, illustrated on the map (link). Applicants should avoid development in these significant habitat areas, or if development cannot be avoided, explain in a narrative how the nature or design of the development will not impact, or will minimize impacts to bird habitat.

Areas of Critical Environmental Concern (ACEC) are defined areas which contain concentrations of highly significant environmental resources and which have been formally designated by the state through a public nomination and review process. Following designation, state agencies, communities, and public and private organizations work to protect, preserve and restore the significant resources in these

areas. Regulatory agencies are expected to apply stricter standards of review to development activities within ACECs. Cape Cod hosts eight ACECs from Wellfleet to Bourne. If a DRI is proposed within an ACEC, the applicant should explain in a narrative how the project has been designed to avoid or minimize impacts to the natural resource interests identified in the designation documents of the ACEC. Designation documentation on the eight ACECs is available upon request.

Districts of Critical Planning Concern (DCPC) are areas designated by Barnstable County ordinance through review and recommendation by the Cape Cod Commission. DCPCs may be established for many purposes under the CCC Act, but many of those in place today were designated to protect natural resource interests. Where a DRI may be proposed within a DCPC with natural resource protection interests, the applicant should provide a narrative explaining how the siting or design of the project addresses the interests of the DCPC.

MINIMIZE CLEARING AND GRADING

Developments should be planned to minimize adverse impacts to wildlife and plant habitat, including new land clearing and alteration of topography. Reuse of existing buildings, parking, and other infrastructure is strongly encouraged, and clearing of new land for development should be minimized. Minimizing impacts includes designing the project to minimize the total cleared and disturbed area on a site, clustering buildings, locating infrastructure under, on, or adjacent to buildings and paved areas, and utilizing existing disturbed areas. Locating structured parking under buildings or in a multi-level garage is encouraged. Clearing new land for solar field development is strongly discouraged; however, locating solar panels above parking or on rooftops is strongly encouraged. In addition to the benefits to wildlife and plant habitat, reusing existing building and paved or disturbed areas, as well as “co-locating” uses or infrastructure on a site helps to reduce costs associated with heating and cooling new structures, managing stormwater, and the additional infrastructure costs associated with longer site drives and running utility lines.

SPECIMEN TREES

Whenever possible, standing specimen trees should be protected. Possible exceptions include invasive species, which will be evaluated on a case by case basis. Defining a specimen tree on Cape Cod will vary depending on the species of tree, but typically

softwoods greater than 18″ dbh and hardwoods greater than 12″ dbh are considered specimens. Protecting specimen trees means not disturbing an area equivalent to 10 feet greater than the canopy perimeter, at a minimum, and ideally protecting a larger area around them, including trees which provide buffering to the specimen tree from storms.

HABITAT FRAGMENTATION

Projects should be designed to minimize fragmentation of wildlife and plant habitat. Greenfield development in the Natural Areas Placetype is strongly discouraged, especially in Key Sites as identified in the State Wildlife Action Plan and in BioMap2 Core Habitat and Critical Natural Landscapes. Development on parcels that may provide connections to a larger habitat network should be laid out to protect large unfragmented areas, and make connections to undeveloped areas offsite. Where appropriate, greenways and wildlife corridors of sufficient width to benefit edge species and those that inhabit the interior forest should be provided. Wildlife should be provided with opportunities for passage under or across roads and safely through developments where such opportunities will maintain the integrity of wildlife corridors. The Commission may require designation of building envelopes (for structures, driveways, lawns, etc.), where appropriate, to limit removal of vegetation. Fencing should not be constructed so as to interfere with identified wildlife migration corridors. See references below for additional guidance on site and subdivision design layout.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE WPH2

Objective WPH2 *– Restore degraded habitats through use of native plant communities*

HABITAT RESTORATION

Opportunities to restore native habitat communities that are found within the Southeastern Massachusetts pine barrens eco-region are encouraged. According to the State Wildlife Action Plan (SWAP), Cape Cod hosts many distinct habitat types that together comprise the pine barrens ecoregion: Habitats such as Pitch Pine-Oak Upland Forest, Shrub Swamps, Lakes and Ponds, Salt Marsh, Coastal Dunes, Beaches, and Small Islands, Grasslands, Vernal Pools, and Coastal Plain Ponds are some of the habitats that create the vibrant landscape mosaic of Cape Cod.

Efforts to restore the natural habitats found within the region with native vegetation is strongly encouraged. Restoration projects or development projects, including "undevelopment", with a habitat restoration component should provide a plan detailing the nature of the restoration, including grading changes, native species to be planted (including types, sizes, quantities), plans to ensure establishment (irrigation and/or invasive species management), a narrative discussing the purpose and objectives of the restoration, and monitoring as needed.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE WPH3

Objective WPH3 *– Protect and preserve rare species habitat, vernal pools, 350-foot buffers to vernal pools*

RARE SPECIES

Where development is proposed within mapped state or federal rare species habitat areas, the proponent must submit the development proposal to the Massachusetts Natural Heritage and Endangered Species Program (NHESP) for review and comment. As a matter of practice, development that would adversely affect habitat of local populations of rare wildlife and plants is not permitted. However, development in mapped rare species habitat may be allowed if the NHESP provides written comment that the work will not adversely affect rare species (or not result in a "take").

Development which NHESP determines may result in a "take" of state listed species may be permitted where the proponent can demonstrate that such development will not adversely affect rare species habitat. An applicant may be able to address a determination of take or likely take through redesign of the project, utilizing best management practices during construction, timing of construction activities, or occasionally through mitigation. Only through a determination by NHESP will mitigation be allowed to address impacts to rare species. In those cases, a wildlife and plant habitat management plan may be required as a condition of approval when development or redevelopment is permitted in rare species habitat areas.

VERNAL POOLS

Vernal pools are ephemeral pools of water that typically appear in the spring with winter snowmelt and spring rains, and often (but not always) disappear by summer's end. They are not resources protected under the state Wetlands Protection Act, but they are recognized as a significant habitat and are protected under the RPP. NRIs should identify vernal pools that may be present on a site according to the criteria established by the Natural Heritage and Endangered Species Program (see reference below and details in NRI).Where a project site is located adjacent to a vernal pool, including pools that include the criteria for certification as a vernal pool, development must be located outside of a 350-foot undisturbed buffer around these resources in

order to protect both the pool habitat as well as the important upland habitat around them. Studies have demonstrated that vernal pool species, which spend most of their yearly lifecycles in upland vegetated buffers outside of the pool, may migrate up to 1,000 feet to breed in the temporary pools. Additionally, new stormwater discharges should be located a minimum of 100 feet from vernal pools in order to protect these resources from the adverse effects of sedimentation, nutrient inputs, or significant changes in water level or water period.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE WPH4

Objective WPH4 *– Manage invasive species*

INVASIVE SPECIES

Development on sites where a NRI identifies the presence of invasive plant species should provide and implement a management and restoration plan detailing the management of, and where possible, the eradication of the invasive species present, and the proposed revegetation of the site with native species. Where significant or sensitive wildlife or plant habitat is threatened, the invasive species management plan should strive to eradicate or reduce the threat to those sensitive species. A current listing of invasive species can be found on the web at www.massnrc.org/mipag/invasive.htm .

Development activities permitted by the Commission should also take steps to avoid introducing invasive species to a development site during construction through use of best management practices. Construction vehicles should be washed prior to initiating work on the project site, and should be inspected and/or washed periodically during construction.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE WPH5

Objective WPH5 *– Promote best management practices to protect wildlife and plant habitat from the adverse impacts of development*

PROTECT HABITAT FROM DEVELOPMENT IMPACTS

In general, development on Cape Cod is strongly encouraged to retain as much of the natural vegetation as possible. As discussed elsewhere (above, and in the Community Design technical guidance), development should be clustered on a site to use land as efficiently as possible, minimize impervious surfaces and minimize impacts to native vegetation and habitats. Construction fencing and/or building envelopes may be employed to limit disturbance to existing trees, shrubs, and groundcovers. Building envelopes will typically reduce restoration and other mitigation costs, and help retain native forested and other vegetative covers to protect the services these natural materials provide in filtering nutrients and stormwater, improving air quality, and providing shade and wildlife habitat. Building envelopes established in a property deed can ensure that impacts from development are not expanded and that these natural services are protected over the long term. The Commission may require the use of building envelopes where sensitive habitats or resources are present.

Erosion control barriers should be used anywhere that slopes or proximity to wetlands or other sensitive resources are present to ensure that the impacts from construction are managed within the construction site. In longer-term construction projects where unvegetated soils may be present through several seasons, seeding and/or erosion control blankets should be employed to manage loss of soils off-site and prevent gullying.

Construction activities can also pose direct threats to wildlife. Where turtles or other slow moving or sensitive wildlife species may be present (such as vernal pool species or amphibians), construction fencing should be employed to redirect wildlife away from the construction site.

GENERAL APPLICATION REQUIREMENTS

Applicants should provide the following materials to address consistency with the Wildlife and Plant Habitat Goal and Objectives.

- Prepare a Natural Resources Inventory (NRI) (see guidance below)
- Where a project is located within mapped rare species habitat, provide documentation indicating review by the Massachusetts Natural Heritage and Endangered Species Program.
- Where a NRI indicates the presence of invasive species, provide an Invasive Species Management Plan (see guidance below).

DEFINITIONS

Vernal Pools – a vernal pool is a wildlife habitat that supports standing water for a period of time from spring into summer and which provides habitat for vernal pool species. For the purposes of DRI review, vernal pools include both those sites which have been certified by the Natural Heritage and Endangered Species Program, and those sites which have the characteristics that make them certifiable by the NHESP. Maps of certified vernal pools and potential vernal pools are available on the Commission's Resource Data Portal (link).

"Take" is defined under the Massachusetts Endangered Species Act as the following:

In reference to animals, it means to harass, harm, pursue, hunt, shoot, hound, kill, trap, capture, collect, process, disrupt the nesting, breeding, feeding or migratory activity or attempt to engage in any such conduct, or to assist such conduct,

And in reference to plants, means to collect, pick, kill, transplant, cut or process or attempt to engage or to assist in any such conduct. Disruption of nesting, breeding, feeding or migratory activity may result from, but is not limited to, the modification, degradation or destruction of habitat.

REFERENCES

See also the Wetlands, Open Space, and Community Design Technical Bulletins

Regional Policy Plan Data Viewer

VERNAL POOL INFORMATION

The Natural Heritage and Endangered Species Program certifies vernal pools and has established criteria for their certification. Information may be found here: https://www.mass.gov/service-details/vernal-pool-certification

RARE SPECIES

Information on rare species, including current list of state listed species, forms requesting state review and comment, and other pertinent resources may be found at the Natural Heritage and Endangered Species Program website https://www.mass.gov/orgs/masswildlifes-natural-heritage-endangered-species-program

STATE WILDLIFE ACTION PLAN

The 2015 update to the Massachusetts State Wildlife Action Plan (SWAP) can be found at this link https://www.mass.gov/service-details/state-wildlife-action-plan-swap

Key sites, as defined by the SWAP and referenced in this technical guidance, may be found in Chapter 4 of the SWAP, starting on page 351.

SITE AND SUBDIVISION DESIGN

See the Community Design Technical Bulletin.

Rural by Design, or Conservation Subdivision Design, both by Randall Arendt, provide detailed guidance about layout of new development in greenfield sites, designed to minimize impacts to habitat and views of significant landscapes.

NATURAL RESOURCES INVENTORY

Once a site has been selected, applicants for DRI review should prepare a natural resources inventory (NRI) to evaluate the site in more detail. Contents of a NRI should include:

Soils

- Describe soils underlying the development site. Where the Barnstable County Soil Survey indicates the presence of prime agricultural soils, the development site should be surveyed and mapped based on results of field testing.

Vegetation

- Describe the major upland vegetational communities located on the site, include canopy/trees, shrub layer, low ground cover, herbaceous vegetation. Note approximate depth of leaf litter, and size and height of mature trees. Note locations of specimen trees. If several different zones of vegetation or natural/vegetational communities are present on the site, note the location of these areas on a site plan (suggested scale: 1"=40').
- Identify and delineate wetlands, waterbodies, banks, dunes, flats, and floodplain areas located on the site. Describe the major vegetational communities located in these areas as above. Note whether wetland delineations have been verified by the town conservation commission.
- Note the relative abundance or scarcity of vegetational community(ies) identified on the site in areas immediately surrounding the development site. In particular, note nearby areas of similar unfragmented habitat. Identify vegetational communities that are unique to the development site.
- Identify and delineate the presence of any state listed invasive species

Wildlife

- Identify wildlife species and evidence of wildlife observed in each vegetational community. Search for amphibians and reptiles under rocks and fallen logs. Identification/observations may include sightings of animal species, identification of species from calls/sounds, tracks, scat, burrows, browse marks, nests, feathers, bone fragments, etc. At least two field visits for the purpose of wildlife identification

should be made. Such field visits should occur within one hour of sunrise and within one hour of sunset during good weather.
- Identify presence of wildlife migration areas and corridors, denning, nesting and breeding areas, and deer yards and travel corridors.
- Note presence of snags and significant dead vegetation that may serve as nesting sites for bird species.
- Note presence of fish, amphibians and other species associated with wetlands and waterbodies located on the site.

Vernal Pools

- Note presence of kettle hole depressions and other areas that may function as vernal pools (regardless of association with other wetland area or state certification). If such areas exist, note presence/evidence of vernal pool species. Refer to the state vernal pool certification guidelines for identification of vernal pools. When possible, vernal pool surveys should be conducted during April, May and June.

Natural Resource Inventory Narrative

The results of the inventory should be provided in a report format and on plans, as appropriate, and should include a discussion of the short and long-term impacts to existing habitats and natural communities that will result from the development activity. The narrative should discuss how the project's design has minimized impacts to the habitats present, including habitat fragmentation. The narrative should also include a description of any proposed mitigation measures that are specifically intended to reduce the impact of the proposed project upon plant and wildlife habitat and/or populations. Include any measures designed to enhance existing plant and wildlife habitat that would provide an overall benefit to the area. Include details on best management practices to be employed during construction to avoid gullying and other effects of erosion, and to avoid the introduction of invasive species (see Detailed Methods for Meeting Objectives WPH4 and WPH5). Where appropriate, describe any revegetation and restoration that is planned after development and associated monitoring. Revegetation should emphasize plant species indigenous to Cape Cod.

In addition to the maps referenced (above/below) several resources may be useful in preparing the NRI. These may include:

- mapping of rare species habitat by the Natural Heritage and Endangered Species Program (NHESP),
- BioMap2 Core Habitat and Critical Natural Communities by NHESP
- Massachusetts State Wildlife Action Plan (SWAP), 2015
- Barnstable County Soil Survey, Prime Agricultural soils mapping
- Aerial photography
- DEP Wetlands layer
- FEMA flood zones
- Areas of Critical Environmental Concern (ACEC), maps and designation narrative
- Districts of Critical Planning Concern (DCPC), maps and designation narrative
- Coastal Zone Management Shoreline Change maps
- Natural Areas Placetype Map, Cape Cod Commission
- Important Bird Area maps

INVASIVE SPECIES INVENTORY AND MANAGEMENT PLAN

Projects proposing to alter undeveloped areas should provide an inventory of invasive species on the proposed site. These inventories should include the percent cover of each species and should delineate each species on a site map. Invasive plants should be identified by genus and species names. Where identified state-listed rare or endangered species are present on a project site, a detailed narrative discussing potential threats to the endangered species from the more aggressive and/or successful invasive species should be provided. This narrative should also address potential problems associated with managing invasive species in proximity to endangered species or in ecologically sensitive areas.

Potential Impact of Invasive Plant Species

The management plan should describe:

- how the invasive plants could be expected to spread if left unmanaged in an undeveloped area and the impacts (if any) to the surrounding plant and wildlife community.
- how the invasive plants could be expected to spread if left unmanaged after the proposed development was constructed.

- alternative management options for the invasive plants on site. These options should include examples of mechanical, chemical, and biological control with a full explanation of any potential adverse effects from control measures.

Development of a Preferred Management Plan

A preferred management plan should use a strategy that best manages the invasive species on site with the minimum adverse impacts from control measures. Wherever possible, the goal of the management plan should be to eradicate the species from the site. Mechanical control, such as cutting or pulling, generally has the least adverse impacts, however, it is not effective on some deciduous woody plant species. Chemical control methods are discouraged, except in situations where chemical management would reduce adverse impacts on the environment. When chemical control is the only viable option, modest applications to cut stems or frill cuts are recommended. Foliar spraying is strongly discouraged because of the negative impact to non-target plant and animal species. Biological control, or use of living organisms as a control agent, has been proven effective on some species. However, only well tested, scientifically documented biological control agents should be considered. The goal of biological control strategies should not be to eradicate the species, because if the target species is eradicated, the biological control agent often moves to a non-target species. Where plant removal is proposed, an alternative planting plan, using plants native to the region, should be provided.

Staff is available to consult with applicants to determine the best management plan for invasive species. A variety of information which may assist in developing management plans is available on-line. Suggested website: http://www.mdflora.org/publications/invasives.htm#control

The Massachusetts Invasive Plant List may be found at: https://www.mass.gov/service-details/invasive-plants

Open Space

This guidance is intended to clarify how the Open Space Goal and Objectives of the Regional Policy Plan (RPP) are to be applied and interpreted in Cape Cod Commission Development of Regional Impact (DRI) project review. This technical bulletin presents specific methods by which a project can meet these goals and objectives.

Open Space Goal: To conserve, preserve, or enhance a network of open space that contributes to the region's natural and community resources and systems.

- ***Objective OS1*** *– Protect and preserve natural, cultural, and recreational resources*
- ***Objective OS2*** *– Maintain or increase the connectivity of open space*
- ***Objective OS3*** *– Protect or provide open space appropriate to context*

The applicability and materiality of these goals and objectives to a project will be determined on a case-by-case basis considering a number of factors including the location, context (as defined by the Placetype of the location), scale, use, and other characteristics of a project.

THE ROLE OF CAPE COD PLACETYPES

The RPP incorporates *a framework for regional land use policies and regulations based on local form and context* as identified through categories of Placetypes found and desired on Cape Cod.

The Placetypes are determined in two ways: some are depicted on a map contained within the RPP Data Viewer located at www.capecodcommission.org/RPPDataViewer adopted by the Commission as part of the Technical Guidance for review of DRIs, which may be amended from time to time as land use patterns and regional land use priorities change, and the remainder are determined using the character descriptions set forth in Section 8 of the RPP and the Technical Guidance.

The project context, as defined by the Placetype of the location, provides the lens through which the Commission will review the project under the RPP. Additional detail can be found in the Cape Cod Placetypes section of the Technical Guidance.

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INTRODUCTION

The vision for the future of Cape Cod is a region of vibrant, sustainable, and healthy communities, and protected natural and cultural resources. Open space is a critical element of achieving this vision.

The open space goal of the RPP is "to conserve, preserve, or enhance a network of open space that contributes to the region's natural and community resources and systems." Open space in all its forms provides a wide range of ecosystem services – direct and indirect contributions to human well-being – throughout Cape Cod. Open space preservation will ensure that the values and characteristics that make this place special will be sustained and stewarded for future generations.

Cape Cod is located within the southeastern Massachusetts pine barrens ecoregion, a globally rare habitat type comprised of a unique assemblage of plants and animals that thrive on the region's nutrient-poor soils and variable climate. Within this ecoregion, a diverse matrix of habitat types — from salt marshes to sandplain grasslands to freshwater wetlands to estuaries — supports 132 state-listed rare plant and animal species and hundreds of additional species that rely on Cape Cod's habitats year-round, during seasonal migrations, or for breeding. Priorities for protection include high value natural resources, significant wildlife habitat, and areas that protect current and potential future drinking water supply sites.

It is of regional importance to preserve Cape Cod's cultural heritage, including traditional maritime and agricultural activities, as well as scenic views and community character. Another priority is to provide and preserve access to beaches, parks, walking and bicycling paths, woodland trails, and community gathering spaces. A range of accessible outdoor recreational opportunities throughout Cape Cod will sustain community health and well-being, as well as contribute to tourism-dependent economic activities. Connections between the natural and built environment in more densely developed areas will enhance quality of life and provide additional transportation and recreation options for residents and visitors alike.

With these priorities in mind, the provision of open space is a requirement of DRIs where new development is proposed. The methods, quantity, and form of open space provided will vary from site to site, reflective of Placetype, sensitive resources that may be present, connections to natural and community systems, extent of development

proposed, and context. The open space objectives may be met through the implementation of methods such as, but not limited to, those described on the following pages. This flexible approach to DRI review will allow for a strong correlation between the form and function of open space and Cape Cod's varied natural and community resources and systems.

Guidance on the method for calculating the required open space based on the *area of development impact* (see page OS-14), as well as the applicability of methods by Placetype (see page OS-15), follows within this Technical Bulletin.

SUMMARY OF METHODS

GOAL | OPEN SPACE

To conserve, preserve, or enhance a network of open space that contributes to the region's natural and community resources and systems.

OBJECTIVE OS1 – Protect and preserve natural, cultural, and recreational resources

METHODS

- Protect and preserve high value resources and minimize development footprint
- Protect lands suitable for future water supply sites
- Preserve wildlife habitat and unfragmented blocks of open space
- Preserve the region's agricultural lands and scenic vistas
- Preserve open space that benefits natural and community systems
- Provide and enhance recreational opportunities and access to open space

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OBJECTIVE OS2 – Maintain or increase the connectivity of open space

METHODS

- Protect open space contiguous to undeveloped lands or protected open space
- Preserve wildlife corridors and opportunities for the movement of wildlife
- Establish, enhance, and connect greenways and recreational trails

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OBJECTIVE OS3 – Protect or provide open space appropriate to context

METHODS

- Projects must provide protected open space according to Placetype in the ratio indicated in the summary table below.
- Depending on Placetype, the open space requirement can be met by one or a combination of three possible mechanisms as indicated in the summary table below: protection of open space on the project site, protection of high-quality land offsite, or by a cash contribution for the purpose of open space protection within the town.

- Where the following criteria are met,the amount of required open space may be reduced by up to 20%:
    - Where no sensitive resource areas are present, including BioMap2 Core Habitat or Critical Natural Landscapes, rare species habitat, wellhead protection areas, wetlands, waterbodies, vernal pools, floodplain, cultural or historic resources, beaches or dunes, agricultural lands or soils;
    - Higher quality open space is provided than what is impacted by the project, as determined by the number, value, and/or significance of the resources to be protected, and
    - The project is not located within a Natural Area or a Rural Development Area.
- The required open space is calculated based on Area of Development Impact (see page OS-14).

BRIEF SUMMARY OF OPEN SPACE MECHANISMS AND RATIOS SPECIFIC TO PLACETYPE:

The ratios below represent the relative amount of Protected Open Space to Area of Development Impact. The available mechanisms for meeting the Open Space requirement are set forth below.

Natural Areas | 3:1 – provide high-quality open space onsite, or in a Natural Area offsite
Rural Development Areas | 2:1 – provide high-quality open space onsite, or in a Natural Area offsite
Suburban Development Areas | 1:1 – provide high-quality open space, adequate buffers and pedestrian amenities onsite, offsite, or by cash contribution
Historic Areas | 1:1 – provide streetscape improvements and/or pocket park appropriate to context onsite, offsite, or by cash contribution
Maritime Areas | 1:1 – provide streetscape improvements and/or pocket park appropriate to context onsite, offsite, or by cash contribution
Community Activity Centers | 1:2 – provide pocket parks, streetscape improvements and/or public sitting areas onsite, offsite, or by cash contribution
Industrial Activity Centers | 1:1 – provide substantial buffers to development and protect sensitive resources onsite, offsite, or by cash contribution
Military and Transportation Areas | 1:1 – provide substantial buffers to development and protect sensitive resources onsite, offsite, or by cash contribution

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE OS1

Objective OS1 *– Protect and preserve natural, cultural, and recreational resources*

The following methods may be implemented to demonstrate consistency with Objective OS1.

Protect and Preserve High Value Resources and Minimize Development Impacts

REGIONAL PROTECTION PRIORITIES

The permanent protection of land and resources within the Natural Areas Placetype is a regional priority. High value resources that are priorities for protection on Cape Cod include: BioMap2 Core Habitat, Critical Natural Landscapes, habitat for rare or endangered species, vernal pools and their buffers, Wellhead Protection Areas, potential future drinking water supply sites, lands adjacent to water resources such as lakes, rivers, shoreline, and wetlands, areas that provide a critical function in preserving the integrity and viability of Cape Cod's significant and diverse ecosystems, and large unfragmented blocks of undeveloped land and wildlife corridors.

Additional high priorities for protection or preservation include: historic, cultural, and archaeological resources; regionally significant scenic vistas and roads; agricultural lands; the region's working waterfronts and maritime heritage; and unique landforms.

SITE DESIGN

Projects within all Placetypes should be designed to protect and/or preserve those areas with the highest natural resource value and to ensure that the most sensitive elements of a site are not impacted by development. A Natural Resources Inventory (see Wildlife and Plant Habitat Technical Bulletin*)* will provide guidance on significant natural resources and characteristics that should be given consideration during site design, including identifying lands that are a high priority for conservation.

On sites where high value natural resources, important wildlife habitat, or other significant resources are not present or do not create site design constraints,

development should be sited close to existing development, roadways, and infrastructure to limit the area of site disturbance.

By limiting impervious surfaces, more land will be left in its natural state, which will provide ecological benefits and may reduce the development footprint. Approaches for minimizing impervious surfaces include reducing paved areas by reducing parking or using asphalt alternatives, or providing some or all of a development's parking requirements under buildings or in multi-level parking structures.

Siting a project outside of Natural Areas will lessen the open space requirement and may also allow for flexibility in how open space is provided.

Protect Lands Suitable for Future Water Supply Sites

Lands identified as future water supply sites are a priority for protection. Ideally, development should not be located in these areas. Permanent protection of land identified as a high priority for protection due to suitability as a future water supply site may allow for a reduction in the open space required. The Water Resources Technical Bulletin provides additional strategies and resources for protecting the region's drinking water supply.

Preserve Wildlife Habitat and Unfragmented Blocks of Open Space

Clustering development will reduce fragmentation of open lands and habitat, which supports healthy ecosystem function, and preserves interior wildlife habitat. For residential subdivisions and commercial subdivision of land, clustering of development is strongly encouraged unless it is inconsistent with local bylaws. The design of cluster residential and commercial developments should preserve natural and community resources, maximize contiguous open space, respect the natural topography and character of the site, and employ wastewater treatment alternatives to allow for more compact development.

Preserve the Region's Cultural Heritage and Community Character

The preservation of the region's rich cultural heritage and community character is supported through flexibility in open space requirements within Maritime Areas and Historic Areas. Provision of public access to and community greenspaces within Historic Areas and Maritime Areas may be proposed as methods for meeting Objective OS1.

The viability and sustainability of working landscapes, including lands in agricultural production and working waterfronts, should be preserved to the greatest extent possible, to support the local economy, preserve Cape Cod's cultural heritage, and provide opportunities to meet some of region's needs locally and sustainably.

If there are regionally significant views within, towards, or across a site, sites should be designed to allow for continued access to those viewscapes to the greatest extent possible. The preservation or reestablishment of historic views to water or landscape vistas is encouraged (see also the Community Design Technical Bulletin)

Provide and Enhance Recreational Opportunities and Access

The provision of public access to on-site open space or a designated greenway within the property to off-site publicly accessible open space may be a component of the open space proposal, depending on factors which include whether there is a public benefit, the characteristics of the open space that access is being provided to, and the Placetype context.

The preservation of public access to resource-dependent recreational activities, such as swimming, boating, fishing, and sailing, is a high regional priority. On-site or off-site provision of open space that preserves public access may allow for a reduction in the open space required.

The provision of public access that benefits people of all ages and abilities through the establishment of ADA compliant pathways is also encouraged.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE OS2

Objective OS2 *– Maintain or increase the connectivity of open space*

The following methods may be implemented to demonstrate consistency with Objective OS2.

Protect Open Space Contiguous to Undeveloped Lands or Protected Open Space

In cases where the project site abuts land that has been permanently restricted for conservation or preservation purposes, or where it is adjacent to working landscapes such as lands in active agricultural production, site design should protect contiguous open space. This will expand unfragmented wildlife habitat, buffer development, and support healthy ecosystem function.

Protection of open space that is contiguous to undeveloped land that is not restricted provides for future expansion of the block of unfragmented open space, should the opportunity arise.

The Context Map (see Resources) is a useful resource in identifying contiguous open space that should be taken into consideration during site design.

Preserve Wildlife Corridors and Opportunities for the Movement of Wildlife

By reviewing the habitat types present on the property, as described in the Natural Resources Inventory and the Context Map, significant blocks of wildlife habitat and corridors of connected open space for the movement of wildlife across the landscape can be identified and protected. Topography, existing and proposed land use, and species requirements should be factored in when determining the necessary wildlife corridor width. Preservation of wildlife corridors is required to be factored into the placement of fencing on-site when this method is applicable.

Establish, Enhance, and Connect Greenways and Recreational Trails

The Context Map is a useful tool for identifying existing pathways to water, trails, and/or multi-modal greenways – a linear open space along either a natural corridor or a right-of-way converted to recreational use – on the project site itself and/or on neighboring properties. When designing the site, any greenway connections already existing on the property should be preserved to the greatest extent possible. The establishment of a new multi-modal greenway section across the property, connected to an existing off-site multi-modal greenway, may contribute to meeting any open space requirement in certain Placetypes.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE OS3

Objective OS3 *– Protect or provide open space appropriate to context*

The following methods may be implemented to demonstrate consistency with Objective OS3.

DRIs are required to provide open space appropriate to context. The following section addresses identification of open space required, including how to calculate the Area of Development Impact; identifying and incorporating open space appropriate to the Placetype; ensuring that the site design protects lands of high natural resource value and that it benefits natural and community systems; and alternate methods for meeting the open space requirement on an off-site parcel or through a cash contribution.

Calculate Area of Development Impact

The Area of Development Impact is the total undeveloped area on the site anticipated to be impacted by the proposed development (see Definitions for *development*). The project's civil engineer should calculate the square footage of areas disturbed by development activity and provide this on the proposed conditions plan.

In redevelopment projects, landscaped areas adjacent to existing buildings or parking may be considered as already disturbed area and excluded from the Area of Development Impact.

Where land is being subdivided for the purpose of residential, commercial, or other lot development, the Area of Development Impact includes the total undeveloped area proposed to be subdivided and/or developed. This provision encourages the efficient use of land and clustering to reduce overall impacts.

Any open space lot/area preserved in perpetuity as part of the project can be excluded from the Area of Development Impact and may be counted towards the open space protection requirement.

To incentivize reducing impervious surfaces due to parking, provision of some or all of a development's parking under buildings or in multi-level parking structures reduces the Area of Development Impact on a site, which in turn reduces the open space

requirement. On sites with structured parking, reduce the Area of Development Impact by twice the area of the structured parking.

Protect Open Space Appropriate to Context

How a project meets the open space requirement varies by Placetype, but may include the protection of land onsite (required in some areas), protection of land on an offsite parcel (may be the preferred method if the land protected has higher resource-protection value), or provision of a cash contribution to the town's open space acquisition fund. A combination of these methods may also be permitted.

Natural Areas – The permanent protection of high value resources within Natural Areas is a regional priority. Development is discouraged due to the sensitivity of resources present. The Commission presumes that the only way a DRI can meet open space objectives is to permanently restrict land from development in Natural Areas, in a minimum ratio of three parts open space to one part development. In most cases, the open space must be provided on site to meet the interests of protecting resources and the character of the Natural Areas Placetype. Projects located in Natural Areas may provide permanently protected open space offsite if the Commission finds that the interests of resources would be better met than providing protected open space on the project site.

Rural Development Areas – Methods such as clustering development to allow for the permanent protection of a larger unfragmented block of open space are encouraged. The Commission presumes that the only way a DRI can meet open space objectives in Rural Development Areas is to permanently restrict land from development, in a ratio of two parts open space to one part development. In most cases, the open space must be provided on site to meet the interests of protecting resources and the character of the Rural Development Areas Placetype. Projects located in Rural Development Areas may provide permanently protected open space offsite in natural areas if the Commission finds that the interests of resources would be better met than providing protected open space on the project site. An agricultural preservation restriction may be an appropriate approach for preserving active farmland on the project site.

Suburban Development Areas – Required open space in an amount equal to the total area impacted by development may include: on-site protection of significant natural and/or community resources; permanent protection of offsite land in Natural Areas; or

provision of greenspace within the Suburban Development Area community system the project is a part of, such as a pocket park, multi-modal greenway, or recreation area. A cash contribution may also be used to meet the open space requirement.

Historic Areas – Protecting character of historic areas is a priority within this Placetype. Impacts may be mitigated by providing public access to historic features, structures, and/or vistas in order to preserve the community's connection to its historic and cultural heritage. Streetscape improvements appropriate to historic context, pocket parks, or sitting areas, may be considered onsite open space in this Placetype. Permanent protection of offsite open space in a Natural Area or Rural Development Area, or a cash contribution may also be used to meet the open space requirement.

Maritime Areas – Protecting maritime character and coastal access are priorities in this Placetype. Projects should be designed to minimize development impacts on maritime activities and to preserve community character, including providing public pathways to scenic shoreline vistas or working waterfronts. Streetscape improvements appropriate to maritime context, pocket parks, or sitting areas may be appropriate. Permanent protection of offsite open space in a Natural Area or Rural Development Area, or a cash contribution may also be used to meet the open space requirement.

Community Activity Centers – Development with context sensitive design (see Community Design) in Community Activity Centers is strongly encouraged. Parks, multi-modal greenways, streetscape improvements appropriate to context, stormwater management systems that provide significant natural or community benefits, or outdoor community gathering spaces within the associated Community Activity Centers may be considered open space. If high value natural resource areas are impacted, open space onsite, or open space of equal or higher ecological value offsite should be permanently conserved. A cash contribution may also be used to meet the open space requirement.

Industrial Activity Centers – Development in Industrial Activity Centers is strongly encouraged. Multi-modal greenways, streetscape improvements appropriate to context, stormwater management systems that provide significant natural or community benefits, or restoration of degraded lands may meet open space requirements within the associated Industrial Activity Centers. If high value natural resource areas are impacted, open space onsite, or open space of equal or higher

ecological value offsite should be permanently conserved. A cash contribution may also be used to meet the open space requirement.

Military and Transportation Areas – If high value natural resource areas are impacted, open space onsite, or open space of equal or higher ecological value offsite should be permanently conserved. Maintaining adequate buffers between incompatible uses is a priority in designing industrial sites, and quality buffers may be used to meet the open space requirement. Permanent protection of offsite open space in a Natural Area or Rural Development Area, or a cash contribution may also be used to meet the open space requirement.

Protect Open Space of High Natural Resource Value

The protection of open space of high natural, cultural, and/or recreational resource value, including current and potential future drinking water supply sites and areas that contribute to preserving the integrity and viability of Cape Cod's diverse ecosystems is a priority. The presence of rare species habitat, wetlands, and other sensitive resources on-site will affect site design, project review, and open space requirements. Areas of high natural resource value include BioMap2 Core Habitat, Critical Natural Landscapes, habitat for rare or endangered species, vernal pools and their buffers, and Wellhead Protection Areas. The methods outlined in the previous sections provide guidance on preserving unfragmented blocks of undeveloped land, connections with contiguous open space, scenic vistas, landscapes that contribute to community character, working landscapes, wildlife corridors, and habitat for Cape Cod's native flora and fauna.

Preserve Open Space that Benefits Natural and Community Systems

In determining how to incorporate open space into a project, form and function consistent with the natural and community systems context should be taken into consideration. The proposed project must demonstrate how natural and community systems have been factored into site design and proposed open space. The Context Map (see Resources) is a tool for reviewing the site in the context of the systems it is a part of.

The project site should be designed to support and sustain natural and community systems, irrespective of property boundaries. This will allow for a systems-based approach to open space protection, as ecosystems, watersheds, wildlife habitat, multi-

modal greenways, and other resources extend beyond property boundaries. Applicants should strive to take advantage of opportunities to link on-site and off-site open space to expand the contiguity of open space.

Protection or restoration of key areas which contribute to coastal resiliency support natural and community systems long-term. On-site or off-site provision of open space to improve coastal resiliency is encouraged. The "Coastal Resiliency" section of this technical guidance provides additional strategies and resources for meeting additional Coastal Resiliency objectives.

Based on the characteristics of a specific project and the resources present, the Commission may consider allowing stormwater management systems which incorporate LID principles, protect floodplain function, provide significant flood reduction benefits, or support coastal resiliency to meet open space requirements (see Water Resources and Community Design Technical Bulletins.)

While there is flexibility in how and where open space is provided based on Placetype, open space should benefit natural or community resources and systems to meet the open space requirements. For example, landscaped islands within parking lots, narrow buffers between developed areas, and drainage structures/detention basins may not be counted towards open space requirements.

OFF-SITE OPEN SPACE

As detailed in the summary table, open space may be provided by one of three methods, based on Placetype. In Natural Areas and Rural Development Areas, onsite open space is required, but in other Placetypes open space may be met by one or a combination of onsite, offsite, or cash contribution methods. Offsite open space may be suitable for project sites with low natural resource values, or dependent on the type of development being proposed. The determination of the appropriateness of off-site protection of open space will be made by the Commission in consultation with the Town (including but not limited to planning departments, conservation committees, open space committees, and land trusts), based upon the size and type of development that will be mitigated with open space protection, and the resource values of the proposed off-site location. The Commission will work with the town and local land trusts to help identify appropriate off-site parcels. Open space proposed for off-site

protection should be of equal or higher natural resource value as the land being impacted by development.

In the case of off-site open space protection, development rights on the property must be permanently extinguished and the land may not be used toward the calculation of densities for future development on the subject parcel or any other parcels.

CONTRIBUTE FUNDS FOR OPEN SPACE PROTECTION

In appropriate cases, the commission may allow a DRI to meet the open space requirement through a cash contribution to a town or land trust's open space acquisition fund. This provision allows a community to protect higher value or priority open space off-site and allow for more concentrated development in certain locations. The availability of this option is limited by Placetype (see Summary Table) and based on whether sensitive resources are present and consultation with the Town.

The cash contribution is determined by Commission staff by the following method, utilizing current Town Assessor's data for the town where the project is located:

- extract all residentially zoned developable parcels in excess of two acres,
- determine the per acre value for each of these properties,
- sort by value,
- remove the top and bottom 10 percent of properties, and
- average the remaining properties to calculate the per acre open space value.

The per-acre open space value may be adjusted by a reasonable inflation factor for years where current Assessor's data is not available.

Incorporate Greenspace into the Built Environment

All people on Cape Cod should have access to greenspace in their communities. Projects in more densely developed Placetypes should support the natural and community systems they are a part of by designing sites and providing greenspace in a manner that integrates the built environment through landscape improvements, provides access to outdoor spaces, and enriches community connections. In Community Activity Centers, for example, pocket parks, recreational areas, multi-modal greenways, walking paths shaded by native trees, and community gathering spaces may

be incorporated into the built environment to sustain community health and well-being. (see also the Community Design Technical Bulletin).

Restore Degraded Areas to a Natural State

The restoration of degraded areas on-site to provide significant natural, scenic, and/or recreational benefits may meet some or all of the open space requirement, depending on the specific natural or community systems the site is a part of. The removal of existing structures on-site to reestablish scenic vistas, reducing the amount of fragmented habitat, or enabling wildlife corridor connections are all encouraged. Any site revegetation should be consistent with the natural and community systems the site is a part of and should utilize native species. Where projects located on severely degraded areas such as gravel pits and landfill sites are revegetated, at the Commission's discretion, the revegetated areas may be counted toward meeting the open space requirement; these areas should be regraded consistent with the surrounding topography in a manner that reduces or eliminates potential erosion.

GUIDANCE ON THE PERMANENT PROTECTION OF ONSITE AND OFFSITE OPEN SPACE

In order for onsite and offsite open space to meet any permanent protection requirements as a condition of DRI approval, it must be restricted in perpetuity for conservation, agriculture, and/or passive recreation purposes.

For those DRIs that elect to meet OS3 by the restriction of open space on or offsite, the following methods may be implemented:

- Land donated to the Town for conservation purposes
- Land donated to a nonprofit (501(c)(3)) conservation organization or land trust
- Conservation Restriction placed on land, held by Town
- Land held by homeowner's association with permanent Deed Restrictions in place

Donation in Fee to a Town, Conservation Organization, or Land Trust

To meet any open space protection requirements, an Applicant should consider donating the property outright to the Town the property is located within, a nonprofit conservation organization, or a land trust. Donating a property in fee for conservation purposes may be the most efficient means for meeting the open space requirement, providing the property has characteristics that make it conducive to a donation and that a partner has been identified who is willing to accept the donation and stewardship of the property in perpetuity.

Donations made to a Town should be placed under the care, custody, and control of a Conservation Commission pursuant to MGL, Ch. 40, Sec. 8C.

Conservation Restriction

Where ownership is retained by an individual, corporation, or association, a perpetual Conservation Restriction (CR) must be placed on the open space to ensure its permanent protection. Conservation Restrictions are authorized by MGL, Ch. 184, Sections 31-33. In appropriate instances an Agricultural Preservation Restriction may also be acceptable.

CRs must be approved by the holder of the restriction (Grantee), as well as locally (by the Board of Selectmen/Town Council and Conservation Commission). The Applicant

should provide evidence of having located a willing Grantee to accept the CR prior to a decision on the project. CRs must also be approved by the Secretary of Environmental Affairs and recorded at the Registry of Deeds or Land Court. If there is a mortgage on the property, the lender must subordinate the mortgage to the CR or provide a partial release for the land under CR. These requirements must be met before a Certificate of Compliance will be issued by the Cape Cod Commission and may be required earlier in the process for some types of projects as a result of permit conditions. It is advisable to submit a draft of the CR for state review prior to proceeding with local approvals of the CR.

Applicants are advised that the approval process for a CR may take several months, and consequently are advised to begin drafting the CR well in advance of seeking compliance with this requirement.

A CR should confer a public benefit in order for the Secretary of Environmental Affairs to make a finding of "public interest" in approving the CR. Such public benefits include: the protection of archeological or historic resources or sites; minimization of "damage to the environment" as defined in M.G.L. Ch. 30 Sec. 61; the protection of beautiful scenery visible from a public road or waterway; the protection of public drinking water sources; the preservation of the historic rural or cultural character of the municipality; the maintenance of critical wildlife habitat, wetlands, or other important ecosystems; the preservation and conservation of farm, forest, or grazing lands; and/or public use and public access to the restricted site. It should also be noted that the Secretary will generally not accept landscaped yards, driveways, roads, private tennis courts, pools, etc. for inclusion in lands subject to a CR. However, there are some uses such as recreation fields that may be included when a public benefit can be demonstrated. The public benefit provided by the CR must be specified in the restriction.

CRs should be considered permanent. Once a CR is placed on a parcel it can only be released after a public hearing and vote by the Selectmen or Town Council, and with approval by the holder (Conservation Commission, land trust, etc.), the Town through Town Meeting, the Secretary of Environmental Affairs, and the Massachusetts Legislature.

Activities Allowed within Protected Open Space

The types of activities allowed within protected open space will be based on the resources present on the site and the Placetype context. Applicants should work closely with the intended owner of the open space and/or holder of the CR when designating and determining the use(s) of the open space.

Protection of Significant Ecological Resources — Within sensitive ecological and/or wildlife habitat areas (such as rare species habitat, dunes, or other high value resource areas), it may be necessary to restrict public access and use of the open space.

Passive Recreation — Passive recreation involves the use of existing natural resources and does not require any development or alteration of existing topography or the use of motorized vehicles. Certain kinds of passive recreation may necessitate minimal alteration of existing vegetation for trail creation, maintenance, and other management activities. Depending on the site and the Placetype, active recreational areas such as playing fields may be an allowed use on land set aside as open space, if the Town agrees to accept the land for this purpose in fee simple.

Agricultural Activities — In appropriate circumstances, agriculture may be an allowed use on land set aside for open space. Instances where agriculture will not adversely impact rare species or their habitats, or adversely impact wetlands or water quality, may be included as allowed uses in a CR. Possible language within the reserved rights section of a CR may include allowances for agricultural activities such as pasture lands, crop lands, and lands accessory to agriculture. Where land is being donated to meet the open space requirement, land in active agricultural or planned for that use may be accepted. These lands typically should not contain structures. However, small structures that are integral to the agricultural operation (e.g. small sheep shelter within a field, pump house for cranberry bogs, fencing around pastures) may be considered by the Commission as allowable within the open space.

Other Forms of Restriction in Special Circumstances

In general, covenants, deed restrictions, and special permits do not satisfy a requirement for permanent protection of open space. In limited situations, such as when LID stormwater systems are incorporated into site design and provide natural/community benefits or in some development/redevelopment projects that incorporate greenspace into site design in the Community Activity Centers or Industrial Activity Centers Placetypes, covenants, deed restrictions, and special permits may be an appropriate tool to meet the open space requirement.

GENERAL APPLICATION REQUIREMENTS

Applicants are required to submit the following as part of their DRI application:

- Natural Resources Inventory (required when project is located on a greenfield site, or is located within a Natural Area – see Wildlife and Plant Habitat Technical Bulletin)
- Calculation of Area of Development Impact (see p. OS-14)
- Open Space Narrative discussing proposal based on Placetype ratio and area of disturbance
- Proposed Method of Permanent Open Space Protection and Conservation Partner, as appropriate

Commission staff are available for consultation early in the design of a project. Applicants are encouraged to set up a meeting when the project is in its conceptual phase.

ADDITIONAL RESOURCES

Map Data Layers:

- Cape Cod Commission Data Portal (www.capecodcommission.org/RPPDataViewer)

Guidance on Open Space Conservation:

Additional information about conservation restrictions, including model language for developing conservation restrictions is contained in the Model Conservation Restriction, available through the Executive Office of Energy and Environmental Affairs, Division of Conservation Services https://www.mass.gov/service-details/conservation-restriction-review-program

Names of municipal and land trust open space contacts are available from the Cape Cod Commission.

DEFINITIONS

Development: Any of the following undertaken as a part of a Development of Regional Impact pursuant to Section 2 of the *Cape Cod Commission Enabling Regulations Governing Review of Developments of Regional Impact*, Barnstable County Ordinance 90-12: any building, construction, renovation, mining, extraction, dredging, filling, excavation, or drilling activity or operation; any material change in the use or appearance of any structure or in the land itself; the division of land into parcels; any change in the intensity of use of land, such as an increase in the number of dwelling units in a structure or a change to a commercial or industrial use from a less intensive use; any activity which alters a shore, beach, seacoast, river, stream, lake, pond, canal, marsh, dune area, woodland, wetland, endangered species habitat, aquifer, or other resource area, including coastal construction or other activity within the jurisdictional limits of Barnstable County; demolition of a structure; the clearing of land as an adjunct of construction; or the deposit of refuse, solid or liquid waste, or fill on a parcel of land or in any water area.

Community Design

This guidance is intended to clarify how the Community Design Goal and Objectives of the Regional Policy Plan (RPP) are to be applied and interpreted in Cape Cod Commission project review. This technical bulletin presents specific methods by which a project can meet these goals and objectives.

Community Design Goal: To protect and enhance the unique character of the region's built and natural environment based on the local context.

- ***Objective CD1*** *– Promote context sensitive building and site design*
- ***Objective CD2*** *– Minimize the amount of newly disturbed land and impervious surfaces*
- ***Objective CD3*** *– Avoid adverse visual impacts from infrastructure to scenic resources*

The applicability and materiality of these goals and objectives to a project will be determined on a case-by-case basis considering a number of factors including the location, context (as defined by the Placetype of the location), scale, use, and other characteristics of a project.

THE ROLE OF CAPE COD PLACETYPES

The RPP incorporates *a framework for regional land use policies and regulations based on local form and context* as identified through categories of Placetypes found and desired on Cape Cod.

The Placetypes are determined in two ways: some are depicted on a map contained within the RPP Data Viewer located at www.capecodcommission.org/RPPDataViewer adopted by the Commission as part of the Technical Guidance for review of DRIs, which may be amended from time to time as land use patterns and regional land use priorities change, and the remainder are determined using the character descriptions set forth in Section 8 of the RPP and the Technical Guidance.

The project context, as defined by the Placetype of the location, provides the lens through which the Commission will review the project under the RPP. Additional detail can be found in the Cape Cod Placetypes section of the Technical Guidance.

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INTRODUCTION

Cape Cod is a unique and special place in terms of both its natural and built environments. The diverse landscape includes historic villages and distinctive architecture that combine traditional forms and materials in a variety of different styles. The region's history and natural environment have shaped development into a recognizable local aesthetic and a regional pattern of dense village centers surrounded by less-developed outlying areas.

Maintaining Cape Cod's unique character is essential to the region's continued economic health and to the quality of life of its residents. Yet, as the Cape continues to grow in population and popularity, new development poses challenges brought by land-consumptive development patterns and incompatible designs. In order to protect the region's distinctive character, new development needs to respect old and established patterns in both building and site design and project siting. This is the essence of context-sensitive design: design that responds to and respects its surroundings, promoting continued vitality for the region and reinforcing the Cape's strong 'sense of place.'

Context sensitive design relates to its surrounding neighborhood, environment and regional traditions. In its design, it meets not only the project goals, but also those related to preserving scenic, aesthetic, historic, environmental and other community values. Context sensitive design recognizes the scale and placement of existing surrounding buildings and follows established patterns, whether they are tall buildings sited close to the street, low buildings clustered in a tight neighborhood, or structures set well back from the road and screened by vegetation. It recognizes regional traditions in building materials and building forms, which on Cape Cod includes small attached massings, sloped roofs, and wood siding materials. It also follows more compact land use patterns to help preserve Cape Cod's natural resources and distinctive character. Cape Cod Placetypes are one way of describing and asserting the various contexts that exist in the region, and they are helpful in identifying appropriate designs based on a project's location.

While there is room for modern design and contemporary interpretation, new buildings should incorporate traditional design elements to support the region's existing character. By guiding development to follow compact land use patterns and limiting building footprints and paved areas, we will better maintain natural lands and preserve

the distinction among different Placetypes, while working to re-establish regional patterns in areas that have existing highway-oriented development.

Cape Cod has a wide variety of scenic resources that contribute to the region's unique sense of place. The character of scenic resources results from the interplay of geology, landform, soils, vegetation, land use and settlement patterns and is made up of a wide variety of features, patterns, and characteristics. Open ocean waters, natural areas, cliffs, dunes, historic resources, open fields, wooded road edges, views to water or historic villages, and scenic roadways may all be considered scenic resources.

The Cape's scenic resources vary in their quality, value, and ability to absorb changes. New infrastructure and large-scale developments must be sited carefully to limit impacts to these resources, especially in areas with a distinctive built or natural character. Visual and scenic resources play a direct role in people's enjoyment of Cape Cod, and their preservation has a direct impact on the region's continued economic vitality. Developments should not have adverse impacts on the region's scenic resources or character.

SUMMARY OF METHODS

GOAL | COMMUNITY DESIGN

To protect and enhance the unique character of the region's built environment based on the local context.

OBJECTIVE CD1 – Promote context sensitive building and site design

METHODS

- Relate siting of development to building and streetscape patterns
- Follow regional and local scale of development
- Use regionally appropriate forms and materials
- Locate parking where it does not adversely impact visual character of the area
- Provide appropriate landscaping and pedestrian amenities
- Ensure lighting protects dark skies and signage fits with community character

OBJECTIVE CD1 AREAS OF EMPHASIS BY PLACETYPE

Natural Areas | New development not encouraged. Redevelopment should be limited to small scale areas that can be screened from view.

Rural Development Areas | Limit development to small scale and areas that can be screened from view.

Suburban Development Areas | Re-establish traditional patterns with buildings close to the street and parking to the side or rear.

Historic Areas and Maritime Areas | New development should conform with established patterns and is consistent with traditional structures and uses.

Community Activity Centers | New and redevelopment encouraged in these areas. Build in traditional patterns with buildings close to the roadway and focus on providing pedestrian amenities and defining the streetscape.

Industrial Activity Centers and Military and Transportation Areas | Flexibility of design is allowed in this area as long as there is limited visibility.

OBJECTIVE CD2 – Minimize the amount of newly disturbed land and impervious surfaces

METHODS

- Reuse and redevelop existing buildings, structures and sites
- Cluster development
- Minimize total parking spaces to no more than what is required by zoning
- Develop multi-story buildings where appropriate
- Provide parking under or within buildings or in structures
- Use permeable or pervious materials
- Maintain existing native vegetation and revegetate disturbed sites

OBJECTIVE CD2 AREAS OF EMPHASIS BY PLACETYPE

Natural Areas | New development strongly discouraged. Reuse and redevelopment should minimize or reduce existing development footprints.

Rural Development Areas | Reuse and redevelopment encouraged. All development should be clustered, respect the surrounding landscape, and protect scenic resources.

Suburban Development Areas | Concentrate development into nodes; minimize and reduce parking area footprints.

Historic Areas | Reuse historic structures; infill development should reflect historic context.

Maritime Areas | Reuse historic structures; infill development should reflect context.

Community Activity Centers | Reuse, redevelopment, mixed use, and multi-story development encouraged; minimize parking through design or shared parking

Industrial Activity Centers & Military and Transportation Areas | Reuse and redevelop when possible; minimize impervious areas.

OBJECTIVE CD3 – Avoid adverse visual impacts from infrastructure on scenic resources

METHODS

- Site infrastructure away from scenic resources
- Design and scale infrastructure appropriate to context
- Collocate infrastructure with other existing infrastructure and/or within buildings
- Utilize previously developed and/or impervious areas
- Locate infrastructure underground where feasible
- Screen infrastructure with vegetative buffers, buildings, or other structures

OBJECTIVE CD3 AREAS OF EMPHASIS BY PLACETYPE

Natural Areas | Avoid siting in these areas except where necessary to protect public health and safety.

Rural Development Areas | Avoid siting in open landscapes; minimize height to that of existing tree canopy.

Suburban Development Areas | Avoid visual impacts to surrounding neighborhood through buffering and/or siting.

Historic Areas | Avoid siting in these areas or ensure no visual impacts on historic resources.

Maritime Areas and Community Activity Centers | Ensure infrastructure is similar in scale to surrounding development.

Industrial Activity Centers & Military and Transportation Areas | Generally appropriate; buffer from residential areas.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE CD1

Objective CD1 *– Promote context sensitive building and site design*

The following methods may be implemented to demonstrate consistency with Objective CD1:

Relate siting of development to building and streetscape patterns

Historically, the pattern of development within the Cape's village centers consisted of buildings that were close to the road and oriented with their narrower façade facing the street. This pattern of development produced a strong sense of enclosure to the street and established a setback pattern that helps define the region's character.

In many locations on the Cape, the edge of the street is very well defined by either buildings, walls, fences, or trees. Twentieth century zoning regulations have encouraged development in other areas that conflicts with historic and traditional settlement patterns. Linear commercial areas are often oriented to the automobile and typically characterized as having poorly defined road edges with parking close to the street and buildings far from the street edge. This is in stark contrast to the traditional village pattern of development seen in the region. The following narrative presents a variety of ways to site new development in the Cape landscape, following traditional streetscape patterns.

FOR ALL PLACETYPES

Follow traditional setbacks: New development should follow traditional setback patterns, whether close to the road edge or set behind small front yard areas. Site new buildings to reinforce the existing building setbacks which help define the streetscape edge. If new construction must be placed farther back than existing structures, use low walls and vegetation to continue the established street edge.

Locate new construction behind existing frontage buildings or vegetation: As an alternative to siting a large building on the street, place structures with more modest forms at the street edge to match existing street patterns and to shield the larger building behind. Placing larger buildings behind existing structures or newly constructed, traditionally scaled buildings will screen the larger buildings and

associated parking areas to the rear and also assure that the traditional streetscape pattern is continued.

Maintain the distinction between developed and outlying areas: Locate new development within Community Activity Centers and existing village centers whenever possible. If locating outside these areas, site new development behind existing vegetated areas to maintain open landscapes and wooded roadway character.

Design streets and roadways in scale with the surrounding context: If an area has a distinctive roadway design or scenic character, any new roadways should be designed consistent with the existing character. Narrower roadways are generally preferred to slow traffic and provide comfort for pedestrians and bicyclists. On-street parking in appropriate areas can also create streets that are better-suited to accommodate all users.

NATURAL AREAS AND RURAL DEVELOPMENT AREAS

Maintain established roadway character: Preserve the landscape character of existing roadways, whether wooded or open landscapes with few structures. Site buildings outside key view areas and sensitive natural resources. Maintain the existing road width and layout and avoid more urban details such as granite curbing.

Design meandering entrance roads: Entrance roads or site accesses should meander through a vegetated buffer to limit views into the site. Trees are especially important along access roads to limit broad views of new development and to provide enclosure in context with outlying areas.

Site outside open landscapes: New development in these areas should locate at the periphery of open landscapes and away from scenic vistas or further reduce visual prominence by siting behind or near woodland edges. Any new development should be designed consistent with existing development density and should follow established relationships between existing buildings and the roadway.

SUBURBAN DEVELOPMENT AREAS

Create focal points of denser commercial development: In strip commercial areas, focus on re-establishing traditional streetscape elements with dense clusters of buildings surrounded by less densely developed areas.

Bring buildings closer to the street: Site new buildings near the roadway to re-establish the street edge and relate the building to the street, or to shield larger elements of the development to the rear.

Move parking to less visible areas: Re-locate parking to the side or rear of the development to reduce its prominence. In some cases, parking can be successfully incorporated into a parking structure that occupies the lower level or rear portion of a building. Where re-locating parking is not possible in the short term, add landscape walls and buffer plantings to effectively screen paved areas.

Improve pedestrian amenities: Add sidewalks and pathways that bring pedestrians along the front facades of buildings. Add shade trees, gardens, seating areas and other pedestrian amenities along the road frontage of new development.

Use cluster to reduce residential development footprints: Residential subdivisions of the 1960's and 1970's are land-consumptive and do not mirror traditional development patterns. New development in these areas should be clustered to respect existing topography, protect sensitive natural resources, and preserve high-quality open space. Cluster development should also minimize the length of new roadways and utilities and create amenities on site for use by residents of the neighborhood.

MARITIME AREAS

Set buildings back from eroding shorelines: In areas where the shoreline is eroding, the setback for all new buildings and septic systems should be at least 30 times the average annual erosion rate of the dune or eroding bank and consider up to 70 times the average annual rate. Shoreline change maps, developed by the Massachusetts Coastal Zone Management Office, and historic photos can help to evaluate long term erosion trends.

Maintain facilities that support water dependent uses: Docking and unloading facilities for commercial fishermen, marinas for public and private vessel use, ferry terminals, and areas for charter boats and whale watching are all water-dependent facilities that should be maintained. Loss of these waterfront facilities results in a loss of traditional economic activity in the community. Maintenance of these facilities, coupled

with access for the public, such as walkways, observation areas and boat launch facilities generate public interest and activity on the waterfront.

Maintain and enhance physical and visual access to the coast: Public access to the shoreline should be provided in waterfront locations. New walkways are encouraged if they enhance shoreline access for the public, including people with disabilities, but they should not be pursued if they degrade undisturbed resources or create adverse impacts to habitat, aesthetics, or storm damage prevention. Where physical access is not appropriate or feasible, visual access should be provided. This can be done by siting multiple buildings to provide views between them, or by providing an arch or walkway to allow views between buildings. Visual impact from the water should be considered when designing the structure, to maintain maritime character and the natural beauty of the shore.

HISTORIC AREAS AND COMMUNITY ACTIVITY CENTERS

Maintain setback patterns and building scale along the road frontage: Design new buildings to front on the street and to maintain established setback patterns, consistent with traditional village design. If appropriate, orient the narrower facade to the street to be consistent with existing facade widths.

Activate the street elevation: Include a street-oriented entrance and principal windows on the street elevation to reinforce the building's primary relationship to the street and encourage pedestrian activity. In commercial areas, consider incorporating porches or other pedestrian amenities in the design.

Site infill development to the rear to preserve desirable existing streetscape patterns: Consider infill development on the rear portion of lots to allow additional activity in already developed areas while maintaining existing streetscape patterns.

Follow regional and local scale of development

Cape Cod's buildings are traditionally modest in scale and comprised of a series of small massings that reflect their gradual growth and expansion over time. While some larger buildings and estates began to be constructed in the region in the late 1800s, the majority of structures remained small in size. To maintain this traditional and

predominantly residential scale that defines most of the Cape's villages, new buildings should appear similar in size to historic structures or they should be sited behind smaller buildings or vegetation that can screen their bulk from public view. This is especially important in Natural and Rural Development Areas where wooded or open landscapes should be dominant, and in Historic or Maritime Areas where traditional building styles should be most prominent. Where existing local development is clearly defined and guided by historic traditions, that scale should inform any new development. In all other locations, new development should reflect regional building scale and traditions. The following narrative presents a variety of ways to fit a new building into the Cape landscape, focusing on how to reduce the apparent building size to make it consistent with the local development scale.

FOR ALL PLACETYPES

Break down large building masses: Separate the building mass into various structures that more closely approximate the size of traditional buildings in the region. Building masses should generally be 15,000 square feet or less and can be grouped around a central courtyard or arranged as a primary building with several attached ells.

Along roadways, orient the short axis of the building parallel to the street to maintain a building profile that is more consistent with the region's traditional scale.

Vary the roof form: Vary the height of the roof line at both the roof peak and the eaves to break large roof masses into smaller elements and to vary their relationship to the ground. Incorporate several different roof forms on different parts of a large building, following historical examples. Gable, shed, and hip roofs are compatible with regional styles and can be effectively combined on a single building.

Flat roofs are discouraged but not prohibited, as they may be appropriate in some areas where existing development includes flat-roofed, row-house style structures, or on some portions of a building. Roof forms should be designed to read as a functional roof over the building, not as a decorative feature added to the facade.

Vary the façade line with set-backs and projections: New development should incorporate pronounced changes in the wall planes and building mass to mirror the pattern of individual facades in a village streetscape. For every 50 feet of façade length, at least 10 feet of projection or setback should be included. Though the façade changes

can be split into several components, changes in the façade line of 10 feet or more are most likely to read as distinct areas and reduce the visual impact of a larger building mass.

A varied rhythm of elements, rather than a strict repetition of the same feature, is most effective for breaking down the building mass into smaller components and providing visual interest to a design. Adjacent wall sections should be varied in length, setback, and height.

Vary the wall height: Provide changes in the building wall height to reduce the overall bulk of the structure and to increase variety along the facades. Portions of the building above 20 feet in height should be roof forms unless the established development pattern in the area includes higher building walls. If a third floor is created, it should be set back or within a roof form to maintain a traditional scale to the building. Designing a second story for a portion of the building is an effective way of varying both the building design and the wall height consistent with traditional development patterns in the region.

Bring down the building edges: Bring the edges of the building down with smaller attached masses such as porches, entrances, or lower additions. The use of arcades (a series of arches supported by columns) that are not physically attached to the building but are stepped forward and essentially act as a frontage building, can be particularly effective in breaking up the apparent massing of a large building.

While visually identifying the entrance of a building is essential to any good design, the mass of the entry should generally be subordinate to the primary building mass. For example, the ridge of an entry should be at or below the primary roof height. The design should provide a visual distinction between primary and secondary entrances, which also helps to incorporate asymmetry into the building facade.

Provide transition areas between commercial and residential developments: Buildings should step down in scale and size where commercial developments abut residential neighborhoods to avoid jarring transitions in street and neighborhood character.

NATURAL AREAS AND RURAL DEVELOPMENT AREAS

Limit development footprints: Development should be avoided in Natural Areas and Rural Development Areas where environmental resources and open landscapes are prominent characteristics. To preserve the open landscape character, wooded nature, and sparse development pattern of these areas, only small scale and clustered developments are appropriate.

SUBURBAN DEVELOPMENT AREAS

Create frontage buildings: Incorporate small frontage buildings to re-establish traditional building scale and relationships to the street. Frontage buildings can also effectively screen larger development and parking areas to the rear.

Reinforce the building setback line: In areas where existing buildings are set well back from the street and large parking areas are in front, use low walls and dense planting areas to continue the traditional building setback along the street edge.

HISTORIC AREAS, MARITIME AREAS, AND COMMUNITY ACTIVITY CENTERS

Mirror existing character: These areas have a distinctive and established character that new development must conform to. Traditionally, buildings in these areas present a pedestrian-scaled facade of one or two stories, with floors over the second story incorporated within a traditional roof form. Village streetscapes have a consistent range of facade lengths and spacing between buildings. This variation should be mirrored in new development by incorporating recesses or projections in the building footprint to mimic the length of traditional building facades. The form and scale of the buildings should be consistent with their surroundings, continuing existing character and streetscape patterns, and should incorporate pedestrian-scaled amenities (such as porches and stoops) and doors and windows on all street-facing elevations.

Avoid long building facades: For long front facades, vary the setback, height, and roof form of the building within the range provided by existing buildings to continue the established rhythm of facades on the street. In most cases, long facades should be avoided, extending no more than 50 feet without a change in the wall plane. In cases where it is difficult to fit a large building into existing patterns, use smaller frontage buildings to screen large buildings in the rear.

Use regionally appropriate forms and materials

The Cape has always been a region of vernacular architecture – architecture which reveals an area's unique local traditions and characteristics. Cape Cod's earliest architecture took the form of simple wood structures based on English styles and was oriented toward the region's agricultural focus. By the 18th century, a new form had evolved to meet the early settlers' needs and protect them from the harsh environment. This form has become known as the "Cape Cod House" and its simplicity, its gable roofs, and weathered shingle or clapboard exterior define the basis of vernacular architecture in this region.

The growth of maritime industries in the early 19th century introduced architectural diversity to the Cape. The region's new wealth was reflected in larger homes designed in Greek Revival and other Neoclassical styles and in the expansion and alteration of many existing buildings. Though the new structures were generally larger, they reinforced the local building traditions by maintaining the simplicity of the earlier forms and continuing the use of local materials. The late 19th and early 20th century saw construction of a variety of Victorian styles, built primarily to accommodate Cape Cod's growth as a resort area. Although these structures incorporated new forms, their general scale and wooden construction were compatible with the region's traditions. Throughout the Cape, small shingled structures continued to be built in simple forms reminiscent of earlier styles.

FOR ALL PLACETYPES

Complement surrounding architecture in areas with distinctive architectural styles: Use similar architectural scale, massing, and materials to relate new buildings to their surroundings. Reflect the predominant rhythm of the existing buildings in new construction. When developing in areas without distinctive architecture, new buildings should be designed to complement the region's traditional vernacular styles. Modern elements may be included but should reference regional traditions in either form or materials.

Use pitched roofs: Roofs play a major role in a building's character because they are a dominant visual element. Roof types such as gable, shed, gambrel, and hip are all seen on the Cape, although gable and shed roofs are most common. The pitch of gabled roofs generally is not more than 12 inches in height for 12 inches in length or less than 7 inches in height for 12 inches in length. When pitched roofs are used, sub-masses

should be attached to the main mass at right angles, with either parallel roof lines or intersecting cross gables.

Use traditional building materials: One distinctive feature of the region is the preponderance of naturally weathered wood on building exteriors. The Cape's traditional building materials are wood shingle and wood clapboard, though brick and stone were also used. In prominent areas, use high quality, traditional materials that weather naturally on the exterior of the building to reflect regional building traditions. Non-traditional materials may be used if they accomplish the overall goal of adding interest and depth to the facade. In areas that should receive less attention, such as service areas and unbroken expanses of wall, use less-formal materials and simpler detailing to make those parts of the façade recede into the background. High-intensity, reflective, and metallic colors and materials are strongly discouraged.

Avoid false fronts: Raised parapets and false-fronted gable ends are strongly discouraged and should be avoided. Non-functioning dormer windows, cupolas, and similar details are also strongly discouraged as they do not serve to break down the building mass, but instead give the impression of unrealistic appendages that detract from, rather than improve, the design.

Conceal heating, ventilation, air conditioning (HVAC) and other mechanical equipment: Place roof mounted equipment behind sloped roofs, parapets, or in the central portion of flat roofs beyond site lines as seen from ground level. Conceal flues and vents in chimneys or cupolas. Screen other utility equipment, loading docks and service areas with vegetation, walls and fences.

HISTORIC AREAS AND COMMUNITY ACTIVITY CENTERS

Be sensitive to forms in historic areas: Historic Areas are the most sensitive to change and require careful design to avoid negative impacts to significant structures and landscapes. When adding to or altering existing historic structures, maintain the quality of materials and workmanship found in the original structure. For more details, refer to the Cultural Heritage technical bulletin.

Avoid using synthetic surface materials: In Historic Areas, synthetic materials should not be used, especially in highly visible areas and on historic structures.

INDUSTRIAL ACTIVITY CENTERS AND MILITARY AND TRANSPORTATION AREAS

These areas are typically less visible and not adjacent to highly visually sensitive areas, so have more flexibility in terms of design and layout. With large building facades, the design should take a cue from the surrounding traditional forms. Vary the detailing, materials, and colors in adjacent sub-masses to resemble the traditional variety found in the region's village centers.

Industrial and warehouse buildings are typically designed to create large volume spaces with open floor plans to accommodate their manufacturing, assembly, and storage functions and are generally not designed with pedestrian use in mind. Consequently, industrial and warehouse buildings are typically large, have little or no architectural detail, and are built at a scale that is in sharp contrast to the regional development forms of the Cape. Screening and appropriate siting are the best solutions for fitting them into the Cape landscape.

Screen buildings with wide landscape buffers: Establish a wide landscaped buffer between the street and the building by retaining existing wooded areas and supplementing with a variety of evergreen and deciduous trees and shrubs as appropriate to the site and design a meandering entrance drive to limit views into the site. In cases where a site does not have an existing wooded buffer, provide a landscaped buffer that consists of a mix of evergreen and deciduous trees and shrubs that provide adequate year-round screening.

Design a portion of the building with traditional form and materials: Design a small portion of the facility, such as the office or a small retail/showcase area, using traditional architectural forms and materials. Locate this portion of the facility in the most-visible portion of the site, where it can function as a frontage building that provides a more-traditional facade to the public and partially screens other parts of the facility from view. Alternatively, combine the warehouse with other uses and shield the warehouse behind the other structures on the site. Using traditional wood siding on a visible façade can help it blend more easily into the landscape.

Locate parking where it does not adversely impact visual character of the area

Parking is a significant part of any development. To preserve the traditional character of the region and to promote pedestrian-friendly development, parking should be located

to the side or rear of a development so that it does not have a strong impact on the character of the streetscape. Building facades and landscaped areas should always be the prominent visual elements. If frontage buildings are used, parking can be located behind them but in front of rear structures. Landscape berms and deep landscape buffers (both along the street and within large lots) can be used to lessen the visibility of existing parking lots, but no new parking should be placed in front where it is visible from the street. Most sensitive are historic and rural/natural areas but preserving character in Community Activity Centers is key to their success.

FOR ALL PLACETYPES

Locate parking to the side or rear of development: Parking should be located further back on a lot than any adjacent buildings. Parking located in front of buildings and next to the street is inconsistent with the region's traditional patterns. It diminishes the sense of enclosure of the roadway and is not compatible with pedestrian activity.

Screen parking from view: Locate new parking lots behind or to the side of buildings to effectively screen them and maintain the character of the streetscape. Parking lots may also be screened from the street by the use of a low wall, fence, hedge, or landscaping. Provide view corridors, informational signage, and walkways to provide visibility and access to parking areas.

Design smaller parking lots with more landscaping: Design smaller parking lots separated by landscaping rather than constructing a single large lot. Use large landscaped islands, at least 10-12 feet wide with trees planted 25-40 feet apart, depending on the tree species selected. Trees should generally be a minimum of 3 inches in diameter when planted. Landscaped islands should comprise 20% of the parking field.

Create safe pedestrian paths through parking areas: Pedestrian walkways should be provided within parking areas to allow for safe pedestrian travel, with crosswalk pavement highlighted either by a change in the pavement texture or color so that pedestrian circulation is clearly defined.

NATURAL AREAS AND RURAL DEVELOPMENT AREAS

Limit new parking lots: Use existing lots and shared parking whenever possible. Many land uses require parking at different times of the day and different days of the week, making it convenient to share parking and minimize construction of new parking areas. Use alternative surface materials like gravel or shell or others to blend in with their surroundings.

HISTORIC AREAS, MARITIME AREAS, AND COMMUNITY ACTIVITY CENTERS

Use existing on-street parking and shared parking lots: In these areas it's most important to keep parking secondary and not a prominent element of the streetscape. Use existing on-street parking and parking lots that can be shared in village centers and developed areas. Churches, offices, restaurants, and other uses that operate at different times may be willing to enter into agreements to share parking areas, reducing costs as well as the amount of land devoted to impervious parking.

SUBURBAN DEVELOPMENT AREAS

Remove existing parking from front yard areas: Where parking exists in front yard areas, reduce the amount of parking provided or relocate it to the side or rear of the lot. Replace those areas with improved landscaping.

Seek shared parking between adjacent uses: Where appropriate, seek opportunities to reduce the amount of parking provided on-site by sharing parking with adjacent uses, particularly in commercial- or industrial-use Suburban Development Areas.

Provide for reserve parking on-site to reduce impervious surfaces: Design overflow parking to be retained in a natural state or use pervious or permeable pavers to reduce the amount of impervious surface in these areas.

Provide appropriate landscaping and pedestrian amenities

Consideration of appropriate landscaping and buffering for development is an integral part of contextual design on Cape Cod. Landscaping can be used to screen parts of development and to enhance its relationship to the site. The development's location and the character of the surrounding landscape context should guide the development

of a landscape plan for a project site. While natural vegetation defines the character of some Placetypes, others are more developed and require a different landscape treatment such as street tree planting or pocket parks. Development should implement a landscape plan that addresses the functional aspects of landscaping, such as stormwater treatment, erosion prevention, screening and buffering, and provision for shade and energy conservation. Retaining or restoring visual access to natural resources is also an important component of the region's historic pattern of development identified in the Cape Cod Placetypes.

FOR ALL PLACETYPES

Preserve the natural landscape: Minimize removal of existing vegetation. Preserve massings of plants in their characteristic natural associations. Maintain forest floor conditions and as many mature trees on site as possible and design the project around existing vegetation so that the existing landscape provides a setting for the project. Transplant and re-use on-site vegetation where feasible.

Restore natural edge conditions: Blend the development into the existing landscape. Species characteristic of the region require less maintenance, provide an appropriate habitat for local wildlife, and integrate the new development more successfully into the existing landscape. Existing wooded areas adjacent to the site may be used as reference in determining appropriate species for new buffer planting.

Use a variety of species to assemble new landscaping masses: Create visual depth in plant massings by layering plants of various textures, sizes, and colors. Include flowering or fruiting species for color, interest, and wildlife habitat where appropriate. Layered plantings soften edges and corners and reduce the scale of buildings in the landscape. Masses of trees and vegetation near buildings reduce the perceived scale of buildings and set them into the landscape. Trees should generally be a minimum of 3 inches in diameter at the time of planting. Consider plant massing along with architectural massing during the design process. Balance the mass, proportion, and rhythm of landscape and building elements.

Create pedestrian-oriented landscape areas: Create landscaped areas adjacent to the building to add variety and depth to a large building facade. Arbors or pergolas can be combined with landscaping to effectively break up a large flat facade, adding different materials, depth, and vegetation. Within large projections or setbacks in the

facade, incorporate landscaped areas to provide relief and provide interest while also softening the building exterior and mass.

Use plants that are characteristic of the region: Use plant materials that are predominantly native species and suitable to the site. Incorporate pollinator species and other species that provide nesting, food, and cover for wildlife. Provide diversity in plant material selection and select species that minimize use of irrigation, pesticides, and fertilizer. Further information about recommended plant species can be found on the Cape Cod Commission website.

Minimize lawn area: Provide alternatives to lawn area including native grasses and forbs to reduce mowing and fertilizer application. Where lawn is necessary, favor fescues and other drought tolerant species.

Provide pedestrian amenities within the development site: Incorporate benches, bike racks, and trash receptacles within the development site as appropriate to the use and scale of the project.

NATURAL AREAS AND RURAL DEVELOPMENT AREAS

Use low-lying plantings to preserve views of the horizon: Especially along the coastline, make use of mat-forming plants or low shrub massings and/or native grasses and forbs that are wind-and salt-tolerant. In wooded areas, preserve existing vegetation.

Use substantial landscape buffers to screen new development: The predominant woodlands found on Cape Cod consist of oak and pitch pine, with a low deciduous understory. These woodlands tend to lack lower branching, and pitch pines, in particular, do not provide effective screening due to their irregular form. This type of natural buffer is an ineffective visual barrier for a proposed development unless it is of substantial depth. Therefore, natural, undisturbed vegetated buffers should be provided by development.

Preserve the feeling of enclosure: Wooded roadways provide enclosure through overhead tree canopy. Retain existing wooded road edges and retain a buffer of natural vegetation between new development and the road edge where possible to preserve the character of scenic wooded roadways. When replanting along the road edge, leave an appropriate distance between the edge of the pavement and any new trees.

Provide footpaths along roadways: Where appropriate, provide footpaths along roadways where they enhance compatible access to natural, scenic, and cultural resources and do not adversely impact these resources.

SUBURBAN DEVELOPMENT AREAS

Improve landscaping and buffering of development: Improve the appearance and function of Suburban Development Areas by providing adequate buffers and/or berms where appropriate between the street and development to screen parking and shield loading areas. Substantial buffers should be provided for side and rear property boundaries where commercial development abuts residential properties.

Provide pedestrian amenities: Provide pedestrian amenities within the site including tables, seating, bus shelters, trash receptacles, bike racks, drinking fountains, shelters, and public restrooms where appropriate. Use plantings and public art to enhance these outdoor spaces.

HISTORIC AREAS, MARITIME AREAS, AND COMMUNITY ACTIVITY CENTERS

Landscaping in these areas should focus primarily on defining the street edge through street tree planting and providing a pedestrian refuge through landscape planter strips that incorporate LID where feasible.

Provide sidewalks along roadways, consistent with the character of the area: While hard curbs may be appropriate in village/activity centers, grass strip and less formal designs are appropriate in other areas. Sidewalks should be accessible when conditions allow.

Enhance the streetscape with landscaping: Provide street trees to define the street edge, provide shade, and contribute to a comforting sense of enclosure. Where appropriate, establish planting strips, road islands and small parks within the public right-of-way, especially where it can make pedestrian crossings more comfortable and safe.

Incorporate pedestrian amenities in Community Activity Centers: Provide public seating, pocket parks, outdoor commercial seating and other amenities along the streetscape to encourage greater activity in front of the building.

Use building setbacks for greenspace/hardscape: Use courtyard areas or setback areas in front and between buildings to accommodate a pocket park, pedestrian plaza, or alleyway to parking behind buildings if appropriate. These areas provide relief, soften the street edge, and provide an opportunity for gathering and interaction that contributes to the vitality of centers.

INDUSTRIAL ACTIVITY CENTERS AND MILITARY AND TRANSPORTATION AREAS

Provide substantial buffers: Natural, undisturbed vegetated buffers should be provided by development, particularly in cases where the building form is non-traditional, such as industrial and warehouse buildings.

Provide open space adjacent to residential areas: Where Industrial Activity Centers and/or Military/Transportation Areas are adjacent to residential uses, open space in addition to vegetated buffers should serve to separate incompatible uses.

Ensure lighting protects dark skies and signage fits with community character

Lighting and signage can add to the character of an areas or can become a significant visual distraction. Lighting should be kept to a minimum safe level and should not spill onto adjacent lots or up into the sky. The appropriateness of outdoor lighting might also relate to the use for which the lighting is proposed, e.g., outdoor lighting proposed for a hospital may require special considerations for public safety, emergency and security not generally applicable to other uses.

FOR ALL PLACETYPES

Design outdoor lighting at moderate levels: Provide a uniform distribution of light without compromising safety and security. Areas of high pedestrian and vehicle use should maintain a minimum footcandle of 1.0, measured four feet above the ground surface at the point of least illumination, and a maximum footcandle of 7.0. measured four feet above the ground surface directly beneath the light source.

Provide total cutoff of light at property lines: Light should not spill from a development onto adjacent properties. Parking areas should have light fixtures that have a total cutoff of all light at less than 90 degrees and a beam cutoff of less than 75

degrees. Attached building or wall pack lighting should be screened by the building's architectural features or contain a 45-degree cutoff shield.

Select light poles that are in scale with proposed or surrounding buildings: The maximum light fixture height for properties that are visible from regional roadways, abut residential areas or regional vistas, should be 20 feet. Properties that do not abut residential areas and/or have no regional views may have a maximum light pole height of 25 feet. For pedestrian walkways and plazas, consider using lights in bollards (3 to 4-foot high posts) where appropriate.

Lighting should not conflict with shade trees within landscaped islands: Select lower mounting heights, below the canopy of trees, rather than high mounted fixtures which may create shadows or dark spots. Spacing of light poles in parking areas should be staggered rather than aligned, to maintain a uniform distribution of light. In all cases, light poles should be located within landscaped islands for safety and aesthetic reasons.

No internally illuminated signs: Internally illuminated or flashing signs are not appropriate on Cape Cod, though channel-lit letters may be appropriate in non-historic areas. For externally illuminated signs, lighting should be aimed downward to avoid impacts on the night sky.

Limit height of signage: Building signs should be located either flush or perpendicular to the building wall. Do not place signs on roofs or above eaves and parapets. If site signs are used, they should be kept as low as possible without impacting safe sight distance at vehicle entrances.

Use the smallest size and least number of signs: A small, simple, well located sign is generally more effective than an improperly located large sign with excessive information. Sign materials, style and shape should be compatible with surrounding building materials, colors and textures. Sign size and lighting should be modest to keep the focus on the surrounding traditional architecture and other cultural features.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE CD2

Objective CD2 *– Minimize the amount of newly disturbed land and impervious surfaces*

The natural resources and open spaces of the region are key to maintaining the culture and character of Cape Cod, as well as its economy. As development replaces the region's natural areas and forest cover, both natural functions and regional character are degraded. To preserve the Cape's distinctive character and minimize impacts to natural processes as the region continues to grow, new development must follow more compact land use patterns and use land more efficiently.

Cape Cod's traditional development patterns are defined by compact land uses with buildings in more densely developed centers or villages, surrounded by open, natural, and less developed lands. However, much modern development in the region follows a more spread out development pattern that requires large swaths of impervious surface and relies on automobiles as a primary means of transportation, necessitating large and often excessive paved parking areas and roadways. More sustainable design builds in tighter patterns and reuses existing buildings.

These large areas of impervious surface not only fragment the natural habitat and resources of the land, but also negatively impact water quality due to increasing runoff while decreasing the capacity of natural systems to recharge and filter stormwater. Reducing the natural and vegetated areas also diminishes the ability of an area to absorb floodwaters and replacing these areas with pavement or dark roofs can lead to increased heat retention, necessitating greater use of air-conditioning and energy. Minimizing the amount of newly disturbed land and impervious surfaces will help maintain and restore the natural areas of the region and the vital functions they serve, while also reinforcing the unique characteristics of the different Placetypes found throughout Cape Cod.

Reuse and redevelop existing structures and sites

Reuse of existing developed sites takes advantage of existing infrastructure, minimizes the amount of newly disturbed land and impervious surfaces, and reinforces regional development patterns. Reuse also avoids unnecessary new construction, conserves energy, and maintains those buildings that are considered architecturally and historically valuable. Existing buildings hold 'embodied energy' from the effort required

to harvest their building materials, process and construct them. Reusing existing buildings reduces construction and demolition waste, saves energy by decreasing extraction and processing of raw materials, and reduces air pollution from transporting materials.

Reusing existing buildings also supports the necessary broad spectrum of housing types including affordable housing and a viable mix of uses within an expanding community. Given recent growth on Cape Cod, it is essential to preserve and continue the traditional pattern of adaptive reuse if the Cape is to retain its special character. This housing diversity facilitates growth while preserving community character and a sense of place.

Redevelopment can be an important component of new retail and office developments, improving the viability and character of an existing property through rehabilitated facades, additions, frontage buildings, and enhanced landscaping. It can also provide a good opportunity to encourage mixed-use development in locations where it does not currently exist.

FOR ALL PLACETYPES

Reuse existing buildings: To avoid unnecessary new construction and to conserve energy, new uses should be found for existing structures, particularly if they have architectural or cultural significance. Reusing buildings provides the potential for increased economic benefit while limiting new development impacts on natural resources.

Reuse developed sites: In addition to reusing existing buildings, existing developed sites should be redeveloped to avoid newly disturbed lands and impervious surfaces. Redevelopment of these sites may involve partial or complete demolition of buildings (provided they are not culturally significant) and new construction in previously developed areas.

Infill development: Constructing new buildings or additions within areas that are already largely or densely developed is another way of adding development consistent with regional traditions. Infill development in historic and maritime character areas must be carefully designed to be consistent with existing patterns by adding structures where there are breaks in the streetscape pattern or where there is available land to the rear of a site can facilitate use of existing infrastructure.

SUBURBAN DEVELOPMENT AREAS

Encourage infill construction in areas of existing strip development: Along the strip, new buildings should be constructed on frontage lots in order to define the roadway edge. Developing frontage lots will also screen large existing parking areas and help to make the area more pedestrian friendly.

HISTORIC AREAS

Reuse historic buildings: Older structures often exhibit architectural styles and a level of craftsmanship that is too expensive to replicate today. They also represent significant periods and events in a community's history which should not be lost to future generations. New users of historic buildings should limit the alterations they make to historic exteriors in order to avoid losing resources that are important to the community.

Cluster development

Cluster development is a form of development that uses smaller lots, and reduced frontage and lot setbacks to focus development on the most appropriate portions of a site while preserving common open space on the more sensitive portions of a site. By concentrating development on one portion of a site, larger and more contiguous natural areas or open spaces may be preserved. Frequently, cluster development permits a reduction in lot area requirements, frontage, and setbacks, allowing reduced construction costs for shorter roadways and other infrastructure. Permanently protected open space is often required as part of the development design and serves as an amenity for the immediate neighborhood and for the larger community. [For examples of cluster development, please refer to the Compact Residential case study in *Designing the Future to Honor the Past*, and examples of open space design provided in *Rural by Design* [ref. at end of document]]

FOR ALL PLACETYPES

Cluster development on a portion of the site: Rather than distributing development uniformly across a site, cluster development close together in areas that are least sensitive in terms of natural resources and where development can most efficiently share infrastructure and other resources. Lay out buildings, roads, and parking lots after sensitive areas and buffers for these areas have been established. Multistory

buildings, mixed use development, and shared parking are features that can help support a smaller development footprint desired in cluster developments.

Reduce cut and fill to minimize disturbance to existing topography and vegetation: Clear only where needed for construction and protect all disturbed areas from erosion and sedimentation. Develop only those areas of the site where the existing slopes are suitable for the proposed use. One benefit of constructing only on suitable slopes is reduced construction costs.

Follow existing topography and landscape: Reflect the form of the land in new road layouts to minimize environmental and visual impact to the landscape. Generally follow existing contours so that roads integrate into the landforms with a minimum of cutting and filling.

NATURAL AREAS

Reduce development footprints: New development should be avoided in Natural Areas, but redevelopment or reuse of existing sites within or adjacent to Natural Areas should be clustered to reduce the overall development footprint. Any changes in this Placetype should involve reduced lots, shortened roadways, and protecting additional land from development. This is particularly true for coastal hazard areas where concerns about safety continue to increase and landforms have reduced ability to respond to natural forces.

Minimize total parking spaces to no more than what is required by zoning

In many cases, zoning for commercial uses requires large setbacks from roadways and excessive parking requirements. These requirements make it difficult for development to respect the Cape's traditional development patterns and can lead to unnecessarily large amounts of impervious surface on a site.

FOR ALL PLACETYPES

Divide up large parking lots: Divide large parking lots and buildings into smaller components as an alternative to extensive grading and paving. Landscaping can be used to divide the larger parking areas into discrete smaller parking areas.

Design parking lots to accommodate average, not peak, volume: To reduce the amount of paved area, design parking lots to accommodate average, not peak, volume. The required number of parking spaces should be based on average use over a twelve-month period rather than peak holiday and summer months. Consider sharing parking areas with compatible uses, on-street parking and town-owned parking lots, as well as school and church parking lots for shuttle service during peak use periods. For new developments, consider reserving an area for additional parking that will be paved in the future if a need is demonstrated, but which will otherwise remain as open space.

Use permeable or pervious pavement: Permeable or pervious construction materials should be used whenever possible. Gridblocks with grass, crushed stone or shells are possible solutions which can improve the appearance of lightly used or seasonal parking areas while reducing stormwater runoff. This is particularly appropriate in Historic Areas and areas adjacent to Natural Areas.

Provide facilities for other modes of transportation: Provide bicycle racks and storage facilities, and/or bus stops, as appropriate to promote use of modes of transportation other than vehicular and reduce demand for vehicle parking.

Develop multi-story buildings where appropriate

Past development in the region often included multi-story buildings with usable second and third floors. Incorporating multiple stories in new development can reduce both the building footprint and development footprint without reducing the usable square footage.

FOR ALL PLACETYPES

Add a second or third story to reduce building footprints: New development should be designed with a usable second or third story, consistent with the region's traditional building forms. Building a second story, rather than placing the entire floor area on the ground level, can reduce the overall footprint of the proposed use and result in a building that more closely matches the local scale. A second story can also accommodate different uses, such as residential or office space above retail, creating a mixed-use development and allowing for more varied architectural features. Alternatively, a second story may be designed without added floor area, but simply to

allow natural light to pass more freely into the interior of the building through an atrium space.

Provide parking under or within buildings or in structures

In some situations, incorporating a parking structure into the design of proposed buildings may be desirable to limit the amount of land area devoted to parking.

FOR ALL PLACETYPES

Locate parking within or under buildings: Locating a portion or all of a development's parking within the first floor of a building or underneath it in a parking garage reduces the need for impervious surface in excess of the building footprint.

Locate parking in parking structures: Parking structures can minimize the amount of impervious surface by using multiple stories to create parking areas with a smaller footprint. Multi-story parking structures are preferably located to the rear of a building because it is difficult to design them in ways that are compatible with traditional building forms. If parking structures will be visible from the street or public ways, they should be incorporated into the design of the building, with a similar level of architectural detail.

Maintain existing vegetation and revegetate disturbed sites

Whenever possible, existing vegetation should be maintained on a site. When vegetation is disturbed, the site should be revegetated with appropriate native species.

FOR ALL PLACETYPES

Integrate existing vegetation into the landscape plan: Integrate existing mature trees and vegetation into the landscape plan. Preserve the function of existing vegetation, such as groves of trees that separate land uses or provide a natural backdrop for development.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE CD3

Objective CD3 *– Avoid adverse visual impacts from infrastructure on scenic resources*

FOR ALL PLACETYPES

Site infrastructure away from scenic resources

There are numerous locations or areas on Cape Cod that contain Scenic Resources. Siting infrastructure so that it is not visible from these locations is the preferred method for meeting Objective CD3. Avoid siting infrastructure in Natural Areas, open landscapes in Rural Development Areas, and Historic Areas.

Collocate infrastructure with other existing infrastructure and/or within buildings

Minimize visual impact of infrastructure by collocating or sharing space/poles with other existing infrastructure where possible and or by locating infrastructure within existing buildings or other structures.

Utilize previously developed and/or impervious areas

For some types of infrastructure such as solar panels and utility infrastructure, the use of previously developed areas such as parking lots are strongly encouraged to reduce natural resource impacts and where other infrastructure may already be located.

Locate infrastructure underground where feasible

Another preferred method for infrastructure unless cultural or natural resources are present is to locate infrastructure underground where it is not visible.

Design and scale infrastructure appropriate to context

Where possible, infrastructure such as roads, sidewalks, traffic signals and other appurtenances as well as wireless facilities, all which may have design flexibility, should be designed to be compatible with its corresponding Placetype.

Minimize the height of infrastructure. In visually sensitive areas, minimize the height of infrastructure to the minimum height necessary and locate at or below the height of surrounding vegetation.

Minimize lighting impacts to surrounding neighborhoods and visually sensitive areas. Avoid flashing lights, strobe lighting, or brightly illuminated infrastructure unless required by the FAA for safety reasons.

Camouflage infrastructure to reduce its visibility. Camouflage infrastructure through designs that reduce the visibility through techniques such as a reduced profile, color, or by disguising the infrastructure to resemble other structures in the built environment where appropriate. Use colors that mimic the predominant background setting and choose colors or materials that are less reflective.

Minimize the silhouette of infrastructure through design. The outline or profile of infrastructure can be minimized through designs that are sleeker or slimmer.

Screen infrastructure with vegetative buffers, buildings, or other structures

In some cases, dense vegetative buffers may be effective in screening infrastructure from roadways or other public viewpoints. Additional guidance on screening methods is available under Objective CD1.

GENERAL APPLICATION REQUIREMENTS

Written Design Narrative. All applicants should provide a narrative that addresses both the project design and the building design. The narrative should present the Applicant's analysis of the project's Placetype and clearly explain the design concept, alternatives considered, and how the proposed project's siting and building design responds to surrounding context. Include information regarding appropriateness of project siting, building siting, and building materials.

Context Map. All applicants should provide a map identifying resource areas, existing landscape features, development patterns, open space networks, and other important features surrounding the project site.

Context Renderings. All applicants should provide project renderings that illustrate how the proposed development appears in relation to its surroundings. Based on the size, scale, and/or location of the project, Commission staff will identify the extent of the surrounding area that should be included in the renderings.

Required Project Plans

- Site Plans
- Building Elevations
- Roof Plans
- Landscaping plan and landscape maintenance protocol
- Lighting/Photometric plans and specifications
- Signage Plan and specifications (including signage lighting)

ADDITIONAL APPLICATION REQUIREMENTS FOR INFRASTRUCTURE PROJECTS

Applicants for infrastructure projects may be required to provide the following additional information as part of their DRI application. Based on the size, scale, and/or location of the project, Commission staff will determine if this additional information will be required at a pre-application meeting.

Visual Impact Map. Map of surrounding scenic resources showing areas from which the project may be visible. Based on the size, scale, and/or location of the project, Commission staff will make a determination on extent of map. For proposed offshore infrastructure that will affect broad ocean views, please see Visual Impact Assessment Methodology for Offshore Developments for detailed methodology on assessing the project's visual impacts.

Visualizations and Simulations. Prepare photo-simulations as determined in the pre-application meeting to describe the anticipated effect of the proposed project on the region's scenic resources. The number of simulations required will depend on the anticipated impact and the sensitivity of the resources. The VIA should include consideration of all parts of the project, including all associated infrastructure both in the ocean or on land. In the event that more than one alternative is being considered, the visual impact of all alternatives should be evaluated by the applicant.

Additional Design Narrative Content. Description of how the infrastructure project has been configured or located and how it avoids or minimizes visual impacts. The narrative should provide details concerning alternative configurations or sites that were evaluated in the design process and the design or mitigation strategies employed to reduce any visual impacts.

DEFINITIONS

Adverse Visual Impact: Where the degree of change in the scenic quality resulting from Development is expected to unreasonably impact or interfere with a scenic resource or otherwise unreasonably alter the character, setting or quality of a scenic resource.

Scenic Resources: Locations or areas that are recognized, utilized, and enjoyed by the public for their visual and scenic qualities and whose features, views, patterns, and characteristics contribute to a distinct sense of appreciation of the natural and cultural environment.

Scenic resources on Cape Cod include, but are not limited to:

- National, State and Regional Parks, marine sanctuaries and wildlife refuges from the U.S. Geological Survey, U.S. Fish and Wildlife, Massachusetts Department of Environmental Management and Massachusetts GIS.
- Historic Districts listed by the Massachusetts Historical Commission in the State Register of Historic Places, Old King's Highway and other Historic Districts, as well as other individually listed properties. Information about individual properties, both within and outside of historic districts is also compiled on MACRIS (Massachusetts Cultural Resources Inventory System). [see also Cultural Heritage Technical Bulletin]
- Municipally designated scenic roads.
- Scenic vistas or viewpoints, e.g. scenic canal overlooks in Bourne; Nobska Light, Falmouth; and Scargo Tower, Dennis.

Scenic Road: A public road that has one or more of the following characteristics:

1. Passes through an area of outstanding natural environmental features providing views of scenic elements such as salt marshes, rivers, bays, dunes and the ocean;
2. Provides outstanding views of rural, agricultural landscapes including scenic elements such as panoramic or distant views, cropland, pastures, fields, streams, ponds, hedgerows, stone or wooden fences, farm buildings and farmsteads;
3. Follows historic road alignments and provides views of historic resources;

4. A large proportion of the road provides frontage for properties that are in a historic district or subject to perpetual or long-term agricultural, environmental or historic easements; or,
5. Is designated by a municipality as a scenic road.

View: Portion of the seascape that is seen from a vantage point.

Visual Impact: The degree of change in scenic quality resulting from Development.

Visual Impact Assessment (VIA): The process for determining the degree of change in scenic quality resulting from Development, including but not limited to establishing the zone of visual influence, identifying Visual and Scenic Resources, preparing visual simulations, and assessing the magnitude of the proposed change.

REFERENCES

Randall Arendt, with Elizabeth A. Brabee, Harry L. Dodson, Christine Reid, Robert D. Yaro. Rural by Design, Maintaining Small Town Character. APA Planners Press, American Planning Association. Copyright 1994.

Coastal Resiliency

This guidance is intended to clarify how the Coastal Resiliency Goal and Objectives of the Regional Policy Plan (RPP) are to be applied and interpreted in Cape Cod Commission Development of Regional Impact (DRI) project review. This technical bulletin presents specific methods by which a project can meet these goals and objectives.

Coastal Resiliency Goal: To prevent or minimize human suffering and loss of life and property or environmental damage resulting from storms, flooding, erosion, and relative sea level rise.

- ***Objective CR1*** *– Minimize development in the floodplain*
- ***Objective CR2*** *– Plan for sea level rise, erosion, and floods*
- ***Objective CR3*** *– Reduce vulnerability of built environment to coastal hazards*

The applicability and materiality of these goals and objectives to a project will be determined on a case-by-case basis considering a number of factors including the location, context (as defined by the Placetype of the location), scale, use, and other characteristics of a project.

THE ROLE OF CAPE COD PLACETYPES

The RPP incorporates *a framework for regional land use policies and regulations based on local form and context* as identified through categories of Placetypes found and desired on Cape Cod.

The Placetypes are determined in two ways: some are depicted on a map contained within the RPP Data Viewer located at www.capecodcommission.org/RPPDataViewer adopted by the Commission as part of the Technical Guidance for review of DRIs, which may be amended from time to time as land use patterns and regional land use priorities change, and the remainder are determined using the character descriptions set forth in Section 8 of the RPP and the Technical Guidance.

The project context, as defined by the Placetype of the location, provides the lens through which the Commission will review the project under the RPP. Additional detail can be found in the Cape Cod Placetypes section of the Technical Guidance.

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INTRODUCTION

Over the last several decades Cape Cod has seen considerable growth and development, much of it in the coastal zone. Thirty percent of the region's assessed property value is located within coastal hazard areas, totaling approximately $9 billion and including roughly 13,000 single family homes. This means that some of the most scenic and desirable development sites are located in areas that are vulnerable to some kind of coastal hazard: storm surge, erosion, flooding, and sea-level rise.

Cape Cod's coastlines are active with non-water dependent development. Since the vast majority of the coastline is privately owned, decisions about how to prepare for and respond to coastal threats has fallen on the property owner. The Regional Policy Plan encourages a shift to more coordinated preparation and planning for coastal threats, and toward reducing hazards within the coastal zone.

Flood hazard areas are those areas defined and delineated by the Federal Emergency Management Agency as V and A Zones – areas impacted by storm driven wave action and/or inundated by flood waters, respectively. The V and A zone maps (FEMA Flood Maps) are delineated by FEMA, and adopted by communities who participate in the National Flood Insurance Program (NFIP). FEMA uses these areas for participation in the NFIP, but they are more broadly employed as delineations of flood hazard areas, and used here for both planning and regulatory purposes (see also Resources).

SUMMARY OF METHODS

GOAL | COASTAL RESILIENCY

To prevent or minimize human suffering and loss of life and property or environmental damage resulting from storms, flooding, erosion, and relative sea level rise.

OBJECTIVE CR1 – Minimize development within the floodplain

METHODS

For all DRI's in the floodplain:

- Must limit new development in V zones to water dependent uses and only where the applicant can show that there is no feasible alternative and that development impacts are minimized and mitigated.
- Must limit new non-water-dependent infrastructure to only installations where the applicant can demonstrate an overriding public purpose.
- Where development is proposed, applicant must demonstrate that there is no feasible alternative, and minimize and mitigate impacts to coastal resources in order to protect their natural beneficial functions (including but not limited to hazard mitigation and habitat).

Additional methods for DRI's in the floodplain:

- Limit new development in A zones;
- Redevelopment within the floodplain may occur where the applicant can show that there is no feasible alternative and that impacts are minimized and mitigated.

OBJECTIVE CR2 – Plan for sea level rise, erosion, and floods

METHODS FOR PROJECTS ON OR NEAR COASTAL BANKS

- Must limit new development on or within 100 ft of a coastal bank to water dependent uses and only where the applicant can show that there is no feasible alternative and that impacts are minimized and mitigated.
- Redevelopment on or within 100 ft of a coastal bank may occur where applicant can show that there is no feasible alternative and that impacts are minimized and mitigated.
- Design development projects to accommodate sea level rise

OBJECTIVE CR3 – Reduce vulnerability of built environment to coastal hazards

METHODS

- Project avoids or minimizes siting new development in coastal resource areas.
- Project removes existing development in coastal resource areas.
- Project restores or rehabilitates salt marsh, beach, dune or floodplains, or restores the ability for coastal resources to migrate naturally.

OBJECTIVE CR3 AREAS OF EMPHASIS BY PLACETYPE

Natural Areas | No new development, areas should be protected to allow coastal resources to provide natural beneficial functions

Rural Development Areas | No new development, areas should be protected to allow coastal resources to provide natural beneficial functions; existing development may be reconstructed

Suburban Development Areas and Historic Areas | No new development; existing development may be reconstructed

Maritime Areas and Community Activity Centers | Water dependent and maritime industries and uses where impacts are minimized and mitigated.

Industrial Activity Centers & Military and Transportation Areas | No new development; Water dependent and maritime industries and uses where impacts are minimized and mitigated.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE CR1

Objective CR1 *– Minimize development within the floodplain*

Development in the Floodplain

Every effort should be made to avoid new development within the floodplain. Every development site on Cape Cod has unique characteristics, but in general, development within the floodplain is vulnerable to coastal storms, and increasingly will be vulnerable to the effects of sea level rise. Damage from coastal threats has impacts on property owners, neighbors, emergency responders, and on the ability of the environment to provide important ecosystem services upon which the community relies.

New development in V zones, (also known as high-hazard areas), is not allowed. Exceptions may be made for water dependent uses where there are no feasible alternatives and the impacts have been minimized and mitigated.

New development within A zones may be permitted where the applicant can demonstrate that there is no feasible alternative and that the impacts have been minimized, but in general, new development in the floodplain is discouraged. Non-water-dependent infrastructure should not be constructed within the floodplain unless there is an overriding public purpose in doing so. Where public infrastructure is proposed to remedy an existing problem or need within the floodplain, it should not result in the promotion of additional development within the floodplain.

Green infrastructure and restoration projects within the floodplain are supported, provided the applicant can demonstrate that impacts have been minimized and mitigated. Maintenance of existing public infrastructure and water dependent structures is also allowed.

Redevelopment in the Floodplain

Redevelopment may be permitted in A and V zones where fire or disaster has damaged structures. The applicant should evaluate removing development or relocating it on the site to reduce hazard exposure. Where relocation is not possible, redevelopment may be permitted on site provided there is no increase in gross floor area, impervious footprint, or intensity of use from the prior use or structure. Intensity of use includes,

but is not limited to, increases in wastewater flow, impervious area, or parking spaces, or conversion from seasonal to year-round use.

All reconstruction must comply with current applicable regulations, including building code.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE CR2

Objective CR2 *– Plan for sea level rise, erosion, and floods*

Development Proximate to Coastal Banks

New development is not generally permitted on a coastal bank. Exceptions may be made for water dependent development provided the applicant shows that there is no feasible alternative, that the impacts to the natural functions of coastal resources are both minimized and mitigated, and that the development is designed to address anticipated sea level rise. Exceptions may also be made for the following activities, provided the applicant demonstrates that best available measures are utilized to minimize adverse impacts on all critical coastal resources and that the activity meets the goals and objectives related to any underlying resource areas present:

- Beach, dune, and bank nourishment and non-structural restoration projects that do not impair the natural beneficial functions of the resource, including temporary fencing and other devices composed of natural material intended to facilitate the resources' natural beneficial function. Monitoring and maintenance plans may be required.
- Appropriately designed and sited pedestrian walkways and elevated decks with appropriate orientation, height, and spacing between planks to allow sufficient sunlight penetration to maintain underlying vegetation and resource migration.
- Maintenance and use of existing public boat launching facilities.
- Maintenance of existing public infrastructure.
- Maintenance required to preserve the aesthetics or structural integrity of existing marine infrastructure.
- Projects that restore or rehabilitate salt marsh, freshwater wetlands, fish runs, or shellfish beds.
- Underground utility crossings that do not disturb protected resources.

All non-water dependent development proximate to a coastal bank must be set back from the top of the coastal bank at least 30 times the average annual erosion rate of the shoreline or 100 feet, whichever is greater. Development should be located as far landward of resource areas and coastal hazard areas as is feasible within a site.

The average annual rate of shoreline erosion is determined by averaging the erosion over the previous 30-year period, at a minimum, or other time frame determined by the Commission, to appropriately reflect current and future shoreline conditions.

Calculating a setback from the top of the coastal bank of at least 70 times the average annual erosion rate of the bank is encouraged. Doing so reflects the typical 70-year lifetime of a residential building, based on a study conducted for the Federal Insurance Administration to establish reliable estimates for the life of residential coastal structures.

Redevelopment Proximate to Coastal Banks

Redevelopment may be permitted on or within 100 feet of a coastal bank provided the applicant shows there is no feasible alternative, that there is no increase in impacts to the natural functions of coastal resources, and that the redevelopment is designed to address anticipated sea level rise. The applicant should evaluate relocating development on the site to reduce hazard exposure and impacts to natural functions of coastal resources. Redevelopment should be designed to have no adverse impact on the function of the bank as a natural sediment source to the coastal system.

Accommodating Sea Level Rise

Development and redevelopment must be designed to address anticipated sea level rise. Structures should be elevated to coordinate anticipated sea level rise with the design life of the structure. Residences are typically designed for 70 year life, though many well-built structures on Cape Cod have persisted for over one hundred years. Structures should be designed and built well to weather the elements and avoid short-term obsolescence (which also results in waste of resources). Within A zones, the lowest horizontal structural member should be elevated at least one-foot above base flood elevation (BFE), or two feet above existing grade, whichever is higher. Within V zones, the lowest horizontal structural member should be elevated at least two feet above the BFE. Where development activity may be allowed on beaches and dunes, structures should be built on open pilings to allow for storm flowage, wave action, and resource migration.

FEMA recognizes that certain historic properties may not be suitable for elevation where the setting for the building is important in defining its historic character. The

Commission may also apply flexibility in requiring elevation of a historic structure where doing so would significantly alter the building's historic qualities.

The most recent Mean Sea Level datum available for a site should be used to determine base flood elevation and inform all coastal construction activities. When determining Mean Sea Level, applicants should use the 1988 datum of NAVD88.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE CR3

Objective CR3 *– Reduce vulnerability of built environment to coastal hazards*

Development and Redevelopment in Coastal Resource Areas

Recognizing the multiple values coastal resources provide, including ecosystem services such as storm-hazard mitigation, habitat, and recreation, development in coastal resource areas is discouraged. Projects within the Natural Areas Placetype are not allowed so as to allow coastal resources to provide their natural beneficial functions. Projects proposed in coastal resource areas located within a Community Activity Center should strive to comply with the requirements set forth in this technical bulletin; however, new development may be permitted provided the applicant shows there is no feasible alternative location and that the project is designed to minimize impacts to the natural functions of coastal resources and to address anticipated sea level rise.

In coastal resources areas, prior to considering redevelopment the applicant should evaluate the potential for removing development from the site. Removal of development from sensitive coastal resource areas is encouraged.

Coastal Resource Restoration

Consistent with objective CR2, activities intended to restore the natural beneficial functions of one or more coastal resource areas are permitted. Natural and/or non-structural methods for coastal restoration are encouraged. Activities might include, but are not limited to, beach, dune and bank nourishment, salt marsh restoration, temporary fencing and other approaches employing natural materials designed to re-establish or create natural forms and functions.

GENERAL APPLICATION REQUIREMENTS

Applicants are required to submit the following as part of their DRI application:

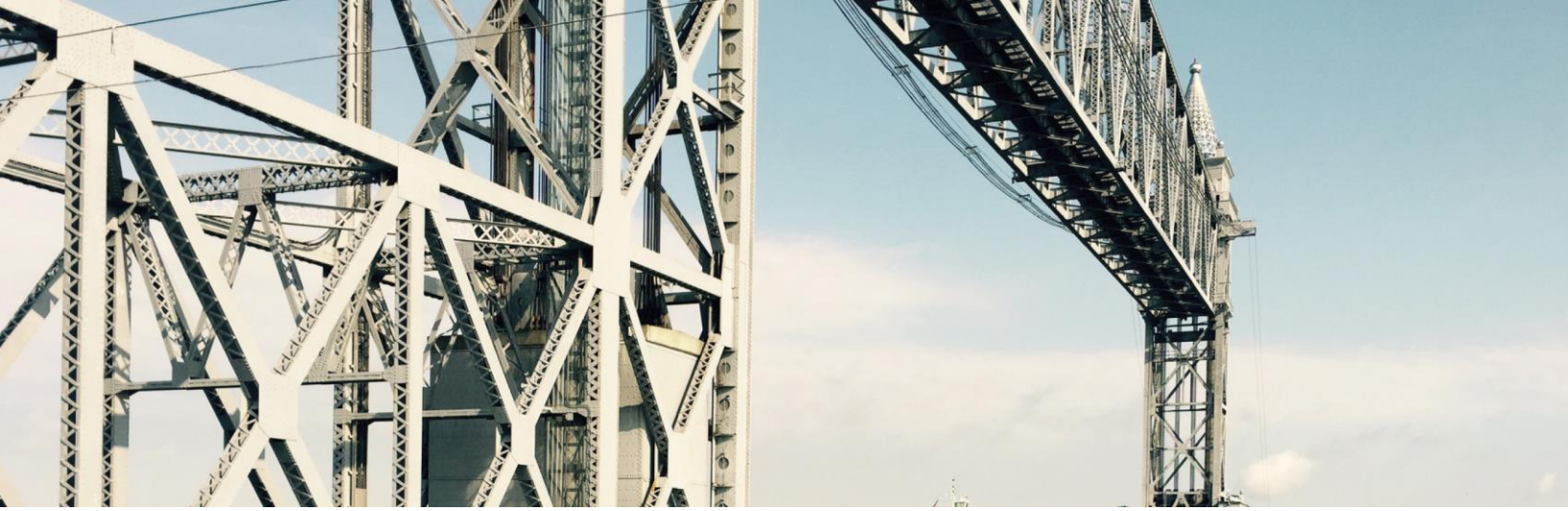
- Site plan showing delineation of all coastal resources and the 100 ft buffer to those delineations.
- If development is proposed within coastal resource areas or buffers, plans detailing the development proposed should be provided, including site plans of existing and proposed conditions, and planting plan for restoration of the site.
- Narrative discussing the alternatives considered, and plans of the alternatives, as appropriate.

DEFINITIONS

Base Flood Elevation – the elevation to which floodwater is anticipated to rise during the base flood. Base flood elevations (BFEs) are shown on Flood Insurance Rate Maps (FIRMs). The BFE is the regulatory requirement for the elevation or floodproofing of structures. The relationship between the BFE and a structure's elevation determines the flood insurance premium.

REFERENCES

Regional Policy Plan Data Viewer



Capital Facilities and Infrastructure

This guidance is intended to clarify how the Capital Facilities and Infrastructure Goal and Objectives of the Regional Policy Plan (RPP) are to be applied and interpreted in Cape Cod Commission Development of Regional Impact (DRI) project review. This technical bulletin presents specific methods by which a project can meet these goals and objectives.

Capital Facilities and Infrastructure Goal: *To guide the development of capital facilities and infrastructure necessary to meet the region's needs while protecting regional resources*

- ***Objective CAP1 –*** *Ensure capital facilities and infrastructure promote long-term sustainability and resiliency*
- ***Objective CAP2 –*** *Coordinate the siting of capital facilities and infrastructure to enhance the efficient provision of services and facilities that respond to the needs of the region*

The applicability and materiality of these goals and objectives to a project will be determined on a case-by-case basis considering a number of factors including the location, context (as defined by the Placetype of the location), scale, use, and other characteristics of a project.

THE ROLE OF CAPE COD PLACETYPES

The RPP incorporates *a framework for regional land use policies and regulations based on local form and context* as identified through categories of Placetypes found and desired on Cape Cod.

The Placetypes are determined in two ways: some are depicted on a map contained within the RPP Data Viewer located at www.capecodcommission.org/RPPDataViewer adopted by the Commission as part of the Technical Guidance for review of DRIs, which may be amended from time to time as land use patterns and regional land use priorities change, and the remainder are determined using the character descriptions set forth in Section 8 of the RPP and the Technical Guidance.

The project context, as defined by the Placetype of the location, provides the lens through which the Commission will review the project under the RPP. Additional detail can be found in the Cape Cod Placetypes section of the Technical Guidance.

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INTRODUCTION

The Cape Cod Commission Act requires the Commission to "anticipate, guide and coordinate the rate and location of development with the capital facilities necessary to support such development, in order to protect the region's natural and historic resources and advance a more balanced economy, housing mix, and social diversity." In order to meet this charge, the Commission seeks to ensure that capital facilities and infrastructure projects are consistent with the regional Growth Policy and the goals and objectives of the Regional Policy Plan.

This Capital Facilities and Infrastructure goal and related objectives apply to projects focused primarily on constructing or modifying capital facilities and infrastructure to support other types of development within the region.

Capital Facilities, a type of infrastructure, is defined by the Cape Cod Commission Act as "public facilities and services necessary to support development, including but not limited to roads, water, sewers, waste disposal, affordable housing, schools, police and fire protection facilities."

For the purposes of this guidance document, Infrastructure is further defined as: "components of the human built system necessary to support communities, protect regional resources, and encourage sustainable economic development including, but not limited to, roads and non-auto transportation structures, drinking water and wastewater distribution and treatment systems, waste disposal and management facilities, telecommunications lines and equipment, energy distribution and generation facilities, and coastal infrastructure."

At such time a Regional Capital Infrastructure Plan is developed by the Commission, it is the intent for that plan to be implemented in tandem with the goals and objectives of the RPP.

SUMMARY OF METHODS

GOAL | CAPITAL FACILITIES AND INFRASTRUCTURE

To guide the development of capital facilities and infrastructure necessary to meet the region's needs while protecting regional resources.

OBJECTIVE CAP1 – Ensure capital facilities and infrastructure promote long-term sustainability and resiliency

METHODS

- Collocate infrastructure or locate infrastructure underground where it will not be subject to wind, ice, tree falls or other above ground hazard
- Locate infrastructure outside of flood-prone or high hazard areas
- Support compact land use patterns
- Project is consistent with the Regional Capital Infrastructure Plan

AREAS OF EMPHASIS BY PLACETYPE

Natural Areas | Avoid siting in these areas unless the project can demonstrate overriding public purpose

Rural Development Areas | Avoid impacts to scenic or cultural resources through siting and design

Suburban Development Areas | Design infrastructure to support improved design and function of these areas and provide appropriate connections to other Placetypes

Historic Areas | Design infrastructure to protect historic character

Maritime Areas | Design infrastructure that supports traditional maritime activities

Community Activity Centers | Design infrastructure to support greater density and compact land use patterns

Industrial Activity Centers | Infrastructure supports industrial development and other industries appropriate to the diversification of the regional economy

Military and Transportation Areas | Shared infrastructure encouraged; infrastructure development should support economic vitality of these areas

OBJECTIVE CAP2 – Coordinate the siting of capital facilities and infrastructure to enhance the efficient provision of services and facilities that respond to the needs of the region

METHODS

- Coordinate project construction with other planned or needed infrastructure projects
- Improve the quality or availability of service
- Use existing utility easements and/or rights of way
- Provide site sharing or space for other providers or types of infrastructure
- Encourages growth of industries appropriate to the diversification of the regional economy

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE CAP1

Objective CAP1 - *Ensure capital facilities and infrastructure promote long-term sustainability and resiliency*

The intent of Objective CAP1 is that capital facilities and infrastructure projects should promote long-term sustainability of the region by supporting compact land use patterns to the greatest extent possible, by supporting transition to carbon-free infrastructure, and by being located and designed to avoid impacts to natural, historic and cultural resources. Capital facilities and infrastructure should also be designed to be resilient to extreme weather events and the effects of climate change or other natural or man-made threats and be responsive to the context in which they are located.

The following methods may be implemented to meet Objective CAP1:

Collocate Infrastructure or Locate Infrastructure Underground

As described in more detail in the Community Design technical bulletin, infrastructure should be collocated with other infrastructure where feasible or located underground to reduce vulnerability to severe storms or other natural or man-made disasters.

Locate Infrastructure Outside of Flood-Prone or High-Hazard Areas

The location of capital facilities and infrastructure could have a significant impact on a community's resilience to natural disasters. Infrastructure located outside of the floodplain is a preferred method to meeting this objective. Locating infrastructure outside of high-hazard areas can ensure that services and access to facilities are available in the event of a natural disaster and protected from damage or loss due to severe storms.

Support Compact Development Patterns

The location of capital facilities and infrastructure could have a major impact on future development patterns in the region. Capital facilities and infrastructure that support compact land use patterns, including development and redevelopment in Community and Industrial Activity Centers, are strongly encouraged to reduce the cost of providing

infrastructure to support residential development and/or mixed-use commercial development.

Project is consistent with the Regional Capital Infrastructure Plan

A priority action item in the 2018 Regional Policy Plan is the development of a regional capital infrastructure plan. The expectation is that Developments of Regional Impact to which CAP1 applies should also take the regional capital infrastructure plan into account when proposing and designing their project.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE CAP2

Objective CAP2 - *Coordinate the siting of capital facilities and infrastructure to enhance the efficient provision of services and facilities that respond to the needs of the region*

Coordinate Project Construction with Other Planned or Needed Infrastructure Projects

Capital facilities and infrastructure should be coordinated with other existing or planned capital facilities and infrastructure to reduce the cost of providing infrastructure, limit land clearing and impacts to natural and other resources, and to protect the region's historic and community character.

Improve the Quality or Availability of Service

Capital facilities and infrastructure should provide safe, reliable, environmentally sound, accessible, high-quality services and facilities to meet the needs of all users in the region. Reliable, high-quality facilities and infrastructure are vital to a competitive economy, a sustainable environment, and a connected community. Capital facilities and infrastructure can help to open new markets, encourage the growth of industries that help diversify the regional economy, encourage fossil-free energy, and enhance educational opportunities. Therefore, infrastructure should be built and managed to provide high-quality, efficient services.

Use Existing Utility Easements and/or Rights of Way

The costs of infrastructure can be reduced by using existing structures and rights-of-way, eliminating waste, and coordinating construction with other planned or needed infrastructure projects. Using land, facilities, and infrastructure efficiently also limits the impact of development on the natural environment.

Provide Site Sharing or Space for Other Providers or Types of Infrastructure

Where appropriate, capital facilities and infrastructure that provides space on-site for other planned or future infrastructure or through collocation is strongly encouraged to reduce the cost of providing infrastructure and minimizing impacts on the region's character and environment.

Encourages Growth of Industries Appropriate to the Diversification of the Regional Economy

Infrastructure development to support industries appropriate to the diversification of the regional economy such as marine science, information technology, and light manufacturing are encouraged, particularly if located in centers of activity and consistent with resources protected under the Act.

GENERAL APPLICATION REQUIREMENTS

Applicants should provide the following materials to address consistency with the Capital Facilities and Infrastructure Goal and Objectives.

- Project plans detailing the location(s) of the proposed project
- Narrative discussing the alternatives considered, as appropriate.
- Statement of Need that provides the information necessary to determine whether:
    - The project addresses existing needs of Cape Cod without unnecessarily duplicating existing services or facilities; and/or,
    - The project addresses new demand to support growth in centers of activity.
- Resiliency Statement with information necessary to determine whether the location and services provided by the project will be resilient (and advance overall resiliency) in the event of a human or natural disaster.

Transportation

This guidance is intended to clarify how the Transportation Goal and Objectives of the Regional Policy Plan (RPP) are to be applied and interpreted in Cape Cod Commission Development of Regional Impact (DRI) project review. This technical bulletin presents specific methods by which a project can meet these goals and objectives.

Transportation Goal: To provide and promote a safe, reliable, and multi-modal transportation system.

- ***Objective TR1*** *– Improve safety and eliminate hazards for all users of Cape Cod's transportation system.*
- ***Objective TR2*** *– Provide and promote a balanced and efficient transportation system that includes healthy transportation options and appropriate connections for all users.*
- ***Objective TR3*** *– Provide an efficient and reliable transportation system that will serve the current and future needs of the region and its people.*

The applicability and materiality of these goals and objectives to a project will be determined on a case-by-case basis considering a number of factors including the location, context (as defined by the Placetype of the location), scale, use, and other characteristics of a project.

THE ROLE OF CAPE COD PLACETYPES

The RPP incorporates *a framework for regional land use policies and regulations based on local form and context* as identified through categories of Placetypes found and desired on Cape Cod.

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General Application Requirements (Transportation Impact Assessment Elements) TR-22

References and Resources TR-31

- References TR-31
- Mapping Resources TR-31

NOTE ON APPLICATION MATERIALS, DEFINITIONS, RESOURCES AND REFERENCES

Application materials, generally presented in the form of a Transportation Impact Assessment (TIA), should provide sufficient detail to demonstrate that the project meets the applicable goals and objectives, but typically include a:

A. Project description
B. Trip generation analysis
C. Detailed multi-modal site plan
D. Driveway safety analysis
E. Off-site safety analysis*
F. Trip reduction analysis*
G. Off-site congestion analysis**

*Required for Study Area locations where the project is expected to increase traffic by 25 or more trips during the project's peak hour.

**Required if credits for trip reduction measures are proposed.

See TIA guidance on page TR-22 for further guidance.
A list of references and resources are provided on page TR-31

INTRODUCTION

Numerous subsystems make up Cape Cod's transportation network including vehicular roadways, railways, public transportation, air travel, marine transportation, and pedestrian and bicyclist accommodations and networks. These systems are responsible for safely and effectively moving the people of the region and the goods they rely on. Additionally, these systems must serve not only the year-round population but must also effectively handle the movements of the more than doubled seasonal population, which requires building and maintaining a transportation system that functions under the strain of the peak season, without negatively impacting the character that defines this unique place.

Section 7 of the RPP – Coordinated Regional and Local Planning – outlines the vision of the Cape Cod Regional Transportation Plan (RTP) and identifies the important connection between transportation and land use planning. If the region is to achieve the RTP vision for "a transportation system that supports the environmental and economic vitality of the region through infrastructure investment that focuses on livability, sustainability, equity, and preservation of the character that makes our special place special," smart transportation investment and land use planning decisions need to be made at all levels.

This Technical Guidance provides examples of various methods and strategies that DRI projects may use to satisfy the Transportation Goal and Objectives of the RPP. Through implementation of these methods and strategies, DRI projects can support the advancement of a transportation system consistent with the vision of the region.

SUMMARY OF METHODS

GOAL | TRANSPORTATION

To provide and promote a safe, reliable, and multi-modal transportation system.

OBJECTIVE TR1 – Improve safety and eliminate hazards for all users of Cape Cod's transportation system

METHODS

All DRIs must employ the following methods to meet Objective TR1:

- Prepare an appropriate Transportation Impact Assessment (TIA). (see page TR-22)
- Apply good access management principles in site and driveway design. (see page TR-9)
- Locate driveways to provide acceptable sight distance and locate signs, vegetation, lighting, and other fixed objects in manner that avoid creating sight distance obstructions. (see page TR-10)
- Provide safe pedestrian connections throughout the site and, where practical, to adjacent sites. (see page TR-10 and page TR-13)
- For projects anticipated to generate 50 or more peak hour trips, present a detailed analysis of off-site safety impacts of the development at Study Area locations (defined on page TR-23) and implement appropriate safety improvements. (see page TR-11)

OBJECTIVE TR2 – Provide and promote a balanced and efficient transportation system that includes healthy transportation options and appropriate connections for all users

METHODS

All DRIs must employ the following methods to meet Objective TR2:

- Housing and employment sites should implement Transportation Demand Management (TDM) best practices. (see page TR-14)
- For employment sites, with 25 or more employees, develop and implement a site-specific TDM Plan. (see page TR-14)

Where feasible:

- Provide appropriate rights-of-way along the street frontage and/or across the property to accommodate current and future pedestrian, bicycle, and transit needs.

Where feasible and appropriate:

- Construct sidewalks, multi-use paths, and/or bicycle/pedestrian connections along or across the site with connections out to the existing pedestrian and bicycling network (see criteria on page TR-14).

OBJECTIVE TR2 AREAS OF EMPHASIS BY PLACETYPE

Natural Areas and Rural Development Areas | Implement TDM. Preserve the natural, scenic, and cultural resources. Improvements should be recommended where they enhance protection of, improve non-vehicular access to, and do not adversely impact these resources

Suburban Development Areas | Implement TDM. Address gaps in the pedestrian network while reinforcing the desirable character elements of the area.

Historic Areas and Maritime Areas | Implement TDM. Reinforce the desirable character elements of the area while addressing gaps in the pedestrian network.

Community Activity Centers | Implement TDM. Address gaps in the pedestrian network while reinforcing the desirable character elements of the area.

Industrial Activity Centers and Military and Transportation Areas | Implement TDM. Minimize conflicts between motorists and non-motorists.

OBJECTIVE TR3 – Provide an efficient and reliable transportation system that will serve the current and future needs of the region and its people

METHODS

All DRIs must employ the following methods to meet Objective TR3:

- Provide for full mitigation of congestion impacts on the transportation system through a combination of trip reduction measures, physical congestion mitigation, and, as appropriate, congestion mitigation payments commensurate with the development's congestion impact. (see page TR-16)
- For projects anticipated to generate 100 or more peak hour trips, provide a detailed analysis of off-site congestion impacts and of any proposed physical congestion mitigation. (see page TR-16)

OBJECTIVE TR3 AREAS OF EMPHASIS BY PLACETYPE

Natural Areas and Rural Development Areas | Implement trip reduction measures and mitigate remaining congestion impacts through congestion mitigation payments. Physical improvements may be appropriate where they enhance compatible access to natural, scenic, and cultural resources and do not adversely impact these resources.

Suburban Development Areas | Address congestion impacts within the study area through compatible physical improvements. Impacts beyond the study area may be mitigated through congestion mitigation payments.

Historic Areas and Maritime Areas | Implement trip reduction measures and mitigate remaining congestion impacts through congestion mitigation payments. Physical improvements may be appropriate where they enhance compatible access to natural, scenic, and cultural resources and do not adversely impact these resources.

Community Activity Centers, Industrial Activity Centers, and Military and Transportation Areas | Address congestion impacts within the study area through physical improvements. Impacts beyond the study area may be mitigated through congestion mitigation payments.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE TR1

Objective TR1 *– To improve safety and eliminate hazards for all users of Cape Cod's transportation system*

Detail on the methods for meeting Objective TR1 is provided below.

Access Management

Access management is the coordinated planning, regulation, and design of access between roadways and land development. It involves the systematic control of the location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway, as well as roadway design applications that affect access, such as median treatments and auxiliary lanes, and the appropriate separation of traffic signals. (Transportation Research Board. *Access Management Manual*.) Good access management principles balance land access and traffic mobility needs based on the type of roadway, specifically the functional classification of the roadway.

The design and location of driveways directly affects traffic operations on the mainline roadway. The spacing of adjacent and opposing driveways, and the spacing of driveways relative to road intersections, influences crash potential.

Good access management principles should be applied to the greatest extent feasible given site constraints. Where feasible, this would include:

- Prohibiting turn-movements that present a hazard through physical means (ex. median installation, channelizing islands in the driveway);
- Limiting the total number of driveways;
- Sharing access with existing driveways instead of creating a new driveway;
- Limiting access and egress to the lower volume roadway when the site has frontage on more than one roadway; and
- Allowing for and, where feasible, constructing interconnections with adjacent properties.

The applicant should seek early coordination with Cape Cod Commission staff to ensure that good access management practices are being followed in the proposed project.

Driveway Location and Design

The location and design of site driveways impact the safety of those accessing the site as well as of users of the adjacent transportation network.

The site driveway should be located to avoid the creation or intensification of a hazard. Acceptable sight distance, as defined by the latest edition of the *American Association of State Highway and Transportation Officials (AASHTO) A Policy on Geometric Design of Highways and Streets*, should be met and maintained at all driveways. Furthermore, human-made sight-distance obstructions such as signage, utility poles and boxes, vegetation, and lighting must be located to avoid visual obstructions as to not negatively impact motorist or non-motorist safety.

Excessively wide curb cuts present a hazard to pedestrians by extending the pedestrian crossing distance thereby increasing exposure. Excessive driveway corner radii also present a hazard to pedestrians by allowing for higher vehicle turning speeds. Driveway width and driveway corner radii should be no larger than needed to accommodate vehicles anticipated to use the site. The *National Association of City Transportation Officials (NACTO) Urban Streets Design Guide* presents a discussion of appropriate corner radii for a variety of conditions.

Driveway travel lanes should not exceed 11 feet per travel lane unless required by local or state design standards. Driveways with a throat width exceeding 22 feet should include a center pedestrian refuge island, where appropriate.

Site Design

Good site design accommodates all roadway users including pedestrians, bicyclists, and motorists in a safe manner. Conflicts between motorists and non-motorists should be minimized and, where possible, eliminated, through the provision of appropriate sidewalks, crosswalks, curb ramps, and bicycle accommodation. Safe pedestrian connections should be provided throughout the site.

Pedestrian and bicyclist facilities should be safe, convenient, and attractive to encourage frequent use. Federal and state law require that all facilities that allow for

use by the public must be compliant with all applicable Americans with Disabilities Act (ADA) and Massachusetts Architectural Access Board (AAB) requirements. Amenities such as bicycle racks, benches, and bus shelters should be incorporated where appropriate.

A more detailed discussion of site design can be found within the Community Design section of the RPP Technical Bulletin.

Off-Site Safety Impacts and Mitigation

A project may impact transportation safety beyond the site driveway. Regardless of the size or nature of the development, developments should not degrade safety for pedestrians, bicyclists, or motor vehicle operators or passengers.

The applicant should identify safety impacts of the development and implement appropriate safety improvements at all Study Area locations. Study Area locations should include, at a minimum, all regional road links, all intersections of regional roads, and all local road intersections with regional roads that are used by a project for access to the regional road network, where the project is expected to increase traffic by 25 or more trips during the project's peak hour. Additional Study Area locations, identified in consultation with Cape Cod Commission staff, town officials, and, as appropriate, the Massachusetts Department of Transportation (MassDOT), may be required.

A Study Area location is considered a high crash location if, over the most recent five (5) years on record, the location averaged of three (3) or more crashes per year or exhibited a crash rate higher than regional average crash rate. The regional average crash rate should be based on Massachusetts Department of Transportation District 5 average crash rates for signalized intersections, unsignalized intersections, and roadway segments (by functional classification).

To allow the Commission to consider potential safety impacts and appropriate safety mitigation, the Applicant must provide:

- A table and map with number of crashes occurring at each Study Area location (roadway segment and intersection) over the most recent five (5) years on record with the Massachusetts Department of Transportation Registry of Motor Vehicles.

- A collision diagram and crash data summary table for each high crash locations based on crash reports obtained from the local police department and, as appropriate, the Massachusetts State Police.
- Crash analysis for all high crash locations identifying potential safety issues at each location and any potential safety impacts attributable to the proposed project.
- A summary of proposed safety mitigation.

Overall, this analysis must demonstrate that, with the proposed safety mitigation, the development will not degrade safety for pedestrians, bicyclists, or motor vehicle operators or passengers.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE TR2

Objective TR2 *– Provide and promote a balanced and efficient transportation system that includes healthy transportation options and appropriate connections for all users*

Detail on the methods for meeting Objective TR2 is provided below.

Healthy Transportation Approach

Supporting healthy transportation options involves decisions about the site and amenities on the site that support the individuals who wish to use healthy transportation modes to access the site.

To the extent feasible, the following site design features and amenities should be included in all projects:

- Sidewalk connections to all buildings
- Safe crossing treatments at all driveway and parking lot crossings
- Conveniently located bicycle racks

Supporting healthy transportation options also involves supporting and providing connections to the region's pedestrian, bicycle, and transit networks.

The region's sidewalk network on Cape Cod has been built out over time. Further development of this network will require a cooperative, coordinated approach with both public and private partners.

In support of further development of the region's sidewalk network, the applicant should provide appropriate rights-of-way along the street frontage and/or across the site to accommodate expected needs for pedestrian, bicycle, and transit accommodation.

Furthermore, where deemed appropriate by the Commission, the applicant should construct sidewalks, multi-use paths, and/or bicycle/pedestrian connections along or across the site.

Where gaps between on-site pedestrian accommodations and the region's sidewalk network exist, extending sidewalks beyond the site may be required to ensure safe

pedestrian access. In determining whether to require construction of sidewalks, multi-use paths and/or bicycle/pedestrian connections along or across the site with connections out to the existing pedestrian and bicycling network, the Cape Cod Commission will consider the extent to which the improvement is necessary to meet Objective TR2 and consider the following factors:

- The location of the project;
- The nature and scale of the project;
- Any constraints to project implementation;
- The anticipated cost of the potential improvement; and
- The anticipated benefit of the potential improvement.

Transportation Demand Management (TDM): Best Practices

Transportation Demand Management (TDM) is a combination of strategies employed to reduce single-occupancy vehicle trips to and from a site. The effectiveness of any strategy, or combination of strategies, depends on the type of land use proposed, proximity to existing transit corridors, walking and bicycling characteristics of the area, and other factors. In all cases, applicants are encouraged to identify and evaluate strategies that are appropriate for the project. Sources of data should be identified, and methods used should be justified.

Sites with fewer than 25 employees or sites that include residential units may consider adopting industry standard TDM Best Practices rather than developing a site-specific TDM plan. Cape Cod Commission staff and MassRIDES staff can provide these TDM best practices. Typical TDM Best Practice measures include:

- Posting of carpool brochures on-site and online
- Posting of transit schedules on-site and online
- Carpool parking spaces
- Bicycle storage
- On-site services such as an employee lunch room
- Enroll in the MassRIDES employer program

Site-Specific TDM Plans

Projects with more than 25 employees are strongly encouraged to develop a site-specific TDM plan. This TDM plan would build on the TDM Best Practices with additional strategies appropriate for larger employers such as:

- On-site Transportation coordinator
- Trip reduction monitoring program
- Showers and changing facilities for pedestrian and bicyclists
- Arrange employee work hours to match transit schedules
- Compressed work weeks
- Flexible work hours for ridesharers
- Delivery services
- Provide/subsidize vans for vanpoolers
- "Guaranteed ride home" program (company car, rental car, cab, designated driver)
- Subsidize transit passes
- Incentives and allowances for using modes of transportation other than a single-occupancy vehicle

Cape Cod Commission staff and MassRIDES staff are available as resources when considering elements of an appropriate TDM plan.

More information on MassRIDES is available at https://commute.com/.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE TR3

Objective TR3 *– Provide an efficient and reliable transportation system that will serve the current and future needs of the region and its people*

Detail on the methods for meeting Objective TR3 is provided below.

Congestion Mitigation Approaches

DRIs are required to provide for full mitigation of congestion impacts on the transportation system through a combination of trip reduction measures, physical congestion mitigation, and, as appropriate, congestion mitigation payments commensurate with the development's congestion impact. The Cape Cod Commission will consider the following factors in determining if the congestion mitigation approach proposed for a DRI meets Objective TR3:

- The location of the project;
- The nature and scale of the congestion impacts of the project;
- The anticipated effectiveness of any trip reduction measures that are being proposed;
- The anticipated cost and congestion benefit of any physical off-site improvements that are being proposed; and
- Whether a congestion mitigation payment can be effectively utilized to offset the anticipated congestion impacts of the project.

Congestion Mitigation through Trip Reduction Measures

Reducing the number of vehicle trips to and from the site reduces the congestion impacts of the project. This can be achieved through means such as, appropriate siting of developments, providing a mix of uses on the site, the promotion of healthy transportation options, and the implementation of Transportation Demand Management measures. The anticipated success of these trip reduction measures should be based on standard industry practice and any sources should be clearly cited.

Net congestion impacts can be further reduced by the donation and protection, through a development restriction pursuant to MGL, Chapter 184, of land in excess of open space mitigation otherwise required by the RPP. Where credit for the donation

and protection of land is proposed by the Applicant and deemed appropriate by the Commission, at a minimum, the land proposed for credit must:

- Be permanently protected through fee simple donation to a conservation entity such as a town conservation commission or an appropriate non-profit land trust, or through the grant and imposition of a development restriction pursuant to MGL, Chapter 184. The method of protection must extinguish future development potential on the land proposed for credit;
    - For developed land:
        - The trip reduction credit should be based on traffic counts at the existing site, ITE trip generation data for the existing land use, or, at the discretion of Cape Cod Commission staff, ITE trip generation data for the same land use and trip generation values/formulas as the proposed DRI project.
    - For vacant land:
        - The land must include the entirety of individual, buildable lot(s);
        - The land must be buildable, having the minimum lot area and minimum (actual and legal) lot frontage required under local zoning and subdivision law;
        - The land should meet the zoning requirements in effect including allowed use and bulk/dimensional requirements such as minimum yard setbacks, maximum building/lot coverage, and maximum building height;
        - The trip reduction credit should be based on trip generation data for the same land use and trip generation values/formulas as the proposed DRI project; and,
        - A preliminary sketch of the potential site development on the credit land, supporting the credit requested, shall be included with the DRI application materials.

Physical Congestion Mitigation

Where physical congestion mitigation is proposed by the Applicant and deemed appropriate by the Commission, it should be designed to accommodate the Estimated Annual 30th Highest Hour Volume during Build Conditions with appropriate Level of Service (LOS). Cape Cod Commission staff should be consulted to determine the appropriate adjustment factors to calculate the Estimated Annual 30th Highest Hour

Volume for the location(s) proposed to be improved. Physical congestion mitigation must:

- Safely accommodate all road users;
- Result in a Build Condition operation that must be no worse than the No-Build Condition operation (as measured by LOS, delay, and queue length);
- Be in accordance with the access requirements, standards, and policies of the applicable state, regional, and/or local jurisdiction; and
- Not degrade historic resources, historic character, community character, scenic resources, and/or natural resources.

Where physical improvements enhance access to natural, scenic, and cultural resources it should be compatible to these resources. The improvement should not significantly change a roadway layout in a way that detracts from its character. Furthermore, the physical improvement should not increase the access or roadway capacity to a level that the resource cannot reasonably accommodate. Improvements that are considered compatible access may increase the ability of the public to access natural, scenic, and cultural resources through lower impact approaches such as transit or remote parking where appropriate and not in excess.

If a new signal is proposed, a roundabout feasibility analysis should also be evaluated. The most appropriate form of traffic control should be implemented.

The cost for improvements that benefit only vehicles accessing the proposed project site should not be considered congestion mitigation. Examples include acceleration and deceleration lanes for new site access points, new left turn lanes which only provide access to the site, and new traffic signals located at the applicant's driveway(s). Where benefits of the improvement are utilized by vehicles accessing the proposed project site and other roadways users, a fair share proportion of the improvements benefiting other roadway users may be included as congestion mitigation.

The total cost of proposed physical mitigation should be clearly set out in the DRI application material.

Fair Share Congestion Mitigation Payment

At the discretion of the Commission, an Applicant may mitigate congestion impacts at specific Study Area locations using a Fair Share Payment as a substitute for physical mitigation.

FAIR SHARE PAYMENT CALCULATIONS

Where a Fair Share Congestion Mitigation Payment is proposed by the Applicant and deemed appropriate by the Commission for a Study Area location, it must be calculated based on the estimated costs of a capacity increase in traffic generation apportioned to and occasioned by the project as follows:

1. Determine the *Capacity With Mitigation* and the *Capacity Without Mitigation.* In this context, capacity is defined as the maximum traffic volume possible with LOS E. When more than one measure of LOS is possible at a location, such as the various movements at an unsignalized intersection, then the most sensitive measure, i.e., any one movement operating at LOS E/F, is the movement used to determine the capacity. Traffic volumes for all movements should be factored by a constant so that all movements will remain a fixed percentage of the total volume at the location. The sum of the volumes of all movements is the Capacity for that scenario. *Capacity Without Mitigation* will be that of the given Location's existing geometric configuration under prevailing traffic conditions (such as peak hour factor, vehicle mix, and other assumptions consistent with the pattern of existing traffic and projected traffic growth) combined with DRI traffic (and then factored to meet the LOS E maximum volumes). *Capacity With Mitigation* will be that of the given Location's proposed (mitigated) configuration under prevailing traffic conditions, given the pattern of existing traffic and projected traffic growth combined with DRI traffic (and then factored to meet the LOS E maximum volumes).
2. Calculate the *Capacity Addition* by subtracting *Capacity Without Mitigation* from the *Capacity With Mitigation***,** as reflected in the following formula:

   Capacity Addition = Capacity With Mitigation - Capacity Without Mitigation

3. Calculate the *Fair Share Proportion* as the *DRI Traffic* divided by the *Capacity Addition,* as reflected in the following formula:

   Fair Share Proportion = DRI Traffic / Capacity Addition

4. Calculate *Mitigation Cost* to public agency(ies) that would be implementing transportation improvement. This cost should be based on costs of similar projects

constructed within the MassDOT District 5 or from current estimated unit costs provided by MassDOT.

5. Calculate the *Fair Share* as the *Fair Share Proportion* times the *Mitigation Cost*, as reflected in the following formula:

$$Fair\ Share = Fair\ Share\ Proportion \times Mitigation\ Cost$$

6. Calculate the *Fair Share Contribution* at each location as the *Fair Share* at each location less the estimated value of Physical Mitigation performed at the expense of the Applicant. The Fair Share Contribution should likewise be reduced by the amount, if any, which is assessed in other agencies' transportation impact fees and the transportation portion of municipalities' local impact fees which are directly related to the specific location.

$$Fair\ Share\ Contribution = Fair\ Share - (Value\ of\ Physical\ Mitigation + Transportation\ Impact\ Fees\ assessed\ by\ other\ agencies)$$

The total *Fair Share Congestion Mitigation Payment* is equal to the sum of the applicant's *Fair Share Contributions* at all locations as reflected in the following formula:

$$Fair\ Share\ Congestion\ Mitigation\ Payment = Sum\ of\ all\ Locations'\ Fair\ Share\ Contribution$$

Fair share mitigation payments may not be used to address safety impacts.

VEHICLE MILES TRAVELED (VMT) CONGESTION MITIGATION PAYMENT

At the discretion of the Commission, an applicant may propose to mitigate some or all congestion impacts of a DRI project using a location-based, Vehicle-Miles-Traveled (VMT) Congestion Mitigation approach. The VMT Congestion Mitigation payment analysis varies based on the location of the proposed project. Projects located in a way that minimizes the burden on the existing transportation network will have a lower calculated VMT Congestion Mitigation payment.

Where a Vehicle Miles Traveled (VMT) Congestion Mitigation Payment is proposed by the Applicant and deemed appropriate by the Commission, the Payment should be based on workbooks for calculating VMT Congestion Mitigation payments available on the Cape Cod Commission's website www.capecodcommission.org or another method deemed acceptable by the Commission. This Workbook will be updated by Cape Cod

Commission staff periodically as new cost data and analysis parameters become available.

If the impact area extends beyond the boundaries of the town in which the development is being proposed, the applicant should present an analysis of the relative impacts in each town to allow such funds to be divided between towns based on the development's impact area.

GENERAL APPLICATION REQUIREMENTS (TRANSPORTATION IMPACT ASSESSMENT ELEMENTS)

Applicants are encouraged to reach out to Cape Cod Commission staff early in the application preparation process to discuss application materials necessary to demonstrate that the project meets the applicable goals and objectives. The application materials are generally presented in the form of a Transportation Impact Assessment (TIA). The scope of a TIA is largely informed by the scale of the potential impact to the transportation system as approximated by the anticipated peak hour trips generated by the project. It is recommended that Applicants submit, in the form of a letter to Cape Cod Commission staff, a draft TIA scope, including the identification of the Study Area, prior to formal application submission. Cape Cod Commission staff will respond to such a letter with recommendations on the appropriateness of the proposed scope. TIA scoping recommendations will be determined on a case-by-case basis based on the location, context (as defined by the Placetype of the location), nature, and other characteristics of a project. Typical TIA elements recommended for inclusion based on the scale of the project are presented below.

Transportation Impact Assessment (TIA) Framework	< = 50 Anticipated Peak Hour Trips*	> 50 Anticipated Peak Hour Trips*	> 100 Anticipated Peak Hour Trips*
A. Project description	x	x	x
B. Trip generation analysis	x	x	x
C. Detailed multi-modal site plan	x	x	x
D. Driveway safety analysis	x	x	x
E. Off-site safety analysis**		x	x
F. Trip reduction analysis***			x
G. Off-site congestion analysis			x
Appendices	As needed	As needed	As needed

*Proposed trips minus existing trips (see page 24)

**Required for Study Area locations where the project is expected to increase traffic by 25 or more trips during the project's peak hour. This criterion is typically only met for projects anticipated to generate 50 or more peak hour trip.

***Required if credits for trip reduction measures are proposed.

The TIA elements are described in more detail in the following section.

A. Project Description

1. Locus Map – Provide a map including regional roadways and town boundaries to provide a regional context.
2. Study Area Map – Provide a map identifying all Study Area locations (roadway segments and intersections) to be analyzed in the TIA. Study Area locations should include, at a minimum, all regional road links, all intersections of regional roads, and all local road intersections with regional roads that are used by a project for access to the regional road network, where the project is expected to increase traffic by 25 or more trips during the project's peak hour. Additional Study Area locations, identified in consultation with Cape Cod Commission staff, town officials, and, as appropriate, the Massachusetts Department of Transportation (MassDOT), may be required.
3. Site Access and Context Map – Provide a map showing site access and all properties and their driveways within 500 feet of the project site. This map should also include property lines, roadway layouts, any driveway interconnects to other properties, and the approximate size of nearby developments.
4. Roadway Network – Describe and provide a map of all the Study Area roadways and intersections indicating jurisdictional responsibilities of each roadway link within the study area.
5. Multi-modal Network – Describe and provide a map of all pedestrian, bicycle, and transit accommodations within the Study Area not already detailed in the description of the Roadway Network.
6. Traffic Volumes – Provide a table and map with Existing Conditions Peak Season and Average Season average weekday daily, AM peak hour, and PM peak hour volumes at all Study Area locations. Saturday daily and peak conditions should also be included for retail developments or other high weekend traffic generators.

   The base year of Existing Conditions Analysis is the year in which the project has been referred for DRI review or filed a Development Agreement application. Actual count volumes that are factored to base year levels should be no greater than two (2) calendar years old prior to the base year.

   Non-peak season traffic counts should be adjusted using Seasonal adjustment factors from the most recent edition of the Cape Cod Commission's Traffic

Counting Report for Cape Cod or, as approved by Cape Cod Commission staff, adjustment factors based on local traffic data. Any adjustment factors or growth rates used should be cited and referenced.

B. Trip Generation Analysis

1. Trip Generation – Trip generation calculations should be based on the unadjusted rates for the particular land use code(s) applicable to the project from the most recent edition of the *Trip Generation Manual,* using methodologies described in the *Trip Generation Handbook*, both published by Institute of Transportation Engineers (ITE). Trip generation calculations should be developed using the "fitted curve" equations when statistically appropriate as determined by the methodologies in the Manual and Handbook. Trip generation calculations should be based on square footage in the case of most commercial development and on the number of dwelling units in the case of most residential development. For peak hour analyses, the "Peak of Generator" trip generation should be used.

   A Local Trip Generation Study may be accepted as the nature of the project warrants. Any Local Trip Generation Study should meet, at a minimum, the ITE guidelines for local trip generation studies as detailed in the most recent edition of the ITE Trip Generation Handbook. This includes the provision that data from at least (3) three facilities similar to the project be included in the analysis.

2. Credits for Existing Development – Credits for existing development should be based on the estimated annual average daily and peak-hour trip generation of the immediate prior use on the site based on the standard trip generation approach, a Local Trip Generation Study, or actual counts from the site as determined in consultation with Cape Cod Commission staff. Outside of Community Activity Centers and Industrial Activity Centers credits for existing development shall not be allowed if the previous use has been discontinued or vacated for five or more consecutive years. The difference in trip generation between existing and proposed development on site will serve as the basis for TIA analysis.

3. Multi-Use Developments – In some multi-use developments, land use interactions may reduce overall trip generation. All trip generation reductions suggested by the applicant resulting from multi-use development should be clearly documented, based on the methods outlined in the most recent version of the *ITE Trip Generation Handbook* , or other best practices as may be approved by Commission staff.

4. Heavy Vehicle Traffic – An estimate of heavy vehicle traffic to/from the site under Build conditions should be included as appropriate.

5. Trip Generation Adjustments – The order in which the various adjustments to trip generation are to be computed is as follows:
    a. Unadjusted trip generation (Weekday, AM peak hour of generator, PM peak hour of generator, Saturday, Saturday peak hour of generator, Sunday, Sunday peak hour of generator, as applicable);
    b. Interconnection reduction credit may be applied for DRIs that allow for site traffic to travel conveniently and safely to adjacent properties without traveling on or crossing a public way or that allow for mixed-use development that minimizes dependence on automobile travel. The credit should be a 10-percent reduction apportioned between the two properties or, if greater, a traffic credit as outlined in the latest edition of the Institute of Transportation Engineers Trip Generation Handbook, or another acceptable methodology subject to Commission approval;
    c. Trip reduction credits; and
    d. Pass-by reduction (if applicable) based on the most recent data from ITE.
6. Trip Distribution Analysis – All generated vehicle trips to/from the site through all access points are to be documented, including the following trip types:
    a. Primary – type of trip in which the purpose of the trip is travel exclusively to the proposed development site.
    b. Pass-By – type of trip directly from the traffic stream passing the proposed development site on the adjacent street system, not requiring a diversion from the primary route.

    Certain projects may be eligible to reduce their anticipated trip generation through pass-by trip reductions. The amount of pass-by trips associated with the applicable land uses should be based on the most recent data from ITE.

    Land uses eligible for pass-by trip reductions are:

    - Retail, banks, supermarkets, hardware stores, convenience stores, fast-food and high-turnover restaurants, gas stations, retail building material stores (provided a majority of the business sales are to retail, not wholesale, customers), and pharmacy/drug stores.

    Land uses not eligible for pass-by trip reductions are:

- Residential, medical and dental offices and clinics, hospitals, churches, schools, offices, libraries, industrial, manufacturing, warehousing, self-storage, automotive sales and services, theatres, golf courses and driving ranges, arenas, athletic facilities and fields, gyms, casinos, bowling alleys, recreational facilities, and night clubs.

Notwithstanding the above, Cape Cod Commission staff may make further determinations as to the applicability/eligibility and amount of pass-by trip reductions to particular land uses as the nature of a project warrants, including determinations as to land uses not appearing in the lists above.

7. Trip Generation and Distribution Summary – A graphical or tabular summary of trip distribution and trip generation outlining trips to and from the project site should be submitted.

C. Detailed Multi-modal Site Plan

1. Vehicle, Pedestrian, Bicycle, and Transit Users Accommodation – A narrative description of how site and driveway design will accommodate all potential users including motorists, bicyclists, pedestrians, and other non-motorists should reference plans included in the DRI application materials.
2. Connections to the Regional Systems – A narrative description of how site and driveway design connect to the region's pedestrian and bicyclist network.

D. Driveway Safety Analysis

1. Access Management Discussion– A narrative description of the access management approach employed in site design and how it meets current industry best practices to the greatest extent feasible given any unavoidable site constraints.
2. Sight Distance Analysis – Measurements of available sight distance should be taken at all existing and proposed project site access/egress locations. Sight distance requirements should be determined according to the most recent *A Policy on Geometric Design of Highways and Streets* published by the American Association of State Highway and Transportation Officials (AASHTO).

E. Off-Site Safety Analysis

1. Crash History and Analysis – Provide a table and map with number of crashes occurring at each Study Area location (roadway segment and intersection) over the most recent five (5) years on record with the Massachusetts Registry of Motor Vehicles.

   A collision diagram and crash data summary table should be prepared for these high crash locations based on crash reports obtained from the local police

department and, as appropriate, the Massachusetts State Police.

Crash analysis for all high crash locations should include identification of potential safety issues at the location. Crash analysis should also identify any potential safety impacts attributable to a proposed project as they must be mitigated as required by the RPP. See page 11 of the Technical Bulletin for guidance on mitigating safety impacts.

2. Safety Impacts – Identify the anticipated safety impacts of the proposed development at each Study Area location
3. Safety Mitigation Analysis and Summary – Provide a summary of the safety analysis and proposed safety

F. Trip Reduction Analysis

1. Proposed Trip Reduction Measures – Identify proposed trip reduction measures. See page TR-14 of the Technical Bulletin for discussion on trip reduction methods.
2. Trip Reduction Credit Estimation – The anticipated success of these trip reduction measures should be clearly documented and based on standard industry practice.

G. Off-Site Congestion Analysis

1. Current and Future Traffic Volumes – The Future No-Build and Future Build conditions should be graphically shown for the AM peak hour of generator, PM peak hour of generator, and if applicable, Saturday and Sunday peak hour of generator for the peak season and average season. Future conditions should cover a seven-year time horizon as a minimum. This seven-year horizon should be from the Base Year as previously defined.
    a. A graphical summary should be submitted showing the seven-year Future No-Build traffic volumes. Background baseline traffic growth should be included in future year background volumes. The traffic assignment for all other anticipated developments with the potential to impact Study Area locations should be combined with future year background volumes to develop the Future No-Build traffic volumes. Other anticipated developments are those permitted, licensed or approved; those having applied for permits, licenses or approvals; or those pending permits, licenses or approvals from state agencies, the Commission, and/or municipal governments within, at a minimum, the most recent prior seven-year period.

b. A graphical summary of project-generated trips on regional roadway links and intersections after adjustments should be submitted.

c. The traffic assignment for the project should then be added to the Future No-Build volumes to generate Future Build volumes.

2. Current and Future Conditions Level of Service (LOS) Analysis – Existing Conditions LOS should be computed for the roadway network including site driveways, site access links and intersections (if appropriate), and all regional roadway elements (including roadway links, intersections, U-Turns, rotaries, roundabouts, interchanges, bridges, and the like). LOS analysis should include: delay, volume to capacity (v/c) ratio, queue length, and, as applicable, heavy vehicle percentages, travel time, weave, merge, and diverge analyses. These analyses should be performed using the most recent Highway Capacity Manual and any updates published by the Transportation Research Board. Computer software programs used for LOS analysis should be approved in the most recent version of *A Guide on Traffic Analysis Tools* published by the Massachusetts Department of Transportation, or superseding publication. Software printouts for any traffic analysis results referenced should be provided and should include assumptions, inputs, and results.

   LOS analysis should be provided for both Peak Season conditions as well as Average Season conditions. The Cape Cod Commission may also request examining a specific peak hour depending on the type of development and location. Generally, it is the hour during which the development has the greatest number of trips in and out (also called the "Peak of Generator") which should be analyzed. Performance indicators such as volume to capacity ratio (v/c ratio) and delay should be reported regardless of value (e.g., v/c ratios greater than as well as less than 1.0, and seconds of delay greater than as well as less than 80 should be presented).

   LOS should be computed under Future No-Build and Build conditions, without and with proposed mitigation measures in place, for the peak and average season. LOS analysis should include: delay, volume to capacity (v/c) ratio, queue length, and, as applicable, heavy vehicle use percentages, travel time, weave, merge, and diverge analyses. The analysis should cover all regional roadway elements, site driveway intersections, and any intervening roadways between the development and the regional roadway access.

3. Congestion Mitigation Analysis and Summary –
    a. Mitigation Actions – These should be clearly identified along with the anticipated future year performance under Future Build conditions, as evidenced by performance indicators such as delay, v/c ratios, and queue lengths. Mitigation improvements should address safety-related impacts at high crash locations as identified during the DRI review process.
    b. Mitigation Analysis – Analyses of all mitigation measures should be computed as outlined on page 17 to page 19. A roundabout analysis should be conducted at any intersection where a new traffic signal is proposed. Impacts on wetlands, archaeological resources, right-of-way availability, historic resources, scenic resources, community character, or other issue areas in the RPP should be identified and quantified.
    c. Proposed Mitigation – The analysis should clearly identify the total cost and timing of the proposed mitigation improvements, including costs and timing associated with any specific phase or part thereof. Cape Cod Commission staff should be consulted to develop an estimate of operations and maintenance costs for signals that will be given over to town jurisdiction. Cape Cod Commission staff should be consulted to develop estimates of costs for the purchase, installation, operations, and maintenance of automated traffic counting equipment. Conceptual improvement plans should be developed showing the recommended proposed improvements. The proposed improvements should be clearly shown in relation to the existing right-of-way, including:
        i. Scaled plan showing existing and proposed right-of-way layout lines;
        ii. Proposed roadway geometric changes and widening (storage lanes, acceleration/deceleration lanes); and
        iii. Proposed intersection improvements, signalization, and/or signal improvements including conceptual phasing and timing.
    d. Mitigation Payments – Congestion Mitigation methodology using a Fair Share or Vehicle Miles Traveled Congestion mitigation approach are detailed on page 19 and page 20, respectively.

Appendices

1. Recorded Traffic Counts
    a. Turning movement counts, including heavy vehicles
    b. Directional volume counts

   c. Existing AM/PM peak period and 24-hour traffic volumes including Peak Hour Factors by approach
   d. Future year peak hour traffic volumes
   e. Adjustment factors and sources
2. Crash Analysis Supplements
   a. Tabular crash data for all study area intersections
   b. Collision diagram and crash data summary for all high crash locations (if not included elsewhere in the TIA)
   c. Supplemental analysis or references to support the effectiveness of proposed safety mitigation countermeasures as appropriate
3. LOS Analysis Data
   a. Lane geometry
   b. Assumed signal phasing and timing
   c. Assumed saturation flow rates
   d. All worksheets or computer outputs
4. ITE Land Use Code Sheets – or other summary sheets showing trip generation calculations
5. ITE Multi-use Development, or other approved Trip Reduction Estimate Sheets
6. Signal Warrant Analysis Sheets

REFERENCES AND RESOURCES

References

1. American Association of State Highway and Transportation Officials (AASHTO). *A Policy on Geometric Design of Highways and Streets*. Most recent edition.
2. Cape Cod Commission. *Cape Cod Regional Policy Plan*. Most recent edition.
3. Cape Cod Commission. *Complete Streets/Living Streets: A Design Manual for Cape Cod*. Most recent edition.
4. Cape Cod Commission. *Traffic Counting Report for Cape Cod*. Most recent edition.
5. Federal Highway Administration. *Manual on Uniform Traffic Control Devices Handbook* (MUTCD including the Massachusetts Amendments). Most recent edition.
6. Institute of Transportation Engineers (ITE). *Parking Generation*. Most recent edition.
7. Institute of Transportation Engineers (ITE). *Trip Generation*. Most recent edition.
8. Institute of Transportation Engineers (ITE). *Trip Generation Handbook*. Most recent edition.
9. Massachusetts Department of Transportation (MassDOT, formerly Massachusetts Highway Department) *Massachusetts Highway Department Project Development & Design Guide*. Most recent edition or superseding publication.
10. National Association of City Transportation Officials (NACTO). *Urban Street Deign Guide*. Most recent edition.
11. Transportation Research Board (TRB), National Academies of Sciences, Engineering, and Medicine. *Access Management Manual*. Most recent edition
12. Transportation Research Board (TRB), National Academies of Sciences, Engineering, and Medicine. *Highway Capacity Manual*. Most recent edition.

Mapping Resources

1. Regional Policy Plan Data Viewer
2. Massachusetts Department of Transportation (MassDOT) Crash Portal available at: https://services.massdot.state.ma.us/crashportal/CrashMapPage.aspx
3. MassDOT Roadway Functional Classification Map available at: http://gis.massdot.state.ma.us/maptemplate/roadinventory/

Energy

This guidance is intended to clarify how the Energy Goal and Objectives of the Regional Policy Plan (RPP) are to be applied and interpreted in Cape Cod Commission Development of Regional Impact (DRI) project review. This technical bulletin presents specific methods by which a project can meet these goals and objectives.

Energy Goal: To provide an adequate, reliable, and diverse supply of energy to serve the communities and economies of Cape Cod.

- **Objective EN1** – *Support renewable energy development that is context-sensitive*
- **Objective EN2** – *Increase resiliency of energy generation and delivery*
- **Objective EN3** – *Minimize energy consumption through planning and design (including energy efficiency and conservation measures)*

The applicability and materiality of these goals and objectives to a project will be determined on a case-by-case basis considering a number of factors including the location, context (as defined by the Placetype of the location), scale, use, and other characteristics of a project.

THE ROLE OF CAPE COD PLACETYPES

The RPP incorporates *a framework for regional land use policies and regulations based on local form and context* as identified through categories of Placetypes found and desired on Cape Cod.

The Placetypes are determined in two ways: some are depicted on a map contained within the RPP Data Viewer located at www.capecodcommission.org/RPPDataViewer adopted by the Commission as part of the Technical Guidance for review of DRIs, which may be amended from time to time as land use patterns and regional land use priorities change, and the remainder are determined using the character descriptions set forth in Section 8 of the RPP and the Technical Guidance.

The project context, as defined by the Placetype of the location, provides the lens through which the Commission will review the project under the RPP. Additional detail can be found in the Cape Cod Placetypes section of the Technical Guidance.

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NOTE ON APPLICATION MATERIALS, DEFINITIONS, RESOURCES AND REFERENCES

Application materials should provide sufficient detail to demonstrate that the project meets the applicable Objectives, but typically include a project narrative, energy system documentation and specifications, and a detailed site plan. See guidance on page EN-14 for more information.

A list of references and resources are provided on page EN-15.

INTRODUCTION

Energy policy and regulation in Massachusetts originates and is largely administered and implemented at the state level. The Commonwealth's Energy Facilities Siting Board is the permitting authority for large scale energy generation, distribution and transmission projects, balancing the relative cost, reliability and environmental impacts in its siting and design review of such infrastructure.

Closely aligned with general energy policy and regulation, Massachusetts also has climate change regulation and policy, which promotes renewable energy sources, storage and greenhouse gas emissions reduction. State law also sets an energy storage target for electric distribution companies and the delivery of clean energy during seasonal peak hours. Massachusetts' Global Warming Solutions Act sets targets on greenhouse gas emissions reduction and contains directives to certain state agencies to act regarding renewable energy development and greenhouse gas emissions reduction. The Massachusetts Green Communities Act is companion legislation directed to municipalities in Massachusetts, which supports the state's overall climate change and clean energy approach. This legislation creates incentives for municipalities to adopt energy efficiency and conservation measures, promote renewable energy development and pursue greenhouse gas emissions reduction strategies.

Expected updates to the International Energy Conservation Code should be released in 2021. This update is expected to inform Commonwealth of Massachusetts Global Warming Solutions Act goals for the short and medium term going forward.

The Commission plays a distinct role in a complex network of energy policy and regulation. Regional energy policy under the RPP is intended to support and fit within the Commonwealth's established policy and regulatory framework (and the larger New England energy grid): it is not intended to be independent of the Commonwealth's approach, and the Commission cannot and does not implement state energy policy and regulation directly. Further, the Commission's regional energy policy considerations are broader than, though consistent with, the particular energy issues addressed in the context of its regulatory review for individual projects.

The primary purpose of the Energy Goal and Objectives in the RPP are to ensure an adequate, reliable, and diverse supply of energy to serve the communities and

economies of Cape Cod. Energy efficient design, conservation measures, and diverse energy sources, including renewable and alternative energies, support the availability and adequacy of supply. These strategies also mitigate the effects of climate change, important in a coastal region like Cape Cod that is especially susceptible to climate change impacts.

In Section 7 of the RPP, Coordinated Regional and Local Planning, Renewable Energy Planning and Development, the Commission states preference for energy generation projects that are not located on greenfield sites or in areas of potential natural resource or water resource impacts. The Commission's preference is for on-site renewable energy generation. In the future the Commission will develop specific guidance for the siting and design of on-site renewable energy systems.

Rapidly advancing building technologies have made the prospect of "Net Zero" building increasingly attainable. Zero energy certifications have been developed by organizations such as the US Green Building Council (USGBC), Passive House Institute US (PHIUS), US Department of Energy (DOE), and Residential Energy Services Network (RESNET). Many definitions of net zero have been developed, but all incorporate the basic concept that a building generates as much energy as it uses. Still, the World Green Building Council recognizes that in most situations, net zero energy buildings are not currently feasible. Therefore, they recommend that buildings that are energy efficient, and supply energy needs from renewable sources (on-site and/or off-site) is a more appropriate target for the mass scale required to achieve Paris Agreement levels of global emission reductions.

This Technical Guidance provides examples of various methods and strategies that DRI projects may use to satisfy the RPPs Energy Goal and Objectives. These methods or strategies deal generally with building and operational energy efficiency and conservation, renewable energy and energy storage, and the general provision of adequate and reliable energy infrastructure. The Commission recognizes that redevelopment projects have unique development considerations. The Energy Goal, Objectives, and methods apply over a wide array of development, according to the type of development or use proposed: from utility-scale energy infrastructure as a principal use, to building and other development projects where energy use is an ancillary design and operational consideration.

SUMMARY OF METHODS

GOAL | ENERGY

To provide an adequate, reliable, and diverse supply of energy to serve the communities and economies of Cape Cod.

OBJECTIVE EN1 – Support renewable energy development that is context-sensitive

METHODS

- Enter into a "Green" power purchase agreement; and/or,
- Incorporate on-site renewable energy generation or alternative energy use, including but not limited to: solar photovoltaic (PV), wind, solar thermal, geothermal, solar carport, fuel cells, the use of biofuels

Projects with energy generation, distribution, or storage as a primary purpose:

- Describe how the project incorporates renewable energy generation or supports Massachusetts' overall approach to a Clean Energy future
- Considerations in siting and design:
    - Minimize tree clearing/encourage the use of existing developed sites;
    - Adequately screen equipment from public view to avoid detrimental visual impacts;
    - Use non-toxic transformer and other fluids;
    - Locate in areas of similar and compatible types of use and development;
    - Provide stormwater management appropriate to scale of project.
    - For guidance on appropriate design and protocols related to proposed Wind Energy Conversion Facility projects, see Appendix "A."

OBJECTIVE EN2 – Increase resiliency of energy generation and delivery

METHODS

- Protect infrastructure by locating utilities underground;
- Manage for peak demand and power outages by incorporating energy storage technology, including but not limited to storage batteries or technology, emergency backup generator.

OBJECTIVE EN3 – Minimize energy consumption through planning and design (including energy efficiency and conservation measures)

METHODS

- Design to earn LEED Certification;
- Design to earn Energy Star® Certification;
- Net Zero Energy and Net Zero Energy Ready Building
- Incorporate building design elements, including but not limited to:
    - Perform a pre-development or redevelopment energy audit, incorporate recommendations to maximum extent practicable
    - Combined Heating and Power (CHP) system
    - Passive heating/cooling/lighting, including building orientation/solar exposure
    - Energy efficient lighting
    - Building envelope conservation measures
    - Green roof or cool (reflective) roof
    - Building design meets "Stretch Code"
    - Sub-metering per building unit
- Incorporate site design elements, including but not limited to:
    - Electric vehicle charging stations
    - Energy efficient lighting
    - Shade over paved areas using vegetation or structures
    - Provide open grid or permeable pavement
- Incorporate operational elements, including but not limited to:
    - Green vehicles for automobile fleets

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE EN1

Objective EN1 – *Support renewable energy development that is context-sensitive*

The purpose of Objective EN1 is to support an adequate and diverse supply of energy for and to Cape Cod. The following is a discussion of the methods that may be implemented to meet Objective EN1.

DRI Applicants may, in whole or in part, generate their own renewable power or incorporate alternative energy use, purchase renewable or alternative ("green") power from energy suppliers, or a combination of both.

Green Power Purchase

Under the Massachusetts Renewable Energy Portfolio Standard (RPS), for every megawatt hour (MWh) of electricity added to the New England electric grid from a renewable energy generator, a Renewable Energy Certificate (REC) is generated. These RECs are available for purchase, supporting the Commonwealth's goal to increase renewable energy generation. The Alternative Energy Portfolio Standard (APS) is a similar approach that focuses on the sale and purchase of renewable energy generated from alternative methods, such as biofuels, geothermal technology, or food waste, as examples. The sales and purchase of RECs claim a portion of the renewable energy generated regionally and added to the regional electric grid for use. Options for the purchase of renewable energy power may include a Power Purchase Agreement (PPA) or Net Metering Credit Purchase Agreement (NMA) with an electric utility provider or a third-party energy provider.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE EN2

Objective EN2 – *Increase resiliency of energy generation and delivery*

The purpose of Objective EN2 is to support the availability of an adequate and diverse supply of energy for and to Cape Cod. By increasing the energy resiliency of development, long-term energy savings, reduced impact on the environment, and less strain on the energy grid may be realized. Applicants are encouraged to propose alternate methods not listed below based on best practices for the type of project proposed, or as new technologies are developed and available. The following is a discussion of the methods that may be implemented to meet Objective EN2.

Underground Utilities

DRI Applicants may locate on-site utilities for development underground, except where the presence of natural features such as wetlands or archaeological resources prevent such placement.

Manage for Peak Demand

Managing energy use for "peak demand" (times during the day when overall energy use is the highest), known as demand response, can reduce strain on energy generators which can cause power outages and decrease end user costs by reducing energy use when demand is highest, and often most costly. For energy consumers this is known as Demand-side Management (DSM), where managing energy use for peak demand may not decrease total energy consumption but may reduce the need for energy infrastructure needed to meet the highest periods of energy use. One example of managing energy use for peak demand is through energy storage technology that can store energy off peak hours for use during peak hours, including but not limited to storage batteries, fuel cells, or emergency backup generators. For energy generators, Supply-side Management (SSM) focuses on providing customers with an adequate supply of energy during peak demand by incorporating energy infrastructure to support generation, distribution, and transmission.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE EN3

Objective EN3 – *Minimize energy consumption through planning and design (including energy efficiency and conservation measures)*

The purpose of Objective EN3 is to promote energy conversation, which supports Objectives EN1 and EN2 to promote an adequate and diverse supply of energy for and to Cape Cod. By increasing the energy efficiency of development, long-term energy savings, reduced impact on the environment, and less strain on the energy grid may be realized. The following is a detailed discussion of the methods to meet Objective EN3.

Designed to Earn LEED Certification

Leadership in Energy and Environmental Design (LEED) is a green certification program of the US Green Building Council (USGBC) for building design, construction, operations, and maintenance. Green Business Certification Inc. (GBCI) administers LEED certification.

The LEED program uses a rating system of methods incorporated into a project to achieve credits towards a certification level: Certified (40-49 points), Silver (50-59 points), Gold (60-79 points), Platinum (80+ points). Methods to achieve LEED credits vary by the project type.

The categories of LEED rating systems are:

- Building Design and Construction (BD+C) (example attached)
- Interior Design and Construction (ID+C)
- Building Operations and Maintenance (O+M) (example attached)
- Neighborhood Development (ND)
- Homes
- Cities and Communities

Applicants who choose this method should have a project designed to achieve at minimum the LEED certification level "Certified" (40-49 points). *Applicants do not have to seek certification through Green Business Certification Inc*. but must provide information that the project is certifiable.

Designed to Earn Energy Star® Certification

Energy Star® is a joint program of the US Environmental Protection Agency (EPA) and US Department of Energy (DOE) that certifies energy efficient products and building development. Energy Star® building certification compares your buildings energy use, design, and operations to similar buildings around the country, on a scale of 1-100 where a score of 50 represents median energy performance and a score of 75 or higher means your building performs better than at least 75% of similar buildings nationwide. For a building to be eligible for Energy Star® certification a building must earn an Energy Star® score of 75 or higher.

Applicants utilizing this method should have a project designed to achieve an Energy Star® score of 75 or higher. *Applicants do not have to seek certification through Energy Star®* but must provide information that the project is certifiable.

Net Zero Energy and Net Zero Energy Ready Buildings

The concept of "Net Zero" building is an evolving concept. Many different definitions of Net Zero building exist, and certifications have been developed for particular building types by organizations such as the US Green Building Council (USGBC), Passive House Institute US (PHIUS), US Department of Energy (DOE), and Residential Energy Services Network (RESNET).

For the purposes of Commission review, Net Zero Energy Ready building shall be defined as a high-performance building which is so energy efficient that a renewable energy system can offset all or most of the building's annual energy consumption. A Zero Energy building additionally produces enough renewable energy on-site to offset the building's annual energy consumption.

Projects are encouraged to achieve Net Zero Energy building, but Net Zero Energy Ready building may be preferable when the provision of on-site renewable energy would have a negative impact on other development considerations such as compact form or the preservation of undisturbed open space.

Applicants utilizing this method should have a project designed consistent with one of the following frameworks: USGBC's LEED Zero Carbon, PHIUS's Passive Building certification, DOE's Zero Energy Ready Home Program, or RESNET's Home Energy Rating System (score of 10 or below). Recognizing the evolving nature of Net Zero Energy construction, other certifications or methods may be considered at the

discretion of the Commission. Applicants do not have to seek certification through these programs but must provide information that the project would be certifiable to the extent applicable.

Building Design

The aim of this method is to minimize energy consumption and maximize energy efficiency and conservation through building design and the use of energy efficient building systems. Applicants are encouraged to propose alternate methods to meet Objective EN3 based on best practices for the type of project proposed, or as new technologies are developed and available.

INCORPORATE A COMBINED HEATING AND POWER (CHP) SYSTEM

Applicants may incorporate a CHP system into the project design, which is a suite of technologies that can use a variety of fuels to produce electricity and use the heat created from the power generation process to provide heating and/or cooling.

GREEN OR COOL ROOF

A green roof may be proposed over the entire roof or a portion thereof. Cool roofs are designed to reflect, as opposed to absorb, sunlight by applying a light colored paint, coating or material to the surface of a roof exposed to the sun. A cool roof surface could be as much as 50 degrees cooler than a standard or dark colored roof, thereby reducing the amount of energy needed to cool a building. Cool roofs can decrease building air conditioning needs, lower peak electricity demand, and reduce the local air temperature. Cool roofs can be used in new construction and in certain roof retrofits depending on other building conditions, and can be used on sloped or flat roofs. For certain buildings where a flat roof is incorporated into the design, making the roof reflective, or a “cool roof” is encouraged.

BUILDING DESIGN MEETS “STRETCH CODE”

The Massachusetts building code is based on the International Energy Conservation Code (IECC). In 2009 Massachusetts became the first state to adopt an above-code appendix to the "base" IECC building energy code, called the Stretch Code. The Stretch Code emphasizes energy performance and is designed to result in cost-effective construction that is more energy efficient than a building built to the "base" energy code.

SUB-METERING

Submetering is the installation of separate utility meters for multi-tenant buildings or properties, which allows for the measurement and tracking of energy usage by individual users. These systems can give energy users information on the energy use of individual tenants, departments, buildings, specific industrial processes and other loads and encourage energy conservation by providing real-time information on energy usage. Sub-metering is appropriate for commercial, residential, and mixed-use buildings and projects.

GENERAL APPLICATION REQUIREMENTS

As applicable:

- Documentation on what percentage of project energy use will be purchased through a green power purchase agreement. Any green power purchase must have a term of no less than five (5) years. Provide documentation on the term of the purchase.
- Documentation and specifications on what type of renewable or alternative energy will be used, the system size in kilowatts (kW), and a projection of the annual kilowatt hours (kWh) to be offset.
- Site Plan showing utility locations and appropriate specifications for locating those utilities underground.
- Documentation and specifications for energy storage technology systems, a narrative describing how the system is incorporated into the building design and operations, a Site Plan showing energy storage location with appropriate specifications.
- Letter from a licensed LEED Accredited Professional describing which certification level the project has been designed to achieve, a description of the project design, and LEED checklist for appropriate project category.
- Statement of Energy Design Intent (SEDI) signed by a licensed professional engineer or architect.
- An energy audit of proposed building design and systems for proposed and/or existing conditions, performed by a qualified auditor, which includes recommendations for increased energy efficiency, with a project narrative detailing how recommendations from the energy audit will be incorporated into the project design to the maximum extent practicable. Qualified auditors include but are not limited to licensed Professional Engineers, Certified Energy Managers, LEED Accredited Professionals, and Building Performance Institute Analysts.
- A project narrative description of chosen features relative to building design, site design, or operations.
    - When proposing a CHP system, Applicants should provide documentation and design specifications on the type of system.
    - A description of the green or cool roof should be included in the project narrative, including a description of the type of system to be installed, vegetation cover types, and maintenance requirements.

- A description of how the building has been designed to meet the Stretch Code.

REFERENCES AND RESOURCES

Massachusetts Energy Consumers Alliance – https://www.massenergy.org

Massachusetts Department of Energy Resources (DOER) – https://www.mass.gov/orgs/massachusetts-department-of-energy-resources

Massachusetts Green Communities Act – https://malegislature.gov/Laws/SessionLaws/Acts/2008/Chapter169

Massachusetts General Law (MGL) Chapter 25A Section 11F (RPS) and Section 11F1/2 (APS)

Code of Massachusetts Regulations 225 CMR 14 and 15 (RPS), 16 (APS)

2018 'Act to Promote a Clean Energy Future' to date has been approved by MA Senate (S2545)

Guide to Purchasing Green Power, US Environmental Protection Agency, Updated September 2018 – https://www.epa.gov/greenpower/guide-purchasing-green-power

Cape Light Compact – https://www.capelightcompact.org

Massachusetts Clean Energy Center – http://www.masscec.com/

MassSave – https://www.masssave.com/

US Green Building Council – https://new.usgbc.org/

Energy Star – https://www.energystar.gov/

Code of Massachusetts Regulations 780 CMR (Massachusetts State Building Code)

Code of Massachusetts Regulations 780 CMR Appendix 115.AA (Stretch Energy Code)

LEED v4 for Building Design and Construction Checklist

LEED v4 for BD+C: New Construction and Major Renovation
Project Checklist

Project Name:
Date:

Y	?	N			
			Credit	Integrative Process	1

Y	?	N		Location and Transportation	16
			Credit	LEED for Neighborhood Development Location	16
			Credit	Sensitive Land Protection	1
			Credit	High Priority Site	2
			Credit	Surrounding Density and Diverse Uses	5
			Credit	Access to Quality Transit	5
			Credit	Bicycle Facilities	1
			Credit	Reduced Parking Footprint	1
			Credit	Green Vehicles	1

Y	?	N		Sustainable Sites	10
Y			Prereq	Construction Activity Pollution Prevention	Required
			Credit	Site Assessment	1
			Credit	Site Development - Protect or Restore Habitat	2
			Credit	Open Space	1
			Credit	Rainwater Management	3
			Credit	Heat Island Reduction	2
			Credit	Light Pollution Reduction	1

Y	?	N		Water Efficiency	11
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
			Credit	Outdoor Water Use Reduction	2
			Credit	Indoor Water Use Reduction	6
			Credit	Cooling Tower Water Use	2
			Credit	Water Metering	1

Y	?	N		Energy and Atmosphere	33
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
			Credit	Enhanced Commissioning	6
			Credit	Optimize Energy Performance	18
			Credit	Advanced Energy Metering	1
			Credit	Demand Response	2
			Credit	Renewable Energy Production	3
			Credit	Enhanced Refrigerant Management	1
			Credit	Green Power and Carbon Offsets	2

Y	?	N		Materials and Resources	13
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
			Credit	Building Life-Cycle Impact Reduction	5
			Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
			Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
			Credit	Building Product Disclosure and Optimization - Material Ingredients	2
			Credit	Construction and Demolition Waste Management	2

Y	?	N		Indoor Environmental Quality	16
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
			Credit	Enhanced Indoor Air Quality Strategies	2
			Credit	Low-Emitting Materials	3
			Credit	Construction Indoor Air Quality Management Plan	1
			Credit	Indoor Air Quality Assessment	2
			Credit	Thermal Comfort	1
			Credit	Interior Lighting	2
			Credit	Daylight	3
			Credit	Quality Views	1
			Credit	Acoustic Performance	1

Y	?	N		Innovation	6
			Credit	Innovation	5
			Credit	LEED Accredited Professional	1

Y	?	N		Regional Priority	4
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1

Y	?	N		Possible Points:	110
0	0	0	TOTALS		

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

LEED v4 for Building Operations and Maintenance Checklist

LEED v4 for Operations & Maintenance: Existing Buildings
Project Checklist

Project Name:
Date:

Y	?	N				
0	0	0	**Location and Transportation**			15
			Credit	Alternative Transportation		15
0	0	0	**Sustainable Sites**			10
Y			Prereq	Site Management Policy		Required
			Credit	Site Development-Protect or Restore Habitat		2
			Credit	Rainwater Management		3
			Credit	Heat Island Reduction		2
			Credit	Light Pollution Reduction		1
			Credit	Site Management		1
			Credit	Site Improvement Plan		1
0	0	0	**Water Efficiency**			12
Y			Prereq	Indoor Water Use Reduction		Required
Y			Prereq	Building-Level Water Metering		Required
			Credit	Outdoor Water Use Reduction		2
			Credit	Indoor Water Use Reduction		5
			Credit	Cooling Tower Water Use		3
			Credit	Water Metering		2
0	0	0	**Energy and Atmosphere**			38
Y			Prereq	Energy Efficiency Best Management Practices		Required
Y			Prereq	Minimum Energy Performance		Required
Y			Prereq	Building-Level Energy Metering		Required
Y			Prereq	Fundamental Refrigerant Management		Required
			Credit	Existing Building Commissioning— Analysis		2
			Credit	Existing Building Commissioning—Implementation		2
			Credit	Ongoing Commissioning		3
			Credit	Optimize Energy Performance		20
			Credit	Advanced Energy Metering		2
			Credit	Demand Response		3
			Credit	Renewable Energy and Carbon Offsets		5
			Credit	Enhanced Refrigerant Management		1
0	0	0	**Materials and Resources**			8
Y			Prereq	Ongoing Purchasing and Waste Policy		Required
Y			Prereq	Facility Maintenance and Renovations Policy		Required
			Credit	Purchasing- Ongoing		1
			Credit	Purchasing- Lamps		1
			Credit	Purchasing- Facility Management and Renovation		2
			Credit	Solid Waste Management- Ongoing		2
			Credit	Solid Waste Management- Facility Management and Renovation		2
0	0	0	**Indoor Environmental Quality**			17
Y			Prereq	Minimum Indoor Air Quality Performance		Required
Y			Prereq	Environmental Tobacco Smoke Control		Required
Y			Prereq	Green Cleaning Policy		Required
			Credit	Indoor Air Quality Management Program		2
			Credit	Enhanced Indoor Air Quality Strategies		2
			Credit	Thermal Comfort		1
			Credit	Interior Lighting		2
			Credit	Daylight and Quality Views		4
			Credit	Green Cleaning- Custodial Effectiveness Assessment		1
			Credit	Green Cleaning- Products and Materials		1
			Credit	Green Cleaning- Equipment		1
			Credit	Integrated Pest Management		2
			Credit	Occupant Comfort Survey		1
0	0	0	**Innovation**			6
			Credit	Innovation		5
			Credit	LEED Accredited Professional		1
0	0	0	**Regional Priority**			4
			Credit	Regional Priority: Specific Credit		1
			Credit	Regional Priority: Specific Credit		1
			Credit	Regional Priority: Specific Credit		1
			Credit	Regional Priority: Specific Credit		1
0	0	0	**TOTALS**		Possible Points:	110

Certified: 40-49 points, **Silver:** 50-59 points, **Gold:** 60-79 points, **Platinum:** 80+ points

APPENDIX A - ENERGY TECHNICAL BULLETIN

WECF Guidelines and Protocols

To the extent a wind energy conversion facility, wholly located within the jurisdictional limits of Barnstable County, comes to the Commission for DRI review, the following will be considered the minimum siting and design guidelines and operational protocols for such facilities in order to be considered appropriate to context, pursuant to Energy Objective EN1. Renewable energy projects, like wind and solar, are ways to meet the 2018 RPPs Energy goal; however, such projects are required to be appropriate to context.

These guidelines and protocols were originally developed with significant public input and review and adopted as revisions to the 2009 Regional Policy Plan Energy Minimum Performance Standards.

The Commission may vary the application of such guidelines and protocols under the particular circumstances of a project, including but not limited to greater setbacks and distances from such facilities.

A wind energy conversion facility (WECF) is equipment, machinery, and structures utilized in connection with the conversion of wind to electricity. This includes, but is not limited to, all transmission, storage, collection and supply equipment, substations, transformers, site access, service roads, and machinery associated with the use. A wind energy conversion facility may consist of one or more wind turbines, and does not include meteorological (or "met") towers.

As used herein, 'receptor' shall mean an occupied property or building.

Because of the unique procedural, legal, and political safeguards applicable to town appropriations and the use of town-owned land, these methods shall not apply to a municipal project proposing a single WECF 250 KW or less on municipally owned land.

- Clear Area: All WECFs shall maintain a Clear Area, free of any structure designed for human occupancy, surrounding the base of the turbine equal to at least 1.5 times

the height of the WECF, or the WECF manufacturer's fall zone, setback, or clear area specification, whichever is greater. The Clear Area setback shall be measured from the base of the turbine.

- Noise: An applicant for a WECF greater than 660 KW shall submit a noise study with its DRI application; fund a peer review of the noise study by a consultant of the Cape Cod Commission choosing; and such WECF shall adhere to a setback of 10 times the rotor diameter of the proposed turbine from the nearest receptor, or residentially zoned parcel, unless the applicant can demonstrate through the noise study that the projected sound levels, including both ambient and infrasound, would result in minimal impacts to occupants within a reduced setback. Such applicant shall also provide a plan which specifies reduced operating procedures to address and mitigate noise complaints that may arise during operation of the WECF; this plan shall be consistent with and incorporate recommendations from the Commission's noise consultant.
- Shadow Flicker: An applicant shall submit in its DRI application an impact study of shadow flicker on receptors which will be affected by the proposed WECF. WECFs with anticipated shadow flicker effects on receptors shall require the applicant to provide a mitigation plan to the Commission which specifies operational controls, landscaping, or other means that mitigate shadow flicker events to fewer than 10 hours per year.
- Avoid Adverse Visual Impacts: WECFs shall be sited and designed to avoid adverse visual impacts to scenic resources. A WECF applicant shall provide in its DRI application a Visual Impact Assessment (VIA); guidance on VIAs can be found in Commission Technical Bulletin 12-001.
- Decommissioning: An applicant shall in its DRI application provide a decommissioning plan, which also addresses removal of the meteorological (or "met") tower. Such plan shall include that any WECF that has not been operational for more than 120 consecutive days shall be dismantled and removed and legally disposed of by the owner, operator, or other authorized parties designated in the decommissioning plan. The applicant shall also provide security in a form and amount satisfactory to the Cape Cod Commission to cover the cost of and ensure decommissioning and removal of any abandoned or damaged WECF.

Waste Management

This guidance is intended to clarify how the Waste Management Goal and Objectives of the Regional Policy Plan (RPP) are to be applied and interpreted in Cape Cod Commission Development of Regional Impact (DRI) project review. This technical bulletin presents specific methods by which a project can meet these goals and objectives.

Waste Management Goal: To promote a sustainable solid waste management system for the region that protects public health, safety, and the environment and supports the economy.

- ***Objective WM1*** *– To reduce waste and waste disposal by promoting waste diversion and other Zero Waste initiatives*
- ***Objective WM2*** *– Support an integrated solid waste management system*

The applicability and materiality of these goals and objectives to a project will be determined on a case-by-case basis considering a number of factors including the location, context (as defined by the Placetype of the location), scale, use, and other characteristics of a project.

THE ROLE OF CAPE COD PLACETYPES

The RPP incorporates *a framework for regional land use policies and regulations based on local form and context* as identified through categories of Placetypes found and desired on Cape Cod.

The Placetypes are determined in two ways: some are depicted on a map contained within the RPP Data Viewer located at www.capecodcommission.org/RPPDataViewer adopted by the Commission as part of the Technical Guidance for review of DRIs, which may be amended from time to time as land use patterns and regional land use priorities change, and the remainder are determined using the character descriptions set forth in Section 8 of the RPP and the Technical Guidance.

The project context, as defined by the Placetype of the location, provides the lens through which the Commission will review the project under the RPP. Additional detail can be found in the Cape Cod Placetypes section of the Technical Guidance.

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NOTE ON APPLICATION MATERIALS, DEFINITIONS, RESOURCES AND REFERENCES

Application materials should provide sufficient detail to demonstrate that the project meets the applicable Objectives, but typically include a project narrative and a detailed site plan. See guidance on page WM-11 for more information.

A list of references and resources are provided on page WM-12.

INTRODUCTION

The Commission may determine that Waste Management is a material issue for those DRIs where the proposed development involves or is likely to involve a significant amount of solid waste generation, or if solid waste handling or management is a principal purpose, use or component of the development.

The RPP's Waste Management Goal and Objectives are intended to support and further the Commonwealth's current Solid Waste Master Plan (2010-2020), which has the primary purpose of making way for a "Zero Waste" future in the Commonwealth. Sustainable waste management practices and policies also have significant greenhouse gas reduction benefits: the Commonwealth's "Zero Waste" vision aligns with the Global Warming Solutions Act (GWSA, Chapter 298 of the Acts of 2008). The RPP's Waste Management Goal and Objectives recognize Barnstable County's relationship and role with the Commonwealth (and beyond) in advancing a sustainable approach to waste management; and alternately, that it is neither feasible nor desirable for Barnstable County to have a waste management system and approach that is entirely independent from the Commonwealth's.

Because the primary purpose of the RPP's Waste Management Goal and Objectives is to support the Commonwealth's long term "Zero Waste" master plan, the Commission's approach under this section is flexible in order to respond to, consider and accommodate for changing circumstances in the solid waste environment as they might arise: many of the recommended policies and actions set out in this section depend on the establishment and evolution of new markets, technologies, infrastructure systems and business networks that are not currently in place.

There are no Placetypes directly associated with the Waste Management Goal and Objectives, and supporting policies and actions set out in this section; however, proposed development reviewed under the Waste Management Goal and Objectives are subject to and will likely be reviewed under other RPP goals for which there are associated Placetypes.

SUMMARY OF METHODS

GOAL | WASTE MANAGEMENT

To promote a sustainable solid waste management system for the region that protects public health, safety, and the environment and supports the economy.

OBJECTIVE WM1 – To reduce waste and waste disposal by promoting waste diversion and other Zero Waste initiatives

METHODS

- Incorporate alternatives to disposal such as the productive re-use of materials, and resource recovery of useful materials.
- Incorporate clean waste-to-energy initiatives such as anaerobic digestion.
- Create or expand opportunities to compost organic materials.
- Incorporate Industrial Ecology, which is co-locating businesses so that by-products from one or more processes are utilized as input to other processes.
- For manufacturing facilities and operations:
    - minimize packaging;
    - reduce toxics in packaging;
    - incorporate extended producer responsibility for reuse, recycling, and disposal manufactured products.
- Develop or support local markets, infrastructure, technologies, jobs and firms in recycling, re-use, resource recovery and related material management efforts.
- Support municipal waste diversion facilities, and encourage regional coordination between municipal facilities.
- Support private waste diversion facilities and markets to support and supplement municipal waste facilities and operations
- Reuse buildings and structures

OBJECTIVE WM2 – Support an integrated solid waste management system

METHODS

- For waste facilities, incorporate zero waste future technologies and initiatives to preserve existing disposal capacity to serve regional needs.
- Develop integrated facility partnerships – including between municipalities and businesses – to support integrated solid waste management systems.
- Properly manage construction and demolition waste and recycling.
- Use alternative methods to trucking to transport waste and recycling materials from Barnstable County, including rail and ship, in order to reserve roadway capacity.
- Support existing municipal waste facilities and encourage regional coordination between municipal facilities.
- Support private waste facilities and markets to support and supplement municipal waste facilities and operations

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE WM1

Objective WM1 *– To reduce waste and waste disposal by promoting waste diversion and other Zero Waste initiatives*

Solid waste management has improved greatly in the Commonwealth since 1990 when MassDEP issued the Commonwealth's first Solid Waste Master Plan. Before that, there were more than 150 landfills in the Commonwealth, most of which were owned/ operated by municipalities and lacked sufficient environmental controls. The Commission's 1991 Regional Policy Plan was concerned primarily with the regionalization of and better environmental controls for municipal solid waste facilities.

Today, Massachusetts has a modern solid waste management system that promotes waste reduction and recycling, and ensures that facilities that handle and dispose of waste are properly designed and operated to protect public health and the environment.

Further, since the 1990's, Massachusetts has imposed state-wide waste bans. Waste bans help to increase recycling and support the recycling economy, and help keep toxics out of the waste stream. Waste bans are a key tool available in Massachusetts to reduce disposal of recyclable and compostable materials and increase recycling and composting. The waste ban regulations require landfills, municipal waste combustors, and transfer stations to develop and implement waste ban plans that include ongoing monitoring for banned materials and comprehensive inspections of waste loads. The Commission's 1996 and 2002 RPPs emphasized recycling and integrated solid waste management, which were themes carried through the 2009 RPP.

Since 2009, the Commonwealth has had a 42 percent recycling rate, one of the highest rates in the nation. However, Massachusetts residents continue to dispose of materials that have significant value – in both monetary and natural-resource terms – and whose environmental impacts could be avoided if they were reused. Solid waste management represents a significant cost to taxpayers and businesses, and disposal of materials causes environmental impacts and is a waste of resources and a lost economic opportunity. The more consumers can reduce the amount of waste that has to be disposed of by reducing generation and increasing reuse, recycling, and composting, the better for the economy, public health and the natural environment. There have also

been dramatic changes in the recycling markets at the state, national and international level over the past few years, suggesting that less reliance on recycling alone and the promotion of other forms of waste diversion are prudent approaches for future solid waste planning.

"Zero Waste" is an alternative vision to the traditional concept of waste disposal, involving the overall reduction in waste generation and the amount of wastes requiring disposal; and less overall reliance on disposal in landfill facilities by diverting materials from the waste stream. Waste diversion approaches include increasing reuse of materials; increasing recycling of materials that have served their useful purpose; resource recovery of useful materials that would otherwise be placed in the waste stream; and composting food and other organic materials. There are increasingly fewer landfills and less landfill capacity in the Commonwealth, and for environmental, economic and other reasons, siting of new landfill facilities to maintain current capacity is unlikely or undesirable. In fact, a good deal of solid waste and recycling is shipped outside the Commonwealth for disposal or handling. The necessary alternative is to reduce reliance on landfilling and disposal.

Under this alternative "Zero Waste" vision, 'waste' is a changing concept. Diverting material from the waste stream saves money, promotes the more efficient use of materials, captures valuable resources, protects the environment, and supports the economy. Disposal of potentially useful and valuable materials is a waste of resources and lost economic opportunity. Resource recovery is using wastes as an input material to create valuable products as new outputs. Plastic, paper, aluminum, glass and metal are examples of where value can be found in waste as input material. There is also the potential to convert waste to energy, such as with an anaerobic digestor facility.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE WM2

Objective WM2 *– Support an integrated solid waste management system*

Integrated Solid Waste Management (ISWM) is a holistic waste reduction, diversion, collection, composting, recycling system that still relies on disposal to some degree, and is a step along the way to try to achieve a "Zero Waste" future. There are currently not the markets or facilities in place to implement a reliable Zero Waste system. At this stage, "Zero Waste" is an aspirational concept with aspects that can be incorporated into and inform the goals of an ISWM system, though preserving the scarce, remaining solid waste disposal capacity that is part of such system is a critical infrastructure consideration for the health of the Cape Cod community, environment and economy.

ISWM systems rely on a network of individual facilities, with the back-bone being municipal transfer stations/solid waste facilities. An ISWM system would include private solid waste or material management businesses to supplement municipal facilities and public markets, which partnerships help in preserving capacity and managing costs. Such local public/ private partnerships, markets and networks can also benefit local economies and support existing or the creation of new home-grown businesses and industries. A municipal integrated solid waste management facility (ISWMF) include components such as:

- a comprehensive recycling drop-off center,
- a materials recovery facility,
- regular hazardous product collections,
- a reuse swap shop,
- grass and leaf waste composting,
- food composting,
- a C&D handling facility.

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GENERAL APPLICATION REQUIREMENTS

As applicable:

- Narrative describing how the project supports the Objectives.
- Site Plan showing how waste will be managed and/or waste management facility design.
- Construction and Demolition (C&D) waste management plan
- Post- Construction/ operational solid waste and recycling management plan
- Toxic waste management plan
- Food waste or other composting plan
- Waste material re-use/ resource recovery plan
- Corporate/ business sustainability plan, including operational best practices and employee training

EXAMPLE CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT PLAN GUIDANCE

The Connecticut Department of Energy and Environmental Projection provides the following guidance on the developing successful Construction and Demolition Waste Management Plans that Applicants may find helpful.

A construction or demolition waste management plan does not need to be lengthy or complicated to be effective. Preparing a plan consists of identifying the types of debris that will be generated by the project and identifying how all waste streams will be handled. A successful waste management plan will contain the following information:

- Waste recycling, salvage or reuse goals
- Estimated types and quantities of materials or waste generated from the project site
- Proposed and intended disposal methods for these materials
- Intended procedures for handling the materials or waste
- Detailed instructions for the subcontractors and laborers on how to separate or collect the materials at the job site

The industry average for waste generated at new construction sites is six pounds per square foot. Most of this waste can be put towards another use, or better yet, be recycled if proper planning is done within the design phase. The primary objective of

these plans are to initially reduce the amount of generated construction waste on projects by requiring all subcontractors and material suppliers to limit quantities of materials and packaging to only those necessary for the project itself.

Additional information available at:
https://www.ct.gov/deep/cwp/view.asp?a=2714&q=458438

REFERENCES AND RESOURCES

MassDEP Recycle Smart Initiative (Recyclopedia) - https://recyclesmartma.org/

Information on Massachusetts Recycling and Waste - https://www.mass.gov/topics/recycling-waste-management

Massachusetts Solid Waste Master Plan - https://www.mass.gov/guides/solid-waste-master-plan

Connecticut Department of Energy and Environmental Projection Guidance on Waste Management Plans - https://www.ct.gov/deep/cwp/view.asp?a=2714&q=458438

Climate Mitigation

This guidance is intended to clarify how the Climate Mitigation Goal and Objectives of the Regional Policy Plan (RPP) are to be applied and interpreted in Cape Cod Commission Development of Regional Impact (DRI) project review. This technical bulletin presents non-exhaustive, non-exclusive methods by which a project can meet this goal and objectives.

Climate Mitigation Goal: To support, advance and contribute as a region to the Commonwealth's interim and long-term greenhouse gas reduction goals and initiatives, including a state-wide net zero carbon target by 2050.

- **Objective CM1** – *Promote low or no carbon transportation alternatives and technologies*
- **Objective CM2** – *Promote low or no carbon technologies for building energy use, including appliances, lighting, and heating, ventilation and cooling (HVAC) systems*
- **Objective CM3** – *Promote carbon sequestration and other emissions removal practices and technologies as appropriate to context*
- **Objective CM4** – *Promote low or no carbon energy generation technologies as appropriate to context*

The applicability and materiality of the RPP goals and objectives to a project will be determined on a case-by-case basis considering a number of factors including the location, context (as defined by the Placetype of the location), scale, use, and other characteristics of a project.

THE ROLE OF CAPE COD PLACETYPES

The RPP incorporates *a framework for regional land use policies and regulations based on local form and context* as identified through categories of Placetypes found and desired on Cape Cod.

The Placetypes are determined in two ways: some are depicted on a map contained within the RPP Data Viewer located at www.capecodcommission.org/RPPDataViewer adopted by the Commission as part of the Technical Guidance for review of DRIs, which may be amended from time to time as land use patterns and regional land use priorities change, and the remainder are determined using the character descriptions set forth in Section 8 of the RPP and the Technical Guidance.

The project context, as defined by the Placetype of the location, provides the lens through which the Commission will review the project under the RPP. Additional detail can be found in the Cape Cod Placetypes section of the Technical Guidance.

Given the pervasive nature of climate change, which cuts across many land use issues, the stated methods set out in this Technical Bulletin are not associated with any particular Placetype. However, Placetypes are still significant considerations in the application of the Climate Mitigation goal, objectives and methods. For instance, proposed mitigation methods related to natural carbon sequestration may be more appropriate in Natural Areas or Rural Development Areas, whereas proposed methods that involve engineered, quasi-industrial technologies to remove carbon are more appropriate for Industrial Activity Centers. Further, the concept of directing certain growth and development to Community Activity Centers has many land use co-benefits, including with respect to climate change mitigation: denser, more walkable development in Community Activity Centers involves more compact development patterns and efficient buildings, fewer vehicles miles traveled (and thus fewer GHG emissions), etc.

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- Project proposes tree planting as part of landscaping plan and/or stormwater LID plan 18
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For rooftop solar PV arrays, this might include orienting the proposed building on the site to maximize rooftop sun exposure, reserving sufficient rooftop area free of HVAC or other building equipment for the location of the future PV array, designing the roof structure to accept the future weight load, and identifying where electrical conduit and connections may be needed..... 21

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INTRODUCTION

Climate change is one of the most pressing global problems, though it also presents localized impacts especially pronounced in coastal communities like Cape Cod. However, there are actions that communities can take to help solve this global issue and its more localized impacts.

The Climate Mitigation goal and objectives deal with lowering greenhouse gas (GHG) emissions as climate change mitigation. This goal ties directly into the well-structured legal, policy and regulatory regime in the Commonwealth, originating with the Global Warming Solutions Act and related legislation, which seek to lower GHG emissions economy-wide from 1990 levels to net zero by 2050. Through the RPP Climate Mitigation goal, Cape Cod can contribute to the Commonwealth's goal in addressing the overarching, global problem.

A critical piece in lowering emissions and meeting state carbon targets is reducing the economy's reliance on fossil fuel use and transitioning to clean, renewable energy sources. On Cape Cod (based on the GHG inventory conducted by the Commission), the transportation and energy sectors are the primary contributors to GHG emissions, similar to the rest of Massachusetts. The Climate Mitigation objectives tie into these sectors expressly; further, the objective dealing with carbon removal and reduction recognizes that leveraging the natural carbon sequestration associated with forests, marshes, wetlands and other natural ecosystems can and will play a large part in mitigating the effects of climate change on Cape Cod.

As is the case with other RPP goals and objectives, but particularly with the Climate Mitigation goal and objectives where climate change concerns cut across so many land use issues, there is and there is intended to be overlap, coherence and consistency between all RPP goals and objectives in their application and interpretation during the Commission's project review. The Climate Mitigation goal and objectives speak directly to the problems associated with climate change and ways to mitigate the problem; there are other RPP goals and objectives that appropriately address climate change and climate change mitigation, though less directly. For instance, there is a particularly close affinity and interrelation between the Energy and Climate Mitigation RPP goals and objectives; one does not pre-empt or supplant another, but each is intended to supplement, inform and reinforce the other.

Methods primarily intended to satisfy other RPP goals and objectives may contribute to satisfying the Climate Mitigation goal and objectives, and vice versa.

SUMMARY OF METHODS

GOAL | CLIMATE MITIGATION

To support, advance and contribute as a region to the Commonwealth's interim and long-term greenhouse gas reduction goals and initiatives, including a state-wide net zero carbon target by 2050.

OBJECTIVE CM1 – Promote low or no carbon transportation alternatives and technologies

METHODS

- Project employs and quantifies the GHG-reduction benefit of the strategies to reduce vehicle miles traveled (see Transportation Technical Bulletin Objective TR-2 Methods)
- Project commits to work-from home policies
- Project provides safe and convenient access to the site for pedestrians, bicyclists, and transit users and quantifies the GHG-reduction benefit (see Transportation Technical Bulletin Objective TR2 Methods)
- Project provides bicycle sharing, racks, or storage (see Transportation Technical Bulletin Objective TR2 Methods)
- Project advances the accommodation of pedestrians, bicyclists, and transit users in the transportation system (see Transportation Technical Bulletin Objective TR2 Methods)
- Project provides sidewalks, and/or connections to multi-use paths (see Transportation Technical Bulletin Objective TR2 Methods)
- Project incorporates dedicated spaces for EVs
- Project incorporates EV charging stations within parking facilities (see Energy Technical Bulletin Objective EN3 Methods: Incorporate Site Design Elements)
- Project includes EVs or hybrid vehicles for fleet vehicles, or has EVs available for business use (see Energy Technical Bulletin Objective EN3 Methods: Incorporate Operational Elements)
- Project provides EVs for car sharing
- Project contributes to build out of regional EV charging network

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OBJECTIVE CM2 – Promote low or no carbon technologies for building energy use, including appliances, lighting, and heating, ventilation and cooling (HVAC) systems

METHODS

- Development maximizes energy efficiency and conservation measures, including optimized building siting and design (see Energy Technical Bulletin Objective EN3 Methods: Net Zero Energy and Net Zero Energy Ready Buildings)
- Redevelopment includes deep retrofits of HVAC systems and retro-commissioning, moisture management, and/or energy efficient appliances
- Buildings include smart temperature controls
- Buildings include educational signage explaining the energy efficiency and conservation systems at work, "leading by example"
- Development includes ground or air source electric heat pumps, in place of fossil fuel HVAC systems
- Project includes site scale battery storage paired with renewable energy generation or emergency generators that use renewable fuels
- Project incorporates methods to reduce peak-demand electricity usage (see Energy Technical Bulletin, Objective EN2 Methods)

OBJECTIVE CM3 – Promote carbon sequestration and other emissions removal practices and technologies as appropriate to context

METHODS

- Buildings incorporate reuse of building materials or use of recycled building materials certified as low carbon
- Project proposes tree planting as part of landscaping plan and/or stormwater LID plan (see Wildlife and Plant Habitat Technical Bulletin Objective WPH1 Methods, and Community Design Technical Bulletin Objective CD1 Methods: Provide appropriate landscaping and pedestrian amenities)
- Project proposes planting or restoration with native vegetation, including trees in appropriate habitat settings (see Wildlife and Plant Habitat Technical Bulletin Objective WPH2 Methods)
- Project limits or avoids supplemental use of fertilizer
- Project permanently protects forest or other naturally vegetated area which sequester carbon (see Open Space Technical Bulletin Objective OS3 Methods)

- New and redevelopment of industrial buildings includes decarbonization of manufacturing systems, including use of scrubbers or engineered solutions, as appropriate
- Capped landfill projects incorporate methane gas capture and conversion technology

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OBJECTIVE CM4 – Promote low or no carbon energy generation technologies as appropriate to context

METHODS

- New buildings and redevelopment include installed green energy systems (solar or other renewable energy generation) on roofs, as solar car-ports, or on disturbed sites; new greenfield development for solar is discouraged (see Energy Technical Bulletin Objective EN1 Method: Incorporate on-site renewable energy)
- New buildings and redevelopment are EV and/or PV ready
- Project commits to purchase of renewable energy (see Energy Technical Bulletin Objective EN1 Method: Green Power Purchase)
- Project incorporates alternative renewable energy sources for onsite building development such as geothermal heating and cooling
- Project proposes, contributes to, or ties into a Microgrid

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE CM1

Objective CM1 – *Promote low or no carbon transportation alternatives and technologies*

The purpose of Objective CM1 is to support and advance low or no carbon transportation alternatives and technologies towards a regional transition away from fossil fuels in the transportation system.

Detail on the methods for meeting Objective CM1 is provided below organized under the headings of reducing vehicle miles traveled, promoting transportation alternatives, and supporting electrification of the transportation system.

Reducing Vehicle Miles Traveled

Reducing vehicle miles traveled can be accomplished through a combination of strategies including implementation of Transportation Demand Management (TDM) strategies and provision of healthy transportation options.

TRANSPORTATION DEMAND MANAGEMENT (TDM)

Transportation Demand Management (TDM) is a combination of strategies employed to reduce single-occupancy vehicle trips to and from a site. TDM best practices and guidance on developing site-specific TDM plans are detailed in the Transportation Technical Bulletin Objective TR2 Methods.

Adoption of a work-from-home policy that reduces employee trips can be an effective TDM strategy.

The effectiveness of any strategy, or combination of strategies, depends on the type of land use proposed, proximity to existing transit corridors, walking and bicycling characteristics of the area, and other factors. In all cases, applicants are encouraged to identify and evaluate strategies that are appropriate for the project. Where feasible, the GHG-reduction benefit of the strategies should be quantified. Sources of data should be identified, and methods used should be justified.

Promoting Transportation Alternatives

Supporting healthy transportation options involves decisions about the site and amenities on the site that support the individuals who wish to use healthy transportation modes to access the site.

As detailed in the Transportation Technical Bulletin Objective TR2 Methods, to the extent feasible, the following site design features and amenities should be included in all projects:

- Sidewalk connections to all buildings
- Safe crossing treatments at all driveway and parking lot crossings
- Conveniently located bicycle racks

Where feasible, the GHG-reduction benefit of the provided healthy transportation options should be quantified.

Supporting healthy transportation options also involves supporting and providing connections to and building out the region's pedestrian, bicycle, and transit networks. These networks on Cape Cod have been built out over time. Further development of these networks will require a cooperative, coordinated approach with both public and private partners.

Transportation Technical Bulletin Objective TR2 Methods details which improvements by the applicant would be appropriate and feasible based on the following factors:

- The location of the project;
- The nature and scale of the project;
- Any constraints to project implementation;
- The anticipated cost of the potential improvement; and
- The anticipated benefit of the potential improvement.

Promoting Electrification of the Transportation System

Promoting electrification of the transportation system involves consideration of electric vehicles (EVs) on the project site (see Energy Technical Bulletin Objective EN3 Methods: Incorporate Site Design Elements) as well as contributing to build out of the regional EV charging network.

DEDICATED SPACES FOR EVS

Even if the project does not propose electric vehicle charging infrastructure, dedicated parking spaces for EVs could be considered to promote the adoption of EVs. It may be appropriate to make the spaces EV ready (see Objective CM4 Methods) to allow for future provision of charging infrastructure.

In other instances, dedicated parking spaces for EVs may also be considered in addition to EV charging spaces.

EV CHARGING STATIONS WITHIN PARKING FACILITIES

The provision of Electric Vehicle Supply Equipment (EVSE), a collection of which is commonly referred to as an EV charging station, is appropriate for a variety of land uses. The appropriateness, type, and number of EVSE is based on the following factors:

- The location of the project, including relative to other on- or off-site EVSE;
- The nature and scale of the project;
- Any constraints to EVSE implementation;
- The anticipated cost of the potential improvement; and
- The anticipated benefit of the potential improvement.

The provision of ESVE is particularly desirable for residential and office settings as well as sites that serve the general public. The potential demand for EV charging can be estimated based on industry best practice and can be supplemented by the Cape Cod Commission Electric Vehicle Charging Station Siting Analysis Tool which maps the following site characteristics:

- Within Community Activity Centers;
- Proximate to a high concentration of community and/or business activity sites;
- Includes large parking lots; and
- Located in areas that currently lack publicly available charging stations.

Where an applicant proposes the provision of EVSE, best practices in terms of implementation should be followed. While best practices will continue to evolve, the following should be considered:

- Level 2 EVSE or higher should be considered for most land uses. Level 1 EVSE may be appropriate in limited applications.[1]
- To allow for the widest user base, connectors that allow for use by a variety of vehicle makes is encouraged.
- Appropriate signage and pavement markings should be provided. Signage should detail the ESVE voltage and amperage levels, safety information, contact information for reporting when the equipment is not operating or other problems, and, as applicable, any use limitation on use (i.e. patrons only), hour of operations, time limits, and usage fees.
- All EVSE placed and proposed shall be compliant with the Americans with Disabilities Act and with applicable Massachusetts Architectural Access Board rules and regulations.
- Where EVSE is provided or proposed within an adjacent pedestrian circulation area, such as a sidewalk or accessible route to the building entrance, the charging equipment must be located so as to not interfere with accessibility requirements.

EVS OR HYBRID VEHICLES FOR FLEET VEHICLES, BUSINESS USE, OR CAR SHARING

Many industries are beginning to use EVs or hybrid vehicles for fleet vehicles or making such vehicles available for business use on a reservation basis. Where practical, EVs are preferred for this application.

A car share is defined as a vehicle that is available by reservation on an hourly basis or in smaller intervals for a business or non-business use. They are often used in combination with TDM strategies that promote transportation to the site without use of a personal automobile. Where practical, EVs are preferred for this application.
A charger must be installed to support the EVs being proposed for fleet vehicles, for business use, or for ride sharing.

Guidance on incorporation of EV charging stations within parking facilities, provision of EVs for fleet vehicles, having EVs available for business use and ride sharing are detailed in Energy Technical Bulletin Objective EN3 Methods: Incorporate Site Design

[1] The terms Level 1 (often referred to as slow charging), Level 2 (often referred to as medium charging), and Direct Current Fast Charging are the most common charging levels used to refer to the electrical power and voltage of the EVSE.

Elements. Where EVs are currently impractical for these applications, hybrid vehicles should be considered.

BUILD OUT OF REGIONAL EV CHARGING NETWORK

The EV charging network on Cape Cod will be built out over time. Further development of this network will require a cooperative, coordinated approach with both public and private partners. The pace of EV adoption in the region will rely on investments in regional EV charging infrastructure at various levels. To the extent feasible, the project should contribute to build out of the regional EV charging network including but not limited to provision of EVSE available for use to the public. As the regional network is built out, we may see a variety of business or cost-recovery models to fund the construction and operation of EVSE, including end user fees for their use. Broad public access to and availability of EVSE is desirable, though it is recognized that use of EVSE may be restricted in certain cases to residents, employees, patrons, or other particular site users.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE CM2

Objective CM2 – *Promote low or no carbon technologies for building energy use, including appliances, lighting, and heating, ventilation and cooling (HVAC) systems*

The purpose of Objective CM2 is to advance the use of energy efficient appliances and building heating and cooling systems that use alternatives to transition from fossil fuels, preferably powered by renewable energy sources. The following is a discussion of the methods that may be implemented to meet Objective CM2.

Optimized energy efficiency through site design

Project designers can find guidance on maximizing energy efficiency through design from several sources. Zero energy certifications have been developed by organizations such as the US Green Building Council (USGBC – LEED), Passive House Institute US (PHIUS), US Department of Energy (DOE), and Residential Energy Services Network (RESNET). Applicants can optimize energy conservation and efficiency through building orientation and taking advantage of topography and existing shade trees, among many design considerations. See Energy Technical Bulletin Objective EN3 Methods: Net Zero Energy and Net Zero Energy Ready Buildings.

HVAC system retrofits, retro-commissioning, moisture management, energy efficient appliances

Deep energy retrofits in existing structures are appropriate when a major overhaul of an existing building is planned, including upgrades to the HVAC system or building envelope, during a change of use in the building, or when a new owner takes control of the building or refinances the mortgage. A deep retrofit can result in significant savings in energy costs, but does require planning, engaging a consulting expert/ specialist, and a commitment to operational changes.

Some existing buildings can also be made more efficient through retro-commissioning. Retro-commissioning is a process of optimizing a building's systems through analysis and fine tuning. Often significant savings in energy and operational costs can be realized through replacement of poorly functioning parts, resetting thermostats and sensors, optimizing lighting usage, and other techniques.

According to the Department of Energy, "controlling moisture can make [a building] more energy-efficient, less costly to heat and cool, more comfortable, and prevent mold growth."

Energy efficient appliances save energy, reducing costs, and reducing energy demand. Energy Star® rated appliances help the consumer identify and compare the efficiency of different products.

Smart Temperature Controls

Installing programmable temperature controls, which allow setting building heating temperatures lower and cooling temperatures higher when the building is not in use (or at night in residences when occupants are sleeping), will save energy and money.

"Leading by Example"

For the purposes of DRI review, "leading by example" means designing buildings and the surrounding site environment with energy efficiency and conservation of resources in mind. An applicant may help lead the way toward a more fuel-conscious and efficient community by installing informational signage for visitors to the project site. The signage should be discreet, viewable at the pedestrian scale (not road signage), in keeping with local sign ordinances, and help inform the viewer of the types of efficiency and conservation measures that have been incorporated into the building and/or site design.

Utilizing Heat Pumps

Existing buildings can be retrofit to swap out fossil-fuel based heating and cooling systems with efficient air or ground-source heat pumps to reduce a building's reliance on fossil fuels. These systems use electricity for power, and when paired with an on-site renewable energy generation system, an older building can greatly reduce its fuel use. An HVAC retrofit should typically be paired with energy efficiency upgrades to reduce heating and cooling leakage through an older structure's building envelope.

Renewable Energy, Emergency Generators, and On-site Battery Storage

Applicants are encouraged to include on-site renewable energy paired with site scale battery storage to enhance the reliability and extend the usefulness of renewable energy generation. Where a generator is needed on-site, renewable fuel sources

should be used, whenever possible. Coupling generators with on-site battery storage will also extend the usefulness of the generator to times when the grid may be down or for other emergency needs. On-site or fleet EVs may also be connected to the building's energy system, providing back-up energy during times when renewable energy sources are unavailable (poor weather or at night).

Manage for peak-demand energy usage

See Energy Technical Bulletin, Objective EN2 Methods

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE CM3

Objective CM3 – *Promote carbon sequestration and other emissions removal practices and technologies as appropriate to context*

The purpose of Objective CM3 is to advance the capture and storage of carbon through natural and technological processes to balance the impacts of development on the causes of climate change (greenhouse gases). The gases that contribute to climate change move through natural cycles from solid to gaseous states. On Cape Cod, the region's emissions of carbon dioxide from daily activities like driving and heating buildings far exceed the region's contributions of other climate-harming gases.

Fortunately, the carbon cycle can be harnessed to mitigate some of the impacts associated with human activities. Plants absorb carbon dioxide through photosynthesis and incorporate carbon into plant structures. Trees and other plants, as long as they are alive, store – or sequester – carbon in this way. Once plants are cut, decomposition releases carbon back into the atmosphere. Healthy soil processes will also store substantial amounts of carbon; however, inappropriate plant or landscape management, like excessive, unnecessary or non-sustainable fertilizer and pesticide use or practices can significantly alter soil's ability to store carbon.

Reuse building materials, or use recycled building materials certified as low carbon

Creating and transporting new building materials produces greenhouse gas emissions. Similarly, disposing of building materials as waste can increase emissions. Reusing existing building materials or using recycled building materials that reduce or eliminate the greenhouse gases associated with creating new building materials can reduce a project's greenhouse gas emissions. Additionally, using recycled building materials that are certified as low carbon can also reduce the greenhouse gas emissions associated with building construction.

Project proposes tree planting as part of landscaping plan and/or stormwater LID plan

See Wildlife and Plant Habitat Technical Bulletin Objective WPH1 Methods, and Community Design Technical Bulletin Objective CD1 Methods: Provide appropriate landscaping and pedestrian amenities

As noted above, trees and other vegetation store carbon within their structures, and will continue to absorb and store carbon as long as they are alive. Thus, tree planting, and plantings with other native vegetation can contribute to carbon sequestration. Revegetation, restoration, and/or site landscaping with native tree, shrub, and grass species is strongly encouraged for the multiple benefits that derive from maintaining and restoring native habitats (e.g., ecosystem services such as filtering of air and water pollutants, provision of habitats for wildlife and native pollinators, and the aesthetic benefits of naturally vegetated lands).

Trees are especially good at sequestering carbon due to their size, and tree planting is encouraged wherever suitable and appropriate to context. However, tree planting should not be prioritized maintaining the balance and diversity of native habitats on Cape Cod, such as sandplain grasslands, pine barrens, and shrub-dominated natural communities that provide important habitats for Cape Cod's native species. More urbanized areas, within community activity centers or villages, and within commercial developments, are appropriate areas to focus tree planting, especially where mature trees can enhance cooling, streetscape appearance, or buffering between land uses.

Restoration with native plant materials

See Wildlife and Plant Habitat Technical Bulletin Objective WPH2 Methods

Limit or avoid use of supplemental fertilizer

Judicious application of fertilizer is often essential to establishing new plantings in landscaped settings following significant disturbance of the native vegetation and soil structure. Targeted fertilization to address specific plant needs or inadequacies in the soil may also be appropriate at different times during the life of a plant, though it is noted that native plants generally require little to no supplemental fertilization especially after establishment. Appropriate fertilization is also sometimes required to maintain healthy plants, which among other things take up CO_2. However, generally speaking, fertilizer is commonly over-applied, with detrimental effects on soil processes, including the ability of soil to sequester carbon.

Applicants can make a commitment to limit or avoid use of fertilizer in their proposed landscapes, together with a corresponding commitment to support plant and soil health in more sustainable ways. Plants do need new sources of nutrients on an annual basis, often best served through the application of compost and mulch and other

sustainable landscape management practices. Additionally, a commitment to no fertilizer does not mean walking away from maintenance after the planting plan is installed; site landscaping should be tended to ensure plant health and the long-term success of the installation.

Permanent protection of native vegetation

See Open Space Technical Bulletin Objective OS3 Methods

Atmospheric Carbon Capture and Removal

Technology exists to "capture" carbon from the atmosphere, for use in certain industrial applications or for storage by underground injection. Known as direct air capture, this technology removes CO2 from the air using chemical solutions or solid filters. More common at this time is carbon capture from industrial processes. Few projects on Cape Cod will generate the volume of smokestack emissions to warrant the technology required to scrub the carbon dioxide from industrial processes, but this technology or similar approaches may be appropriate in certain circumstances as industries transition away from the use of fossil fuels and as these technologies mature. Alternately, applicants may propose to support off-site carbon capture and storage to mitigate the impacts of a project's on-site GHG emissions.

Capped landfill methane gas capture

Capped landfills generate the most potent type of harmful greenhouse gas, methane; however, landfill gases can be captured and converted to CO2, generating energy in the process. While CO2 is a climate-harming GHG, it is less powerful in affecting climate change processes than the methane that is emitted from capped landfills. Conversion of methane gas to CO2 through specialized technology can reduce the GHG emissions from landfills while also generating energy.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE CM4

Objective CM4 – *Promote low or no carbon energy generation technologies as appropriate to context*

The purpose of Objective CM4 is to encourage the generation of renewable energy on Cape Cod.

Green energy systems installed

See Energy Technical Bulletin Objective EN1 Method: Incorporate on-site renewable energy

EV and/or PV Ready

EV and/or PV ready construction incorporates the siting, design considerations, and infrastructure necessary for the future installation of such technologies after a building has been constructed and site developed. This can make future installations of EVSE or solar PV arrays more cost effective by reducing the need for site or structural upgrades when the time comes to install an EV charging station or a solar PV array.

For EVSE, this might include designating future EV parking spots, then installing the necessary electrical equipment and conduit to those parking spots for the installation of future EV charging stations, and sizing the site electric equipment to support the increased future electricity demand.

For rooftop solar PV arrays, this might include orienting the proposed building on the site to maximize rooftop sun exposure, reserving sufficient rooftop area free of HVAC or other building equipment for the location of the future PV array, designing the roof structure to accept the future weight load, and identifying where electrical conduit and connections may be needed.

Commitment to purchase of renewable energy

See Energy Technical Bulletin Objective EN1 Method: Green Power Purchase

Alternative Energy Sources

A project may include an alternative renewable energy source such as biomass or biofuels, geothermal technology, or hydrogen fuel cell technology. Biofuels are predominantly transportation fuels derived from plants or plant material such as

agricultural crops and byproducts. Geothermal technology uses heat below the Earth's surface in the form of steam or hot water for use in electricity generation, direct usage applications, or in heat pumps for building heating and cooling. Hydrogen fuel cells generate electricity that can be used in buildings, for backup power supply such as an emergency generator, or in transportation. There are many alternative energy sources and an applicant may propose an alternative energy source other than those listed here.

Microgrids

The United States Department of Energy Microgrid Exchange Group defines a microgrid as a group of interconnected loads and distributed energy resources (DERs) within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. A microgrid can connect and disconnect from the grid to enable it to operate in both connected or island-mode.

NOTE ON APPLICATION MATERIALS, DEFINITIONS, RESOURCES AND REFERENCES

Application Materials

GHG IMPACT ANALYSIS AND MITIGATION PLAN

An applicant shall provide a narrative analysis describing its anticipated contributions and impacts with respect to regional greenhouse gas (GHG) emissions from its proposed development, based on the categories of sources, as project-relevant, set out in the Barnstable County GHG Inventory (e.g., transportation, stationary energy, etc.). The applicant will lay out methods in the narrative by which it proposes to mitigate, minimize or avoid GHG emissions from its proposed development.

The majority of GHG emissions from Cape Cod is associated with the transportation and energy sectors (vehicle trip generation and energy consumption), 55% and 39% of total Cape Cod emissions, respectively.

Note that the Barnstable County GHG Inventory deals primarily with the most prevalent type of GHG, carbon dioxide (CO_2), which should similarly be the focus of the applicant's GHG Impact Analysis and Mitigation Plan. (Other GHG emissions may be significant in certain types of projects, and should be addressed in the analysis, as the case may be). There should be sufficient detail in plans and other information submitted with the DRI application to support the analysis and proposed mitigation approaches (e.g., construction plans/notes describing the building size, envelope attributes, operation schedule, building systems, occupancy, and other information necessary to describe the building relative to estimating energy consumption and calculating GHG emissions; transportation documents like TIAS, TDM plans, etc.)

In order to better frame a project's impacts and evidence the effectiveness of its proposed mitigation approaches, an applicant may submit a quantitative estimate of its GHG emissions under existing and proposed conditions, including different scenarios with or without proposed mitigation factored into the calculations. The Commission anticipates preparing further guidance in the near future on how to quantify GHG emissions for a proposed development under DRI review. In the meantime, an applicant who proposes to submit estimated GHG emissions calculations for DRI review can reference the MEPA GHG policy (which includes guidance on calculating emissions from development for purposes of MEPA review) as well as the Barnstable County GHG

Inventory. For DRI projects that were also subject to MEPA (and which prepared GHG calculations for MEPA review), an applicant can submit these calculations for the Commission to consider under DRI review. As part of this quantification, an applicant could estimate the anticipated building energy use of the building/s for the proposed project using energy modeling software, including all fuels proposed to be used on-site.

RESOURCES FOR GHG IMPACT ANALYSIS AND MITIGATION PLAN

World Resources Institute/World Business Council for Sustainable Development Greenhouse Gas Protocol Initiative (www.ghgprotocol.org)

Calculation Tool for Direct Emissions from Stationary Combustion Sources: "GHG Tool for Stationary Combustion" (https://ghgprotocol.org/calculation-tools#sector_specific_tools_id)

Emissions Factors and GWPs: MassDEP Emissions Factor Calculation "Calculation of 2017 GHG Emission Factors" (https://www.mass.gov/doc/calculation-of-2017-ghg-emission-factors/download), "GWPs & EFs" tab, located at Massachusetts Greenhouse Gas (GHG) Reporting Program Data (https://www.mass.gov/lists/massachusetts-greenhouse-gas-ghg-reporting-program-data)

"2017 ISO New England Electric Generator Air Emissions Report" (https://www.iso-ne.com/static-assets/documents/2019/04/2017_emissions_report.pdf)

U.S. Energy Information Administration Energy Conversion Calculators (https://www.eia.gov/energyexplained/units-and-calculators/energy-conversion-calculators.php)

U.S. Energy Information Administration Carbon Dioxide Emissions Coefficients (https://www.eia.gov/environment/emissions/co2_vol_mass.php)

U.S. Department of Energy Building Energy Modeling (https://www.energy.gov/eere/buildings/building-energy-modeling)

"Revised MEPA Greenhouse Gas Emissions Policy and Protocol", effective date May 5, 2010 http://www.env.state.ma.us/mepa/downloads/GHG%20Policy%20FINAL.pdf .

REFERENCES AND RESOURCES

Passive House Institute US (PHIUS) (https://www.phius.org/home-page)

"Siting Electric Vehicle Charging Stations on Cape Cod" (https://capecodcommission.org/ev-siting-analysis)

Cape Cod Greenhouse Gas Emissions Inventory (https://capecodcommission.org/our-work/greenhouse-gas-emissions-inventory/)

Solar Screening Tool (https://www.capecodcommission.org/our-work/solar-screening-tool/)

U.S. Department of Energy National Renewable Energy Lab Solar Ready Planning (https://www.nrel.gov/state-local-tribal/blog/posts/solar-ready-building-design-a-summary-of-technical-considerations.html) and "Solar Ready Buildings Planning Guide", December 2009 (https://www.nrel.gov/docs/fy10osti/46078.pdf)

Cultural Heritage

This guidance is intended to clarify how the Cultural Heritage Goal and Objectives of the Regional Policy Plan (RPP) are to be applied and interpreted in Cape Cod Commission Development of Regional Impact (DRI) project review. This technical bulletin presents specific methods by which a project can meet these goals and objectives.

Cultural Heritage Goal: To protect and preserve the significant cultural, historic, and archeological values and resources of Cape Cod.

- ***Objective CH1 –*** *Protect and preserve forms, layouts, scale, massing, and key character defining features of historic resources, including traditional development patterns of villages and neighborhoods.*
- ***Objective CH2*** *– Protect and preserve archaeological resources and assets from alteration or relocation.*
- ***Objective CH3*** *– Preserve and enhance public access and rights to and along the shore.*
- ***Objective CH4*** *– Protect and preserve traditional agricultural and maritime development and uses.*

The applicability and materiality of these goals and objectives to a project will be determined on a case-by-case basis considering a number of factors including the location, context (as defined by the Placetype of the location), scale, use, and other characteristics of a project.

THE ROLE OF CAPE COD PLACETYPES

The RPP incorporates *a framework for regional land use policies and regulations based on local form and context* as identified through categories of Placetypes found and desired on Cape Cod.

The Placetypes are determined in two ways: some are depicted on a map contained within the RPP Data Viewer located at www.capecodcommission.org/RPPDataViewer adopted by the Commission as part of the Technical Guidance for review of DRIs, which may be amended from time to time as land use patterns and regional land use priorities change, and the remainder are determined using the character descriptions set forth in Section 8 of the RPP and the Technical Guidance.

The project context, as defined by the Placetype of the location, provides the lens through which the Commission will review the project under the RPP. Additional detail can be found in the Cape Cod Placetypes section of the Technical Guidance.

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NOTE ON APPLICATION MATERIALS, DEFINITIONS, RESOURCES AND REFERENCES

Application materials should provide sufficient detail to demonstrate that the project meets the applicable Objectives, but typically include an assessment of cultural resources on the project site and in the project vicinity as detailed on page CH-16.

Definitions of key terms, including Historic Resource, are presented on page CH-17.

INTRODUCTION

Historic and archaeological sites reflect the evolution and growth of a property over long periods of time, providing glimpses into many different eras in the region's history. Preserving these properties protects an important educational resource, but preservation does not necessarily mean that change cannot continue. Change is inevitable in buildings and neighborhoods. The challenge is to accommodate change while still protecting the most historically significant aspects of a property or district. Preserving these resources carries forward regional traditions in which buildings were typically added to incrementally, without destroying the work of previous generations.

Protecting public access to the shore and facilitating agricultural and maritime uses that are linked to the region's historic development and traditional occupations also preserves an important legacy. Reinforcing public trust rights for fishing, fowling and navigation along the shore ensures continued recreational opportunities and visual access in the face of ever increasing development pressures. Similarly, maintaining key agricultural lands and sheltered harbors for traditional uses acknowledges the potential for these and similar uses to become more prominent again and preserves these resources for future generations.

SUMMARY OF METHODS

GOAL | CULTURAL HERITAGE

To protect and preserve the significant cultural, historic, and archeological values and resources of Cape Cod.

OBJECTIVE CH1 – Protect and preserve forms, layouts, scale, massing, and key character defining features of historic resources, including traditional development patterns of villages and neighborhoods.

METHODS

- Renovate, re-use and incorporate historic structures into new development proposals in a way that retains their original building materials, including the structural frame and exterior architectural trim.
- Design changes or alterations to historic structures to be reversible (as discussed in the Secretary of the Interior's Standards), so that they can be undone in the future without loss of significant historic materials and original architectural features.
- Locate additions to historic structures on secondary facades and stepped back from the original structure to limit demolition of original materials and ensure that addition is secondary to the original building.
- Site new development outside of cultural landscapes such as open farmlands or designed parks and gardens, or locate at their periphery to preserve their unique character.

OBJECTIVE CH1 AREAS OF EMPHASIS BY PLACETYPE

Natural Areas and Rural Development Areas | Preserve historic resources while also limiting new development footprints and maintaining rural character. Protect entirety of cultural landscapes to maintain rural development pattern.

Suburban Development Areas | Preserve historic resources and allow appropriate alterations that are consistent with character of the historic resource.

Historic Areas and Maritime Areas | Preserve historic resources, allowing limited, appropriate alteration or expansion only if consistent with surrounding character area.

Community Activity Centers | Preserve historic resources and allow appropriate alteration or expansion that is consistent with the character of the historic resource.

Industrial Activity Centers and Military and Transportation Areas | Preserve historic resources; possibly allow relocation if jeopardized by incompatible development.

OBJECTIVE CH2 – Protect and preserve archaeological resources and assets from alteration or relocation.

METHODS

- Site new development away from significant archaeological sites so they are not disturbed.
- Place permanent Preservation Restrictions (PR) or Conservation Restrictions (CR) on significant archaeological sites to protect them in situ for the future.

OBJECTIVE CH2 AREAS OF EMPHASIS BY PLACETYPE

Natural Areas and Rural Development Areas | Preserve significant archaeological sites in their entirety and protect them with permanent restrictions from development.

All Other Placetypes | Preserve significant archaeological sites and protect them from disturbance.

OBJECTIVE CH3 – Preserve and enhance public access and rights to and along the shore.

METHODS

- Provide public access to the shoreline for any new coastal development without impairing the natural beneficial functions of natural resources.
- Maintain and broaden existing physical and/or visual access to the coast wherever possible.
- Restore historic public access to the shore, both physical and visual, wherever possible.
- Protect existing access to the coast with permanent Conservation Restrictions or Easements.

OBJECTIVE CH3 AREAS OF EMPHASIS BY PLACETYPE

For All Placetypes | Maintain existing public access routes and views to the shore; provide additional public access if possible without harming natural resources.

OBJECTIVE CH4 – Protect and preserve traditional agricultural and maritime development and uses.

METHODS

- Maintain or restore traditional industries that contribute to economic diversity and preserve historical traditions.
- Place Preservation Restrictions (PR) or Conservation Restrictions (CR) on farmlands that are noted in historic or cultural landscape inventories or listed on the National Register of Historic Places.
- If present, retain existing maritime industrial structures and allow for continued maritime industrial use on the project site.
- For improvements or expansion of existing maritime industrial buildings, retain their maritime industrial or water-dependent use.
- For new or expanded coastal development that is not maritime industrial, set aside land area for traditional maritime industries and public access to the water.

OBJECTIVE CH4 AREAS OF EMPHASIS BY PLACETYPE

Natural Areas and Rural Development Areas | Retain existing agricultural uses and maritime industries that are compatible with natural resource protection; consider using Preservation Restrictions and Conservation Restrictions to permanently protect their open landscapes.

Suburban Development Areas | Require any new development to be designed to cluster away from existing agricultural or maritime industrial uses.

Historic Areas and Maritime Areas | Preserve traditional agricultural and maritime uses; consider Preservation Restrictions or Conservation Restrictions on historic agricultural landscapes and maritime areas to permanently protect them.

Community Activity Centers | Require any new coastal development to preserve existing maritime industries and to reserve land area for traditional maritime industries and public views to the water.

Industrial Activity Centers | Require any new development to limit impacts on existing agricultural or maritime industrial uses.

DETAILED METHODS FOR MEETING OBJECTIVE CH1

Objective CH1 *– Protect and preserve forms, layouts, scale, massing, and key character defining features of historic resources, including traditional development patterns of villages and neighborhoods.*

The following methods may be implemented to demonstrate consistency with Objective CH1.

Identify Historic Resources

The first step in protecting historic resources is identifying those that may be impacted by a proposed project. Identifying historic resources on the project site and in the project vicinity will require checking existing cultural resource inventories as well as site inspection. Many historic resources have been inventoried in MACRIS, the Massachusetts Cultural Resource Inventory System, which includes information on properties described on historic inventory forms as well as those listed on the National Register of Historic Places or protected by Local Historic Districts and Preservation Restrictions. Some significant historic resources have never been inventoried or given a special designation. To insure that important properties are not overlooked, any existing building on site should be inspected and researched to determine if it meets the definition of historic resource. Town Historical Commissions and Local Historical Societies are a potential source of information about existing buildings.

Renovate and Re-use Historic Properties

Historic properties reveal information about a community's history and character that cannot be duplicated. They are a non-renewable resource. As such, significant historic structures should always be preserved and incorporated into new development proposals in a way that preserves the character-defining features of the resource. Historic structures may be renovated to become part of the primary new use, or they may be retained as a separate use on the property. Demolition should be considered only if the historic resource is no longer found to be significant. There is a presumption that all properties on the National Register of Historic Places, whether individually listed or "contributing" members of a district, are significant. Any demolition request based upon structural instability or deterioration will require a technical report prepared by a registered architect or engineer approved by the Commission.

The original site and setting of the historic structure should also be retained as it is part of the historic record, but in some cases it may be appropriate to allow a historic building to be relocated elsewhere on the project property or elsewhere in the community. Issues to consider in whether relocation may be appropriate include whether the building has been moved in the past (and thus may be tied less strongly to its existing site), whether the building has a unique and special relationship to features on its site (and thus has important relationships that would be hard to duplicate on another site), and whether the building stands alone or is part of a distinctive neighborhood of related structures (a group of related structures should be kept together to preserve their collective story). If the Commission finds that an historic structure is threatened by erosion or coastal flooding, relocation may be appropriate, preferably within the same community and in a similar setting.

Allowing Change in Historic Properties/Secretary's Standards

There are many facets of an historic building or property that contribute to its historic qualities or significance, including its materials, construction type, architectural style, and association with important events or people. A complete understanding of any property may require research about its style, construction, and function; knowledge about the original building, owner, and later occupants; and information about the evolutionary history of the building.

For all historic properties, the goal is to preserve as much of the historic structure (its framing materials, sheathing and architectural detailing) as possible to retain existing evidence about the building's construction and history. There is an intrinsic value in the original historic materials used because they reveal not only the builders' choice of materials but also the engineering and construction methods available.

Many historic buildings have evolved and changed over time, whether to accommodate a new profession, a growing family, or new technologies. It is possible for historic structures to continue to evolve to meet modern needs, but that evolution should occur without destroying historically significant elements contained in the existing structure. This is the concept of "reversibility" that is used by preservationists in evaluating whether proposed changes can be undone at some time in the future without the loss of many significant materials. It is also consistent with traditional regional patterns of adding incrementally to buildings.

The most recognized standards for evaluating acceptable changes to historic structures are the Secretary of the Interior's Standards for Treatment of Historic Properties [https://www.nps.gov/tps/standards.htm], developed by the National Park Service and used by preservation professionals across the country. For properties where re-use and renovation is expected, the Secretary's Standards for Rehabilitation [https://www.nps.gov/tps/standards/rehabilitation.htm] are used.

Consistent with the Secretary's Standards, the Commission will focus on these elements in reviewing proposed additions or alterations to historic buildings:

1. Preserve significant historic materials and original features. New additions should be designed to require little removal of original historic materials. Additions are preferably attached to secondary or less prominent facades of the building and placed so as to limit the removal of distinctive architectural features and trim. If the proposed addition is large, a smaller connecting mass to link the old and new construction will require less removal of historic material. Original architectural details such as window and door surrounds, corner boards, and moldings should be retained and repaired where possible, rather than removed and replaced with entirely new features.
2. Preserve the building's historic character. A new addition or alteration should aim to complement and be compatible with the character of the historic building, not overwhelm it, using similar size, scale, massings and proportions. To avoid changing the primary historic form too much, follow the region's traditional means of expanding buildings through the use of side or rear additions under separate rooflines, or the use of dormers within the roof slope to expand usable top floor space. There are several ways to design an addition without overwhelming the original building – by stepping back from the historic façade, or by incorporating a recessed area between the old and new portions of the building so that the original building form remains distinct and prominent.
3. Make a visual distinction between old and new. New additions/alterations to historic buildings should be distinguishable from the original structure to avoid a false sense of history. Plan the new addition in a manner that provides some differentiation in material, color and detailing so that the new work does not appear to be part of the historic building mass. The addition of porches, decks, or other exterior features should be designed without removing significant historic building

material so that they can be later removed without harming the building's historic integrity.

Working in Cultural Landscapes

Cultural Landscapes are places that combine both cultural and natural resources, revealing aspects of our region's origins and development as well as our revolving relationship with the natural world. Identifying cultural landscapes is the first step in protecting them. Cultural landscapes can take several forms – historic sites, designed landscapes, vernacular landscapes, and ethnographic landscapes – and they may overlap. As defined by the Secretary of the Interior, an historic site is a landscape significant for its association with an historic event, activity or person, such as a presidential homestead or battlefield. Historic designed landscapes are those laid out by a landscape architect or other designer, and include formal parks, campuses and estates. Historic vernacular landscapes are lands that have evolved through use by the people whose activities or occupancy shaped them, such as a farmstead, an industrial complex, a cranberry bog trail system, or a rural village along a river valley. Ethnographic landscapes contain a variety of natural and cultural resources that the associated people define as heritage resources and often include unique natural landforms or sacred religious sites.

These landscapes are important to understanding our culture and they help to define the character of our region. Many Cape towns have a partial inventory of their cultural landscapes, with some properties identified by graduate students as part of a regional inventory effort, and others named as part of a town-wide historic resource inventory. While some cultural landscapes are included in MACRIS, many have not yet been inventoried. Commission staff may be consulted to help identify these resources in areas where no inventory has been completed.

As with other historic resources, the character-defining features of a cultural landscape should be preserved to maintain the integrity of the resource. It can be challenging to accommodate new development on a cultural landscape and new development will only be acceptable if it preserves significant existing cultural and natural features.

DETAILED METHODS FOR MEETING OBJECTIVE CH2

Objective CH2 *– Protect and preserve archaeological resources and assets from alteration or relocation.*

The following methods may be implemented to demonstrate consistency with Objective CH2.

Protecting Archaeological Resources

Any work on undeveloped properties, or on land that has not been disturbed in recent history, requires consideration of archaeological resources to determine whether significant resources are present. All archaeological investigations and site work requires a permit from the State Archaeologist at Massachusetts Historical Commission (MHC). MHC maintains an inventory of known archaeological sites and uses that information to build a predictive model to estimate where other archaeological sites are likely to be found. If a property is thought to be archaeologically sensitive, or likely to contain archaeological resources, an archaeological survey will be required.

Archaeological sites and archaeological resources hold clues to the past that are best understood when the resources are seen in their original arrangement and setting. As such, resource recovery or the removal of archaeological resources should be considered only as a last resort. Some archaeological sites that are subject to coastal erosion or other natural processes may need to be recovered and documented now, but the same is not true of sites located on higher ground. It is generally believed that archaeological resources are best protected by keeping them in place as long as possible, with the expectation that future societies will have even greater ability to fully document and analyze their significance.

Underwater archaeological resources are addressed in the Ocean Resources section of the RPP and are surveyed and protected in concert with the Massachusetts Board of Underwater Archaeological Resources (MBUAR).

DETAILED METHODS FOR MEETING OBJECTIVE CH3

Objective CH3 *– Preserve and enhance public access and rights to and along the shore*

The following methods may be implemented to demonstrate consistency with Objective CH3.

Maintain and Expand Existing Public Access to the Shore

Much of the Massachusetts coast and tidelands are privately owned, though under Massachusetts law, rights of public use for fishing, fowling and navigation are reserved in private tidelands. Public access to many coastal areas is already limited and this continues to be a problem as development increases along the coast and erosion impacts some access points. The Commission strives to preserve any existing public access points, to restore historic public rights of way, and to expand public access to the shore, especially in areas where there are few existing public access points.

Existing and new public access to the shore may take many forms, including pathways, parks or view corridors, but must also consider potential impacts on natural and historic or archaeological resources. New walkways are encouraged if they enhance shoreline access for the public, including people with disabilities, but they should not be pursued if they degrade undisturbed resources or create adverse impacts to habitat, aesthetics or storm damage prevention. Coastal engineering structures should be designed to allow the public to pass along the shore (either above or below the structures) in the exercise of its public trust rights to fishing, fowling and navigation. In development or redevelopment of water-dependent facilities, public access to the shore should be included through means such as viewing areas, pedestrian pathways, seating areas and boat launches. Some forms of public access may contribute to meeting open space goals. Reference Open Space section for a discussion of open space requirements. Reference Coastal Resiliency and Wetlands sections for a discussion of natural processes and the beneficial function of natural resources which could be impacted by expanding public access.

DETAILED METHODS FOR MEETING OBJECTIVE CH4

Objective CH4 *– Protect and preserve traditional agricultural and maritime development and uses*

The following methods may be implemented to demonstrate consistency with Objective CH4.

Preserving Traditional Uses

The Cape's traditional industries include the agricultural and maritime industries that are responsible for much of the region's historic growth. A combination of agriculture and maritime pursuits has sustained the Cape's residents from its earliest inhabitants to today. Agricultural lands became more significant and began to produce crops for a larger region in the 19th century, but many of these lands were gradually replaced by tourist and second home development as the Cape grew in popularity. Maritime industries in the region reached their peak during the early 1800s, with shipbuilding, fishing and all their related industries bringing new development to the region's harbors and waterways. The prominence of these industries and the area devoted to them has been greatly reduced in more recent history, but the region maintains both working agricultural lands and working harbors. Shell and fin fishing, boat building industries, and agricultural pursuits preserve a traditional way of life in the region and help to maintain some of the Cape's character-defining elements.

Other water-dependent uses such as scientific study of the oceans, commercial and recreational boating have also become traditions in the region. Access for these and the traditional water-dependent industries needs to be maintained. Unless there is an over-riding public benefit provided, water-dependent uses should not be changed to non-water dependent uses. Encroachment from other forms of development should be limited, and historic maritime buildings should be preserved and reused whenever possible. FEMA regulations acknowledge the value of protecting certain historic structures in flood hazard areas and include special provisions to encourage their preservation.

Similarly, historic agricultural lands and other working agricultural lands must be retained to prevent further loss of these dwindling resources that speak to the Cape's agricultural past. With the growing popularity of farm stands and the local food

movement, regional interest in agricultural pursuits has increased. In preserving these traditional uses, the region helps to protect both economic diversity and flexibility to adapt to future needs and interests.

One way to protect traditional industries is to permanently restrict land for those uses. Conservation Restrictions, Preservation Restrictions and Agricultural Preservation Restrictions are all tools allowed under Massachusetts General Law that can protect land or building features in perpetuity. They can be particularly useful in maintaining open natural areas that were once part of traditional land-based industries, and preserving historic barns and fields for continued agricultural production. Protection efforts should also focus on limiting new development to a small portion of an agricultural property, clustering it in an area that is least suited for agricultural uses, and protecting the remaining land area for continued traditional use.

GENERAL APPLICATION REQUIREMENTS

Applicants are encouraged to reach out to Cape Cod Commission staff early in the application preparation process to discuss application materials necessary to demonstrate that the project meets the applicable goal and objectives. In almost all cases, application materials will include an assessment of cultural resources on the project site and in the project vicinity, as follows:

- Identify historic resources on the project site and on nearby properties that might be impacted by the proposed development.
- Evaluate all properties for archaeological sensitivity by filing a Project Notification Form (PNF) with Massachusetts Historical Commission (MHC) and determining whether intensive survey work is necessary.
- Identify existing public access to the shore on the subject property and adjacent properties.
- Identify agricultural lands and/or maritime industrial uses on the project site.

DEFINITIONS

Historic Resource – any building, structure or site that has historic significance due to its age; association with events that are historically significant; association with persons significant in our past; embodiment of distinctive characteristics of a type, period, or method of construction; or likelihood of yielding information significant in history or pre-history. This includes resources inventoried on the Massachusetts Cultural Resource Inventory System (MACRIS) and listed on the State or National Registers of Historic Places, as well as resources of significance based on the above criteria that have not yet been inventoried or designated.

Historic District – a collection of historic structures and/or sites within a defined area designated either as a Local Historic District under Chapter 40C of MGL, as a Local or Regional District created by Special Legislation under MGL, or an area listed on the National Register of Historic Places as a District or Multiple Resource Area.

Cultural Landscape – a geographic area associated with an historic event, activity, or person, or exhibiting other cultural or aesthetic values. There are four general types of cultural landscapes, not mutually exclusive: historic sites, historic designed landscapes, historic vernacular landscapes, and ethnographic landscapes.

Substantial Alteration – an alteration that jeopardizes an historic resource's continuing individual eligibility for listing in the National Register of Historic Places, or its continuing status as a contributing structure in a National Register Historic District.

Economy

This guidance is intended to clarify how the Economy Goal and Objectives of the Regional Policy Plan (RPP) are to be applied and interpreted in Cape Cod Commission Development of Regional Impact (DRI) project review. This technical bulletin presents specific methods by which a project can meet these goals and objectives.

Economy Goal: To promote a sustainable regional economy comprised of a broad range of businesses providing employment opportunities to a diverse workforce.

- ***Objective EC1*** *– Protect and build on the Cape's competitive advantages*
- ***Objective EC2*** *– Use resources and infrastructure efficiently*
- ***Objective EC3*** *– Foster a balanced and diverse mix of business and industry*
- ***Objective EC4*** *– Encourage industries that provide living wage jobs to a diverse workforce*
- ***Objective EC5*** *– Expand economic activity and regional wealth through exports, value added, import substitution, and local ownership*

The applicability and materiality of these goals and objectives to a project will be determined on a case-by-case basis considering a number of factors including the location, context (as defined by the Placetype of the location), scale, use, and other characteristics of a project.

THE ROLE OF CAPE COD PLACETYPES

The RPP incorporates *a framework for regional land use policies and regulations based on local form and context* as identified through categories of Placetypes found and desired on Cape Cod.

The Placetypes are determined in two ways: some are depicted on a map contained within the RPP Data Viewer located at www.capecodcommission.org/RPPDataViewer adopted by the Commission as part of the Technical Guidance for review of DRIs, which may be amended from time to time as land use patterns and regional land use priorities change, and the remainder are determined using the character descriptions set forth in Section 8 of the RPP and the Technical Guidance.

The project context, as defined by the Placetype of the location, provides the lens through which the Commission will review the project under the RPP. Additional detail can be found in the Cape Cod Placetypes section of the Technical Guidance.

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INTRODUCTION

The stated purposes of the Cape Cod Commission Act ("the Act") acknowledge that our regional economy is inextricably linked to the health and appeal of our natural and built environment by calling for the Commission to "maintain and enhance sound local and regional economies, and to ensure balanced economic development" while protecting the unique values of the region. To achieve these purposes set forth in the Act, the Commission is charged with "promot[ing] the expansion of employment opportunities; implement[ing] a balanced and sustainable economic development strategy for Cape Cod capable of absorbing the effects of seasonal fluctuations in economic activity," and "establish[ing] a process and procedures to site and develop capital facilities and developments of regional impact which are necessary to ensure a balanced economy."

This technical bulletin serves to clarify the goals and objectives of the Regional Policy Plan (RPP) that pertain to the Cape Cod economy. Its purpose is to help applicants for development projects interpret and apply the basic economic principles contained in the RPP Economy Goal and Objectives. This guidance presents a variety of methods, a project can meet this Goal and related Objectives.

SUMMARY OF METHODS

GOAL | ECONOMY

To promote a sustainable regional economy comprised of a broad range of businesses providing employment opportunities to a diverse workforce.

OBJECTIVE EC1 – Protect and build on the Cape's competitive advantages

METHODS

- Reinforce historic development patterns through community design
- Cluster development to preserve high-quality open space
- Incorporate uses that promote walkability and/or use multiple modes of transportation
- Improve the design and function of commercial roadway corridors
- Preserve historic structures or buildings, areas, and/or landscapes
- Project proposes adaptive re-use, including re-use of historic structures
- Preserve agricultural lands and operations
- Preserve or complement the continued operation of working waterfronts
- Preserve or expand public access to the coast and natural areas for passive recreation
- Preserve access to and the continued viability of working shell/fin fishing grounds
- Restore and/or protect open space in Natural Areas

OBJECTIVE EC1 AREAS OF EMPHASIS BY PLACETYPE

Natural Areas | Protect these areas from development; as part of development proposal, remove development in these areas to restore rural character and improve resilience.

Rural Development Areas | Cluster development at appropriate scale to preserve rural character; protect agricultural, cultural and historic resources

Suburban Development Areas | Re-development encourage to focus development in areas with infrastructure

Historic Areas | Protect, restore and re-use historic structures; development should complement the scale of historic structures and landscapes

Maritime Areas | Preserve maritime industries and working waterfront uses

Community Activity Centers | Encourage uses with high pedestrian activity; encourage development of mixed use and multi-family housing
Industrial Activity Centers | Encourage uses involved in the creation and production of goods, technology, or other products
Military and Transportation Areas | Development should not conflict with the continued use of these areas for their specialized purposes

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OBJECTIVE EC2 – Use resources and infrastructure efficiently

METHODS

- Re-use or redevelop existing structures
- Includes infill and/or redevelopment
- Accessible by multiple modes of transportation
- Includes mixed-use buildings and/or a mix of uses on site
- Cluster development to reduce the cost of providing infrastructure
- Shares onsite infrastructure with proximate developments
- Provides renewable energy generation onsite that serves uses on and proximate to the site
- Expands last-mile connections to open access telecommunication networks
- Project undergrounds new utilities to reduce storm outages
- Project undergrounds existing overhead utility infrastructure
- Encourages extension or expansion of public transit
- Avoids development of infrastructure in Natural Areas

OBJECTIVE EC2 AREAS OF EMPHASIS BY PLACETYPE

Natural Areas | Preserve, protect and restore natural resources such as wetlands, salt marshes that provide ecosystems services and improve community resilience
Rural Development Areas | Cluster development on a portion of the site to protect resources, share infrastructure, and create a smaller development footprint
Suburban Development Areas | Focus development and encourage infill and/or reuse where infrastructure is available; restore degraded natural resources
Historic Areas and Maritime Areas| Provide infrastructure in these areas at appropriate scale; protect historic, maritime, and cultural resources

Community Activity Centers | Focus infrastructure and capital facilities development in these areas; encourage development of multi-family housing and mixed-use commercial space

Industrial Activity Centers and Military and Transportation Areas | Encourage generation of renewable energy on impervious areas or otherwise disturbed areas; encourage use of shared infrastructure

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OBJECTIVE EC3 – Foster a balanced and diverse mix of business and industry

METHODS

- Provide employment opportunities in emerging industry clusters, including marine science and technology industries
- Support entrepreneurship and the development of new businesses, technologies and/or products
- Support artist and other creative occupations
- Building design accommodates a range of uses

OBJECTIVE EC4 – Encourage industries that provide living wage jobs to a diverse workforce

METHODS

- Create jobs, with an emphasis on year-round jobs
- Create jobs, with an emphasis on jobs that pay above-average wages relative to similar occupations and industries in the region and relative to the region as a whole
- Provide employees with training for career advancement
- Provide employees with paid sick, vacation, medical and disability benefits
- Provide affordable housing for employees (year-round and/or seasonal)

OBJECTIVE EC5 – Expand economic activity and regional wealth through exports, value added, import substitution, and local ownership

METHODS

- Project provides space for small local businesses
- Project enhances or supports research and development activities
- Support businesses selling locally grown or produced products
- Support businesses that export goods
- Support businesses developing goods locally that were previously imported
- Support businesses that add value to local raw materials

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE EC1

Objective EC1 *– Protect and build on the Cape's competitive advantages*

This Economy objective is based on the principles of competitive advantage – attributes and characteristics that make Cape Cod unique and economically viable. According to the 2014 Comprehensive Economic Development Strategy, Cape Cod's core economic asset is our natural environment, followed closely by our historic villages. In the past, the natural environment directly provided for the region's economy through farming, fishing, and maritime occupations. Today, the coastal environment and historic villages continue to play a vital role in making Cape Cod a coveted destination for tourists, second-home owners, and retirees.

The intent of objective EC1 is to maintain and enhance natural areas that provide vital ecosystem services, and to encourage development and emerging industries that leverage these natural assets into growing regional wealth. In order to preserve and protect the assets that make Cape Cod a desirable region for residents and visitors alike, the vision of this RPP is to restore these environments through infrastructure investments, protecting open space, and preserving the region's historic and cultural resources. The methods identified under this objective focus on ways redevelopment and new development can protect the region's key competitive advantages to meet Objective EC1.

Development location and design are also important factors in maintaining the region's economic health. The methods in EC1 are focused on the design of development to minimize sprawl, improve walkability and use of multiple forms of transit, increasing mixed use development, clustering development within a site, and preserving natural and sensitive areas. The Community Design and Cultural Heritage technical bulletins provide additional information on how to locate and design developments to complement the Cape's historic development pattern, building designs, and scale.

Several methods focus on the protection of traditional natural resources-based assets, specifically agricultural lands, harbors, and shell or fin fishing grounds. These areas continue to be important to community health and to our competitive advantage as a destination.

Objective EC1 - Areas of Emphasis by Placetype

NATURAL AREAS

Natural Areas are important economic assets that should be restored and preserved. New regional-scale commercial and residential development should avoid these areas altogether unless there is an overriding justification for locating in these sensitive areas. Where avoiding these areas is not possible, applicants should seek to remove existing development and/or restore sensitive natural resources present in these areas.

RURAL DEVELOPMENT AREAS

In Rural Development Areas, development should seek to cluster residential development at an appropriate scale to preserve rural character of these areas, and to protect the region's valuable agricultural, cultural and historic resources.

COMMUNITY ACTIVITY CENTERS

For Community Activity Centers to be truly vibrant and desirable locations to live, work, and visit, they must have a wide array of uses and a walkable urban form. Development that generates high pedestrian activity and/or includes a housing component are encouraged in these areas, as well as businesses that provide local services for both residents and visitors.

HISTORIC AREAS

Many centers of activity are also historic areas on Cape Cod. Development in these areas should therefore protect, restore and re-use historic structures. Where new structures are proposed, they should complement the scale of historic structures and landscapes.

SUBURBAN DEVELOPMENT AREAS

Suburban Development Areas were primarily developed to accommodate the automobile and fit national business models. The Cape economy will see long-term benefits from the redevelopment of these areas to reflect more compact land use patterns. Development in these areas should seek to improve the design of these areas to focus development in areas with infrastructure, including access to transit and bicycle networks.

INDUSTRIAL ACTIVITY CENTERS

Industrial Activity Centers are important economic assets, preserving land specifically to accommodate uses that are best separated from residential and other commercial activities, such as manufacturing, assembly, warehousing, and utilities. Development in these areas should be clustered to reduce their overall development footprint and preserve forested areas and natural resource assets.

MARITIME AREAS & MILITARY AND TRANSPORTATION AREAS

Maritime Areas and Military & Transportation Areas have unique roles in the regional economy that new development and redevelopment should reinforce through compatible development and uses that complement and support the continued use of these areas for their specialized purposes such as fishing, agriculture, compatible military training and regional transportation facilities.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE EC2

Objective EC2 *– Use resources and infrastructure efficiently*

Development relies on infrastructure to provide energy, waste management, transportation and communications services. The region's existing land use pattern and lack of available infrastructure are significant challenges to economic development. To retain the region's competitive advantage, development is strongly encouraged to locate in areas served by public transit, water and wastewater. In addition, development should use available resources efficiently by developing in a compact form and including a mix of uses to encourage pedestrian activity. If new infrastructure is proposed as part of a development, it should be designed to encourage shared use by adjacent development. Finally, development should invest in renewable sources of energy on-site and underground utilities whenever possible to reduce demand on the electrical grid and reduce storm outages.

Objective EC2 - Areas of Emphasis by Placetype

NATURAL AREAS

Natural Areas contain valuable natural resources that absorb the by-products of human activity and provide beneficial ecosystem services. Projects should be designed to avoid development of new infrastructure in these areas.

RURAL DEVELOPMENT AREAS

In order to protect valuable historic and/or cultural resources, development in Rural Development Areas should seek to cluster development on a portion of the site to reduce the development footprint, protect resources and reduce the cost of providing infrastructure, and/or seek opportunities to share infrastructure with nearby developments.

SUBURBAN DEVELOPMENT AREAS

Development in these areas should be focused on areas with adequate infrastructure. Infill development is encouraged where infrastructure exists to reduce costs of infrastructure and facilitate non-auto transportation options. Restoration of degraded or impacted natural resources is also encouraged

HISTORIC AREAS AND MARITIME AREAS

In Historic Areas and Maritime Areas, development should focus on redevelopment, infill and/or re-use of historic structures. Infrastructure should be designed at an appropriate scale in these areas to protect historic, maritime, and cultural resources.

COMMUNITY ACTIVITY CENTERS

Development is encouraged to provide or support existing infrastructure in these areas for the development of multi-family housing, mixed-use commercial space, and other uses in a compact, walkable environment.

INDUSTRIAL ACTIVITY CENTERS AND MILITARY & TRANSPORTATION AREAS

Industrial Activity Centers and Military & Transportation Areas may present an opportunity to advance the generation of renewable energy using existing impervious or otherwise disturbed areas. Building rooftops and parking areas should be considered for solar and other renewable sources of energy where appropriate. Renewable energy generation in combination with appropriate industrial uses are strongly encouraged to reduce industry's reliance on fossil fuels and to support the development of new technologies.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE EC3

Objective EC3 *– Foster a balanced and diverse mix of business and industry*

Development that helps diversify the region's economic mix and are flexible to changes in markets will best serve Cape residents over the long term. Projects that provide high-quality employment opportunities while building flexible spaces can help support new and emerging industries, entrepreneurship (especially where it results in technologies or products that can restore our natural environment), and/or artistic or creative occupations will provide greater economic diversity and resiliency.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE EC4

Objective EC4 *– Encourage industries that provide living wage jobs to a diverse workforce*

The cost of living and heavy demand for leisure related services and housing limit both workforce and business diversity in the region. Current employers have difficulty retaining and attracting labor to this region as the cost of living far outstrips the average wage in the top industries. As a result, current employers offering both low and high skill jobs, have difficulty retaining and attracting labor to this region. While these challenges are systemic and individual development projects cannot fix them, development can offer the wages, job benefits, opportunities for employment and improvement, and the economic diversity that will help move the region closer to the goal of a sustainable, diverse, and resilient economy.

Development can show they support long-term workforce diversity by documenting how the project will provide high-quality employment opportunities or how the project will address the region's high cost of living. Projects could provide workers with housing, housing vouchers, or down payment assistance, or contribute indirectly by building more affordable housing in areas easily accessed by transit.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE EC5

Objective EC5 *– Expand economic activity and regional wealth through exports, value added, import substitution, and local ownership*

The regional economy expands when products made locally, are sold to non-residents (that is, exported), or when goods previously imported are made and sold locally (known as import substitution). The size of the economy is also impacted by business ownership; locally-owned businesses retain and circulate money within the regional economy to a greater degree than non-local businesses.

An applicant may document ways in which the development will reduce the need for goods or services from off-Cape, add value to local products, or export local products to other regions. An applicant could also show how they will support research and development that could lead to a net increase in regional economic activity. Another way to achieve this objective is for projects to accommodate space for locally-owned businesses.

GENERAL APPLICATION REQUIREMENTS

All applicants must provide an Economic Narrative with their initial DRI application. The narrative should include a brief description of the project and describe the methods by which the applicant will meet the Economy Goal and Objectives. Depending on various factors such as project location, geographic context (as defined by the Placetypes), scale, and proposed use, an applicant may be required to complete a full Economic Impact Assessment (EIA), in addition to the Economic Narrative. The required elements of these documents are outlined below.

ECONOMIC NARRATIVE

An Economic Narrative should include the following:

- Brief description of the proposed development project, including a description of the products or services that the project will provide and the customers this project will primarily serve (for example, residents of the region, summer residents/second homeowners, tourists, or customers located outside the region);
- Description of the basic elements of the development project, how much it will cost to construct (i.e. total investment including all design and permitting costs), and how many jobs will be created, and expected wages and salaries;
- Narrative describing the methods used to meet the Economy Goal and related Objectives.

ECONOMIC IMPACT ASSESSMENT (EIA)

An EIA should provide detailed information and data on the project, the employment opportunities related to the project, and the expected fiscal impact of the project on the community and the region as a whole.

In addition to the data and information requested below, applicants are welcome to provide economic analyses commonly used to show how the proposed project is favorable to the regional economy. This could include simple location-quotients and shift-share analyses to more complex impact assessments using in-put/out-put multipliers, econometric models, and/or fiscal impact models.

An EIA must include the following information:

1. Locus Map(s): Provide a map or maps showing the location of the project relative to:
    a. Community Activity Centers
    b. Direct competitors
    c. Suppliers
    d. Customers

2. Market Niche: Detailed description of the products or services that the project will provide and the customers this project will primarily serve

3. Corporate and/or Ownership Information: Provide documentation of the following as appropriate:
    a. Incorporation type for tax purposes
    b. State of incorporation
    c. Location of corporate headquarters

4. Estimated Cost of the Project: Provide the following information on the estimated investment required to complete the proposed project:
    a. Total investment required to complete the building of the project including construction materials, labor costs, and related development services
    b. Total investment required to acquire the land and any existing buildings located on the property being developed

5. Employment Information: Employment information for the last three years (if applicable) and estimated employment for three years following completion of the project. Actual company data should be provided when available rather than general industry norms.
    a. Short-term, Construction-phase Employment:
        i. Total work hours estimated to complete the project
        ii. Total labor costs for construction
        iii. Average wage(s)/salary(ies) anticipated
    b. Workforce Data:
        i. Total number of individuals to be employed at the site after construction has been completed and specify how many will be full-time, part-time, temporary, and/or seasonal.
        ii. Full-time Equivalent Employment: Provide the total number of full-time equivalents (FTEs) to be employed at the site after

construction has been completed based on a standard work week (40 hours).

For each category, please specify if these employees will be working on a full or part-time basis.

6. Wage Data:
    a. Total Payroll: Provide the total wages to be paid annually to all employees.
    b. Net New Payroll: Provide a three-year average of the total payroll and payroll per FTE generated at the site by the applicant.
    c. Wages: Provide the average wage, median wage, and maximum and minimum wage to be paid to employees working at the site after construction has been completed. For salaried employees, provide the annual salary and the standard number of hours worked per week for full-time employees. Unless otherwise noted, 40 hours will be used as the standard week.

7. Employee Benefits Data: Provide official company documentation regarding the following:
    a. Types of benefits: Provide a list of all the benefits offered to employees (i.e. medical, dental, vision, retirement, disability.)
    b. Eligibility for Benefits: Provide the policies regarding the eligibility of employees for benefits as determined by hours worked, employment classifications, or other qualifying factors. Provide the number and percent of employees meeting these eligibility requirements.
    c. Cost of benefits: Provide the total cost of the benefit package provided to employees including the percent paid by the employer and the percent paid by the employee
    d. Career Advancement & Training Data: Provide documentation outlining programs and funding allocated to the following:
        - On-site or In-service Training
        - Apprentice Programs
        - Tuition Reimbursement

ADDITIONAL RESOURCES

Links to assist with identifying Emerging Industry Clusters:

- STATS America: http://www.statsamerica.org/
- Innovation in American Regions - Industries: http://www.statsamerica.org/innovation/anydata/
- Cluster Mapping: http://www.clustermapping.us/

General Economic Resource links:

- STATS Cape Cod: https://www.statscapecod.org/
- American Fact Finder: https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml
- Data USA: https://datausa.io/

Housing

This guidance is intended to clarify how the Housing Goal and Objectives of the Regional Policy Plan (RPP) are to be applied and interpreted in Cape Cod Commission Development of Regional Impact (DRI) project review. This technical bulletin presents specific methods by which a project can meet these goals and objectives.

Housing Goal: To promote the production of an adequate supply of ownership and rental housing that is safe, healthy, and attainable for people with different income levels and diverse needs.

- ***Objective HOU1** – Promote an increase in housing diversity and choice*
- ***Objective HOU2** – Promote an increase in year-round housing supply*
- ***Objective HOU3** – Protect and improve existing housing stock*
- ***Objective HOU4** – Increase housing affordability*

The applicability and materiality of these goals and objectives to a project will be determined on a case-by-case basis considering a number of factors including the location, context (as defined by the Placetype of the location), scale, use, and other characteristics of a project.

APPLICABILITY

Housing Goals and Objectives apply to the following DRI projects:

1. Residential and mixed-use residential projects will be reviewed for consistency with the Housing Objectives HOU1, HOU2 and HOU3.
2. Projects on sites improved with existing dwelling units will be reviewed for consistency with the Housing Goal and Objective HOU3.
3. Projects proposing the creation of ten (10) or more dwelling units or 10 or more residential building lots will be reviewed for consistency with the Housing Goal and Objective HOU4.

THE ROLE OF CAPE COD PLACETYPES

The RPP incorporates *a framework for regional land use policies and regulations based on local form and context* as identified through categories of Placetypes found and desired on Cape Cod.

The Placetypes are determined in two ways: some are depicted on a map contained within the RPP Data Viewer located at www.capecodcommission.org/RPPDataViewer adopted by the Commission as part of the Technical Guidance for review of DRIs, which may be amended from time to time as land use patterns and regional land use priorities change, and the remainder are determined using the character descriptions set forth in Section 8 of the RPP and the Technical Guidance.

The project context, as defined by the Placetype of the location, provides the lens through which the Commission will review the project under the RPP. Additional detail can be found in the Cape Cod Placetypes section of the Technical Guidance.

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INTRODUCTION

Housing affordability and diversity are among Cape Cod's most critical challenges. The Housing Technical Bulletin is intended to promote smaller scale housing supply in centers of activity, prioritizing compact housing of a variety of scales and densities appropriate to its Placetype context. There is a special focus on the development of rental housing. This Technical Bulletin provides direction to the form, design and type of housing appropriate to a given location, in light of the existing built and natural resources, infrastructure systems and amenities present in such location, i.e., the intent is to direct appropriate housing types to appropriate Placetypes.

Housing growth is necessary for the region. Ideally such growth will be directed to developed centers of activity and will add new modes and types of housing. In particular, the RPP emphasizes the production of small-scale, multi-unit "infill" housing within centers of activity, a housing type that could greatly increase choice, but is largely missing from the region. Infill development and redevelopment for housing is generally encouraged, subject to consideration for any natural, historical or cultural resources that might be adversely impacted by such a housing proposal. This technical bulletin also establishes how and under what circumstances affordable housing mitigation is to be provided for residential development projects under Cape Cod Commission review.

In the Fall of 2017, the Commission released its first regional housing market analysis. The report affirmed the regionally unique and important relationship of our housing supply to our regional economy and the need for 26,000 new housing units Cape-wide to meet existing demand. The 2018 Regional Policy Plan affirms the need to plan for and stimulate housing supply, to promote housing diversity, and to increase stock to meet year-round needs and affordability.

The following methods are established to support the production of an adequate supply of ownership and rental housing in the region that is safe, healthy, and attainable for people with different income levels and diverse needs, taking into account the location of the proposed housing.

SUMMARY OF METHODS

GOAL | HOUSING

To promote the production of an adequate supply of ownership and rental housing that is safe, healthy, and attainable for people with different income levels and diverse needs.

OBJECTIVE HOU1 – Promote an increase in housing diversity and choice

METHODS

- Create small-scale housing units.
- Create small lot residential development.
- Redevelop existing buildings for mixed use residential and/or residential development.
- Pursue infill development for housing, i.e., development of vacant or under-used parcels within previously built areas.
- Create a variety of year-round housing types meeting a range of life stage and other social needs.
- Create seasonal workforce housing.
- Create multi-unit residential development with 100% rental units of 850 sq. ft. or less.

OBJECTIVE HOU2 – Promote an increase in year-round housing supply

METHODS

- Create year-round rental and ownership housing units.

OBJECTIVE HOU1 & OBJECTIVE HOU2 AREAS OF EMPHASIS BY PLACETYPE

Natural Areas | New development is discouraged in these areas. If housing is proposed only very low density small lot cluster or open space development should be considered. Affordable housing mitigation for development in Natural Areas provided under HOU4 should be located or directed outside of Natural Areas..

Rural Development Areas | Reuse and redevelopment are encouraged. All development should be clustered, respect the surrounding landscape, and protect scenic resources. Preference is to direct affordable housing mitigation for development located in Rural Development Areas, provided under HOU4, outside of Rural Development Areas.

Suburban Development Areas | All housing types are considered appropriate, so long as adequate infrastructure exists or is proposed to support the housing type and density. Infill development and redevelopment for housing that improves building and development form to a more traditional form is particularly encouraged.

Historic Areas | All housing types are considered appropriate, so long as adequate infrastructure exists or is proposed to support the housing type and density, and the proposed housing is consistent with historic development patterns, does not displace, substantially alter, nor interfere with historic structures, buildings and sites, and is consistent with existing historic uses. Infill housing may be appropriate subject to layout and design.

Maritime Areas | All housing types are considered appropriate, so long as adequate infrastructure exists or is proposed to support the housing type and density, and the proposed housing is consistent with maritime development, and does not displace, substantially alter, nor interfere with maritime structures and uses. Infill housing may be appropriate subject to layout, design and consideration of the existing site and surrounding uses.

Community Activity Centers | Housing is encouraged in general. Infill and higher density housing is encouraged so long as the proposed housing type, density, form and design is consistent with the context of surrounding development forms and patterns. Smaller unit sizes less than 1,200 sq.f.t are preferred.

Industrial Activity Centers | Housing is not encouraged, with the exception of on-site caretaker or security housing.

Military and Transportation Areas | Housing will be considered on a case by case basis. Master planned projects, including transit-oriented development planned in coordination with transportation assets or developments planned in coordination with infrastructure identified through a capital improvement plan is encouraged and may be evaluated similarly to Community Activity Centers.

OBJECTIVE HOU3 – Protect and improve existing housing stock

METHODS

- Improve the condition and habitability of existing dwelling units
- Improve the safety of existing dwelling units
- Improve the accessibility or visitability of existing dwelling units
- Preserve or increase the number of net existing housing units in the region

OBJECTIVE HOU4 – Increase housing affordability

METHODS

- Developments proposing ten (10) or more new residential lots and/or units must provide on-site 10% of the project's lots and/or units for year-round housing use as Affordable Housing and/or Workforce Housing.
- The Commission may, in its discretion, allow an applicant to provide the required units or lots off-site, or make a monetary contribution equal to or greater in value than the on-site mitigation otherwise required

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE HOU1

Objective HOU1 *– Promote an increase in housing diversity and choice*

Housing diversity involves both housing type and housing affordability. According to a 2017 regional housing analysis, the region needs to create a variety of housing types at various densities to meet housing demand and the needs of a range of Cape Cod residents from single young people to retirees looking to downsize their housing, which in turn will free up larger houses for young families. The region is also in need of year-round ownership and rental housing for Very Low Income and Low Income households, households seeking Affordable, Workforce, and Senior and Accessible Housing as these terms are defined below. Accessible Housing - handicapped accessible unit(s) that meet visitability standards: one entrance with zero steps; 32-inch clear passage through all interior main-floor doors; and at least one-half bath on the main floor.

Affordable Housing – housing for households earning at or below 80% of AMI.

Affordability Standards – As may be promulgated by the Commonwealth of Massachusetts Executive Office of Communities and Development from time to time.

AMI – Area Median Income – determined by the U.S. Department of Housing and Urban Development (HUD).

Low Income Housing – housing for households earning between 51% - 79% of AMI.

Senior Housing – An independent unit providing housing for household members over the age 55.

Very Low Income Housing – housing for households earning 50% or less of AMI.

Workforce Housing – housing for households earning between 81% and 120% of AMI.

Create a variety of year-round housing types meeting a range of life stage and other social needs

Housing types generally range from single family homes, Accessory Dwelling Units (ADUs) which are accessory to a single family home, to duplexes, multi-family homes,

town houses, by-right higher density single family homes (i.e., M.G.L. Chapter 40R Starter Homes), as well as tiny homes and cottage courts, and multifamily construction.

Over 40% of the region's housing need is for households over the age of 65 earning 100% of the median income or less. Housing approaches and strategies to support these residents, including Senior housing will be important in meeting the region's housing needs. In some instances, housing is needed for disabled residents, residents requiring memory care, and other vulnerable populations.

Create small-scale housing units

There is a need for both year-round ownership and rental units in the region, however the rental unit need is particularly acute. For this reason, projects are encouraged to include year- round rental units, particularly rental units of less than 1,200 sq. ft. or smaller depending on family size. In compact neighborhoods higher density is appropriate, and smaller unit sizes of less than 1,200 sq.ft. are preferred. This smaller unit size will provide housing for an underserved market in the region.

Units are encouraged in historic structures and outbuildings such as carriage buildings where appropriate. Developing new or additional units in historic buildings can generate income for property owners to reinvest in their historic buildings.

Create small lot residential development

Over 80% of Cape Cod's existing housing stock is in the form of single-family homes. In appropriate contexts and Placetypes, small lot and/or cluster subdivisions for smaller scale housing units such as cottage courts and other compact residential development types are preferred to add to the diversity and mix of housing in the region. Subdivision design should protect sensitive resources and promote the efficient deployment of required infrastructure.

Redevelop existing buildings for mixed use residential and/or residential development.

The preservation and reuse of existing housing stock and other buildings is important for the region. Typically, redevelopment can protect community character and reinforce traditional development patterns.

Increasing mixed-use residential development will also promote walkability and reinforce traditional development patterns. This type of residential development also broadens the housing choices for residents that do not own a vehicle or cannot drive including seniors and those with disabilities.

Pursue infill development for housing, i.e., development of vacant or under-used parcels within previously built areas

Infill housing development can be created on scattered vacant, under-used, or previously developed parcels within existing substantially built-up areas. Infill development provides a potential means to protect community character and reinforce traditional development patterns while increasing housing supply and housing type options.

Create seasonal workforce housing

In locations served by transit or within walking or bicycling distance to seasonal work opportunities, seasonal workforce housing may be appropriate.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE HOU2

Objective HOU2 *– Promote an increase in year-round housing supply*

Create year-round rental and ownership housing units

The 2017 regional housing analysis highlights the extent to which the region's existing housing supply has changed from year-round ownership to second home ownership. Year-round housing is that which provides a primary residence for a household. This change in ownership pattern is more pronounced in the Outer and Lower Cape than the Mid and Upper Cape; however, it impacts the housing needs of the entire region. To address this change, residential DRI's are strongly encouraged to create year-round ownership and rental units in the region.

The Commission may require that an affidavit, covenant, or deed restriction be provided to the town, as holder or beneficiary, in which the development is located to ensure that housing is limited to year-round occupancy. In addition, limitations on short-term rentals through a homeowners association or condominium association may also be utilized to demonstrate year-round occupancy.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE HOU3

Objective HOU3 *– Protect and improve existing housing stock*

As the housing stock in our region ages, with most of our housing supply now more than 30 years old, a focus on sustaining the life-safety, maintenance and energy efficiency of our existing housing supply is important to the housing market. Opportunities to upgrade rental housing stock to improve substandard living conditions, such as inadequate cooking facilities, are a regional priority.

Improve the condition and habitability of existing dwelling units

Applicants may propose improvements to existing dwelling units which may include but shall not be limited to: exterior and interior maintenance, utility and system upgrades, weatherproofing and energy efficiency. Before and after photographic images and evidence of energy ratings for appliances and utilities should be submitted to evidence compliance with HOU3.

Improve the safety of existing dwelling units

Improvements to existing dwelling units may include but shall not be limited to: access and egress improvements, and systemic improvements to drinking water quality and availability and improvements to wastewater disposal or other systems that improve conditions and lower operating costs. Before and after photographic images or public utility final inspection reports should be submitted to evidence compliance with HOU3.

Improve the accessibility or visitability of existing dwelling units

DRI's should create Accessible Housing that is handicapped accessible and meets the following visitability standards: one entrance with zero steps; 32-inch clear passage through all interior main-floor doors; and at least one-half bath on the main floor. A floor plan and verification from an appropriately qualified professional that the improvements meet visibility standards should be provided to the Commission to evidence compliance with HOU3.

Preserve or increase the number of net existing housing units in the region

The proposed development should demonstrate that any potential loss in housing units lost will be replaced on or off-site with at least an equivalent or greater number of housing units.

DETAILED DISCUSSION OF METHODS FOR MEETING OBJECTIVE HOU4

Objective HOU4 *– Increase housing affordability*

AFFORDABILITY REQUIREMENT

The need for affordable housing on Cape Cod is sufficiently acute that affordable housing mitigation is required for all proposed residential or mixed use residential projects of 10 lots/ units or greater.

For the purposes of calculating the 10-percent affordable and/or workforce housing contribution, all numbers are rounded to the highest whole figure, for instance.(i.e., if 10% yields 4.4 units, 5 units required)

Developments required to provide more than one set aside unit must provide the first lot and/or unit as affordable housing; subsequent set aside lots and/or units may be Affordable or Workforce housing. In considering the proportion of workforce and affordable units, the Commission will evaluate the demand for housing for those earning above 80% of the median income in making the determination of the appropriate mix of housing units offered. Local housing production plans and the 2017 regional housing market analysis should be consulted.

Residential Construction

Residential projects that will construct 10 or more units must provide at least 10 percent of the proposed units as Affordable and/or Workforce units. Units may be provided within the proposed project or the applicant may provide the requisite number of units through purchase of existing units, redevelopment, or construction of new units off site. An applicant may also contribute land that can support as of right the required number of Affordable and/or Workforce units or a cash contribution dedicated to creating affordable units. A contribution of land should be accompanied by a development plan acceptable to the Commission, demonstrating that the requisite number of units may be developed by right under zoning and reasonably expected to be approved under applicable municipal regulations.

After the first unit, at the discretion of the Commission, a mix of lots and Affordable and Workforce units may be provided to meet the Regional Policy Plan Goal and Objectives

for housing. In considering the proportion of workforce and affordable units, the Commission shall evaluate the demand for housing for those earning above 80% of the median income. Local housing production plans and the 2017 regional housing market analysis should be consulted.

Residential Subdivisions

Residential subdivisions or land divisions of 10 lots or more must provide at least 10 percent of the proposed lots as Affordable or Workforce housing sites. In lieu of providing such lots on site, the applicant may develop, or contribute comparable off-site lot(s) that can support as of right, the required number of affordable and/or workforce units An applicant may also make a cash contribution dedicated to creating affordable units. A contribution of land should be accompanied by a development plan acceptable to the Commission, demonstrating that the requisite number of units may be developed by right under zoning and reasonably expected to be approved under applicable municipal regulations.

Cash-contribution Option

An applicant may satisfy HOU4 by providing a cash contribution of equivalent value for the funding or purchase of affordable housing, provided that:

(a) the applicant submits a plan acceptable to the Commission to expend those funds within the same time frame as the applicant's development, and

(b) such proposal will result in an equal or greater number of units or lots than had they been created on site.

Equivalent value should be determined through one of the following methods:

(a) for lot subdivisions, current appraised value of the affordable lots;

(b) for ownership projects, the difference between the affordable sales price(s) and the market sales price(s) of similar bedroom units within the project;

(c) for rental projects, the difference in appraised value between the value of the project with and without the affordable units. The applicant shall pay for all appraisals, and the Commission must approve the applicant's chosen appraiser.

Off-site Option

The applicant may offer, and the Commission may accept in appropriate Placetypes, off-site donations of land or existing units in fee simple that the Commission determines are suitable for the construction or establishment of affordable housing units. The Commission may require that the applicant submit appraisals of the off-site land or units in question, as well as other data relevant to the determination of equivalent value of providing for affordable housing onsite.

Allowing off-site provision of affordable units gives flexibility to both the applicant and the Town, and may result in better locations for affordable housing. For example, encouraging the provision of affordable units near municipal services or access to public transportation may be preferable to providing 'on-site' affordable housing further from such services.

Timing and Mix of Affordable Units

Regardless of whether affordable units are provided on-site or off-site, development of affordable housing should take place at the same rate and within the same time frame as the development of the market-rate units. There should be a similar proportion of affordable and market-rate units in those DRIs with a mix of unit/bedroom sizes and/or in those DRIs with a mixture of housing types (for example, ownership and rental; etc.).

Integration and Size of Affordable Units

Affordable housing units should be integrated with the rest of the development in terms of location and should be compatible in exterior design, appearance, construction, and quality of materials with other units. To ensure that affordable units qualify for the state's Subsidized Housing Inventory (SHI), both on-site and off-site affordable housing units should meet the Department of Housing and Community Development's Local Initiative Program (LIP) unit size guidelines.

Pricing and Rents of Affordable Units

For ownership units, the affordable sales prices should be calculated using the Barnstable County HOME Consortium methodology and guidelines. For rental units, the affordable rents should be the high HOME rents, as published annually by the US Department of Housing and Urban Development (HUD). If comprehensive services are included in the monthly rent (for example, continuing-care retirement communities (CCRC), assisted living, and/or skilled nursing facility projects), and the monthly rent

exceeds the limits set forth by the HOME Program, the Commission will utilize existing state housing program guidelines (for example, MassHousing's Elder Choice program, the Massachusetts Department of Housing and Community Development's CCRC guidelines, 24 CFR 5.069 and HUD Handbook 4350.3 etc.) to determine the amount of household income that must be devoted to rent and services. Prior to the occupancy of the affordable units, the applicant should demonstrate that the occupants are income-eligible in accordance with HOME Consortium guidelines.

The applicant shall identify in its DRI application a qualified monitoring agent for which the monitoring of affordable housing is a primary function of their operation For age-restricted senior care retirement, assisted living and skilled nursing facilities, proposed monitoring agents shall demonstrate that monitoring of these types of facilities is a prime function of their operation.

Term of Affordability/ Permanent Affordability

As a condition of DRI approval, Affordable and Workforce Housing units shall be subject to affordable housing restrictions (consistent with MGL Chapter 184Sections 31 through 33) that are recorded against title to the subject properties at the Barnstable County Registry of Deeds and which require the units to remain affordable in perpetuity, or for such periods as the grantee may otherwise require. All affordable units must be eligible for listing on the Commonwealth of Massachusetts Subsidized Housing Inventory. Affordable and Workforce units must provide year-round housing. It is the Commission's preference that Affordable and Workforce housing restrictions be held by the host community or a qualified housing entity. The form and content of such housing restrictions shall be acceptable to both the Commission and the grantee. The applicant should provide draft proposed restrictions with the DRI application.

Affirmative Marketing and Selection of Buyers/Tenants/ Monitoring of Affordability

As a condition of a DRI approval, the Commission will require that an applicant submit to the Commission for its consideration and approval a marketing plan that describes how affordable units will be affirmatively and fairly marketed to potential home buyers and/or renters. The plan should include a description of the lottery process to be utilized for selecting the home buyers and/or renters. The lottery should have either one pool for all applicants or two pools: a regional resident pool for up to 70 percent of the units; and all applicants in the second pool. The marketing and selection plan

should be consistent with the state's LIP guidelines so that the affordable units will qualify for the state's Subsidized Housing Inventory.

Similarly, as a condition of DRI approval, a monitoring agreement between the applicant and a third-party entity acceptable to the Commission (with experience in affordable housing income verification) will be required for all Affordable and Workforce housing units. For rental DRIs, the monitoring agent should be responsible for certifying initial tenant income eligibility, rents, and compliance with the affirmative marketing and tenant-selection plan; thereafter, the agent should annually certify income eligibility and rents. For ownership DRIs, the monitoring agent should be responsible for certifying initial buyer income eligibility and compliance with the affirmative marketing and buyer selection plan.

GENERAL APPLICATION REQUIREMENTS

Application materials should provide sufficient detail to demonstrate that the project meets the applicable goals and objectives, but typically include a project description, a detailed narrative of how the project will meet housing goals and objectives, and project plans including site plans, floor plans and elevations. The project description should include a discussion of the Placetype and context in which the development is proposed, and how the proposal is appropriate to its Placetype and context.

The application should include a detailed description of all proposed housing unit(s) including the location, number and size of units, number of bedrooms and proposed cost of rental and ownership units. If Affordable and Workforce housing units are required to be provided or are otherwise proposed in a DRI, an applicant should submit a marketing plan, draft monitoring agreement including the proposed qualified monitoring agent and a draft affordability restriction in a form acceptable to the grantee. Appraisals may be required to evaluate offsite or other alternative housing mitigation proposals. Terms and conditions of draft affordability restrictions, monitoring agreements and marketing plans, should be discussed and agreed upon in principle between applicants and proposed holders, beneficiaries, grantees or counterparties under these documents prior to or during the DRI permitting process.

OTHER MATERIALS

Regional Housing Market Analysis and 10 Year Forecast, Final Report, 9/11/2017: www.capecodcommission.org/housing