MASSDOT HIGHWAY DIVISION
WETLAND MITIGATION DESIGN SUBMITTAL
BASIC GUIDELINES

This document is intended as baseline guidance for designers and reviewers for all projects requiring wetland replication and/or restoration. More complex projects, such as those requiring a DEP Variance, may require a higher standard of submission and shall be coordinated with MassDOT Environmental Services.

GENERAL

- A wetland scientist, restoration ecologist, or landscape architect should design the wetland mitigation. The designer should be able to demonstrate knowledge of ecological restoration and at least five years of experience designing wetlands similar to that required by the project.
- Wetland designs should meet all MA Wetlands Protection Act Regulations requirements 310 CMR 10.55 and, when applicable, Army Corp of Engineers Section 404 of the Clean Water Act.
- Permanent wetland impacts should be replicated at a minimum 1:1 impact to replication ratio and temporary wetland impacts should be restored in-kind.
- Replication should recreate a wetland similar in hydrology and type to the wetland lost.
- Mitigation that includes stream relocation or that may result in changes to stream hydrology should involve the expertise of a fluvial geomorphologist early in the design process.
- MassDOT Special Provisions, seed mixes, and additional guidance are available online: https://www.mass.gov/lists/landscape-design-and-roadside-maintenance

SITE SELECTION CONSIDERATIONS

- Locate replication within the state or town right-of-way layout if possible.
- Consolidate numerous small impacts into one large replication where feasible.
- Hydrology.
    - Ensure that there is an existing hydrologic connection (not roadway drainage) for the wetland replication. Preferably, an adjacent existing wetland of similar characteristics (reference wetland).
    - Consider whether and how roadway construction will affect existing hydrologic regimes.
    - For freshwater wetland replications that are over 1,000 sf, monitoring wells should be used to determine hydrology in advance of site selection and design. Wells should be installed and monitored for two growing seasons.
    - For tidal wetlands, determine localized hydrology by biological benchmarking and/or tide gauge to establish intertidal zone elevations, particularly Local Mean Sea Level (LMSL), Mean High Water (MHW), Higher High Tide Line (HTL), and Mean Higher High Water (MHHW), as applicable. Preserve existing vegetation and habitat.
    - Avoid locating replication areas within areas mapped as rare species habitat.
    - Avoid loss, damage, or degradation to existing quality habitat (i.e., mature trees, native grassland) when locating replication area and access route.
    - Locate or shape wetland to avoid damaging root systems of large trees adjacent to the replication.
    - If tree impacts cannot be avoided, leave tree(s) as a snag, if appropriate.

- Do not locate replication on river or stream banks or such that they may destabilize the bank.
- Consider accessibility for construction, plant care, and future monitoring.
- Consider the proximity of existing invasive plants and extent of infestations. Avoid locations where meeting permit requirements for an invasive-free wetland is not feasible.

PERMIT SUBMITTAL

- Permit specifications and plans must be consistent with MassDOT contract documents:
  - Use MassDOT Special Provisions (see Wetland Special Provisions below).
  - *Use and modify the MassDOT Standard CAD Plan Sheets and Details (once created) to ensure consistency.*

CONTRACT SUBMITTAL

PLANS AND DETAILS

General

- Wetland impacts, mitigation proposed, and associated details should be shown on a Wetland Mitigation Sheet, Environmental, or Landscape Sheets, not on Grading, Construction Details, or sheets for other categories. Include the sheet reference in the plan set Cover Sheet Index.
- Follow the Landscape Plan Development Guidelines available in CAD on the Landscape Sheets. Use and amend the MassDOT Landscape details and sheet notes as appropriate.
- General wetland information (location, size, access route, etc.) and early coordination information (ex., trees and woody debris to be retained) should be shown on the Construction Sheets. Specific details should be shown on the Mitigation Sheet.
- Do not repeat instructions already contained in the contract Special Provisions or Standard Specifications. Only note items/actions that are site specific, need to be coordinated with other work (ex., incorporation of woody material), or otherwise need to be emphasized.

Proposed Mitigation Work

At a minimum, show or otherwise convey the following:

- General
  - Square foot area for both replication and restoration areas.
  - Elevations of existing adjacent wetland being used as the hydrologic connection and how proposed wetland ties into this.
  - Grading contours (typically 1-foot intervals) and target elevations. Show how proposed contours meet existing contours.
  - Water lines (i.e., ordinary high water line).
  - Proposed access route. Access route should be designed for minimal disturbance and the smallest equipment possible. Includes notes to that effect.
  - Show temporary wildlife barriers as applicable (i.e., turtle barrier).
  - Show extent of phragmites and Japanese knotweed when plants are within or immediately adjacent to proposed replication and when soil disturbance (root zone disturbance) will occur requiring a treatment or soil management plan to prevent spread.
  - Location of monitoring wells for wetlands over 1,000 sf or per permit requirements.

- Site Protections
    - Propose and note or show soil and vegetation protection measures to be used to protect existing wetlands and uplands from temporary impacts or construction damage (ex., timber mats, temporary geotextile fabric, fencing). Use MassDOT items and special provisions.
    - Locate sediment barrier to protect both proposed and adjacent wetlands during roadway and wetland construction. See guidance below under Sediment Barrier & Erosion Prevention Measures.

- Restoration
    - Include erosion prevention measures for adjacent slopes after construction is complete (jute mesh, compost blanket, etc.). Use MassDOT items and special provisions.
    - Show proposed planting and seeding of mitigation areas and of adjacent disturbed upland, including access route. Ensure grading and ecological connection between upland and wetland. See additional guidance below under Seeding and Planting.
    - Note soil remediation (tilling, compost application, etc.), if necessary, to restore temporarily impacted wetlands.
    - If wetland plants are to be laid out by the Wetland Specialist, specify in Wetland Notes.

- Cross-Sections
    - Provide two cross-section views showing width and length and how mitigation ties into existing conditions.
    - Show target elevations and how grading ties into existing or proposed final grades and to adjacent wetland or hydrologic source.
    - Indicate seeding and planting of the area surrounding the replication.
    - Rather than include notes to arbitrarily excavate 12 inches of soil and backfill, proposed excavation and profile should be as needed to achieve a future effective hydrology. The following language is recommended:

        Wetland Replication Area shall be constructed in accordance with Item 755.35 of the special provisions. Excavate existing soil to target elevations. If existing subsoil is determined to be unsuitable for planting, excavate to depth necessary for planting and backfill with appropriate manufactured soil. Backfill shall be installed as per MassDOT Standard Specifications.
- Tidal Wetlands
    - Indicate method used to determine inter-tidal zone elevations of reference wetland. Show location of reference wetland.
    - Show existing and proposed intertidal zone elevations including Mean Low Water (MLW), Local Mean Sea Level (LMSL), Mean High Water (MHW), Higher High Tide Line (HTL), and Mean Higher High Water (MHHW), as applicable.
    - If applicable, show locations of tide gauges and reference wetland.
    - Show or note vegetation in the adjacent wetland being used as the hydrologic connection.

WETLAND SPECIAL PROVISIONS

- Include special provisions as appropriate: Inland Wetland Replication Area; Wetland Restoration; Tidal Wetland Mitigation Area; Wetland Specialist; Wetland Monitoring Reports. Include associated items (ex., Timber Mats, invasive plant management, etc.) as necessary.
- Coordinate and modify wetland specifications as necessary for specific wetland, permit requirements, and length of contract. Changes other than where highlighted for designer modifications must be coordinated with Environmental Services or Landscape Design Section.
- Include a breakdown of estimated costs (i.e., soil, seed, specialist hours, etc.) in the Calc Book.

WETLAND RELATED ITEMS

Sediment Barrier & Erosion Prevention Measures

- Sediment Barriers
  - Use MassDOT CAD linetypes.
  - Locate with respect to expected flow (not limit of project) and such that barrier meets the intended functions (sediment capture and slowing flow of water). Barriers should not be located to delineate Limit of Work or serve as wildlife barrier, but to manage sediments.
  - Locate to protect existing wetland from proposed mitigation work as well as to protect wetland from roadway work when necessary. Keep construction sequencing in mind and phase barrier placement if necessary. Barriers should be in place until seed is established (until there is no risk of sedimentation or erosion).
  - Use Coir Log as sediment barrier in wet soils or if area will be subject to inundation. Use MassDOT special provision.
  - Ensure an ample quantity of barriers to cover maintenance repairs for the duration of the contract.

- Temporary Erosion Prevention Measures
  - Include items for compost blanket, jute mesh, annual seed, and/or other material to stabilize adjacent slopes during construction and after construction while seed establishes.
  - Consider circumstances when soil work may be done outside the growing season.

Seeding

- Specify appropriate mix for the specific wetland condition: woodland, meadow, riparian, frequency of inundation. MassDOT has a variety of mixes available online.
- Specify appropriate mix to restore adjacent disturbed upland. Use MassDOT mixes.
- No seeding should be specified for tidal wetlands.

Planting

- The designer for planting plans must have a sound knowledge of plants, wetlands, ecology, and restoration planting strategies.
- Refer to the Landscape Plan Development Guidelines available on the CAD Landscape Sheets. Use the Landscape Notes as applicable to the work.
- For revegetation of wetlands, MassDOT recommends allowing for succession through natural recruitment from adjacent wetlands. This retains local ecotypes, reduces weed introductions from nursery stock, and does not require expenditures of resources (water, fertilizer, fuel, etc.) for plant establishment. Thus, unless explicitly required for the specific project by the regulating authorities or applicable performance standards, MassDOT prefers no woody plants under the following conditions:
  - When future access to the site will be difficult or unsafe (i.e., traffic, fencing, terrain, etc.).
  - When invasive plants dominate adjacent areas and can't be managed.
  - When wetlands replications are small (<300 square feet), particularly when adjacent native vegetation will colonize the area over time.

- General planting guidance for wetland mitigation areas:
  - Use a diverse mix of native species (no cultivars), sizes, and types appropriate to the expected hydrology and site conditions.
  - Planting patterns should replicate natural patterns. Plants should be clustered. Trees should be intermixed with shrub understory as appropriate to species and site conditions.
  - Use higher quantity and smaller sized plants. Unless there is specific reason, deciduous trees should generally be specified at no larger than 5-6 feet in height, evergreens no larger than 2-3 feet, and shrubs no larger than 2-3 feet.
  - When mitigation area is subject to extended periods of saturation, locate woody plants up-gradient, allowing plants to infill the wetland through natural recruitment over time.
  - Include plant protection measures against damage from animal browsing (i.e., beaver, deer) when necessary.

Restoration of Disturbed Adjacent Upland

- Soil restoration and remediation, including access routes, should be specified (i.e., scarification, compost blanket, re-grading).
- Seed with a native mix appropriate to existing native vegetation, sun exposure, and soil conditions. Include the Landscape Sheet Notes for native seeding as applicable.
- Include woody plants if necessary to restore habitat, shade, slope protection, or to provide a buffer between wetland and roadway. Plant locations should allow for clear zones and routine edge cuts as appropriate to the route and conditions.
- Retain cut trees and woody debris to be incorporated into restored area for habitat and erosion control when feasible and appropriate and per language of wetland special provision. This work should be coordinated with Construction Plans.

Invasive Plants

- Invasive plants should be addressed under Item 755.35 Inland Wetland Replication and must be coordinated with the wetland special provision and with permits or other restrictions.
- Consult with MassDOT Landscape Design Section if invasive plant special provisions 102.3 and 102.33 will be used for herbicide treatment.
- Item 102.3 Herbicide Treatment of Invasive Plants should never be used for manual removal.

DEFINITIONS

For the purposes of this document, the following definitions apply:

Wetlands:	Vegetated wetland or bordering vegetated wetlands.
Wetland Replication:	Creation of a new wetland to mitigate for a permanently impacted wetland.
Wetland Restoration:	Work required to restore the soil, vegetation, hydrology, function, and future ecology of an existing wetland that has been temporarily filled, compacted, or otherwise impacted for construction or access purposes.
Reference Wetland:	Wetland being used as an example of vegetation and hydrology expected from the replicated wetland. Reference wetland may be the wetland to be impacted and/or a wetland adjacent to the site or to the proposed wetland replication.
Upland Buffer:	Upland area adjacent to a wetland and integral to the protection, habitat, and ecology of both existing and proposed wetlands.