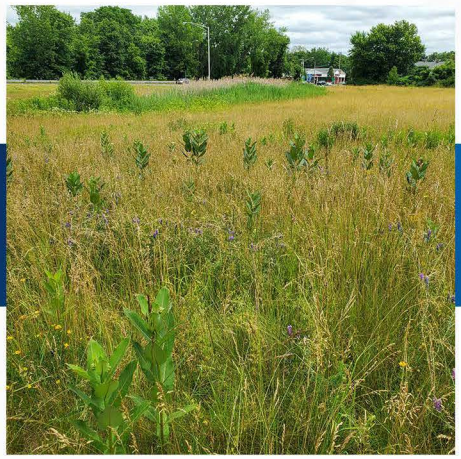
VEGETATION MANAGEMENT GUIDELINES

CONNECTICUT DEPARTMENT OF TRANSPORTATION



CTDOT
CONNECTICUT TRANSPORTATION

DATE ISSUED: JUNE 2024

VEGETATION MANAGEMENT GUIDELINES

JUNE 2024

Recommended by:

Bureau Chief Paul T. Rizzo **Date:** 6/12/2024

Approved by:

Commissioner Garrett T. Eucalitto **Date:** 6/12/24

Table of Contents

Introduction

Public Act 23-135 requires the Connecticut Department of Transportation (CTDOT) to develop, and revise as necessary, "guidelines governing tree and vegetation management, removal and replacement along state highways for use by its employees and contractors when undertaking maintenance and construction projects."

It is the primary mission of CTDOT to keep Connecticut's infrastructure safe for all users and efficient for the movement of people, goods, and commerce. In addition, CTDOT believes that being a good steward of our environment can keep our communities safer and healthier and support the sustainability of our infrastructure. CTDOT also understands the environmental and aesthetic value of healthy vegetation and trees and endeavors to preserve trees and aesthetic appeal to the extent that safety and efficiency concerns are not compromised. CTDOT is committed to being a good steward of our Right of Way, and this commitment is evident in our upkeep of structures, provisions for landscaping in our projects, litter and graffiti removal, and pollinator program, among other initiatives. CTDOT has created these guidelines to not only define roles and document best practices for employees and contractors, but also to serve as a reference for the public to better understand CTDOT's vegetation management operations and processes. These practices span multiple Bureaus, and are dictated by an array of other guidelines, manuals, specifications, directives, etc., all referenced herein. These guidelines will hopefully bring clarity by providing an overview and referencing the controlling document where appropriate.

CTDOT strives to ensure that the impacts of maintenance and construction projects on the environment and landscape are balanced or outweighed by utilizing measures to minimize

and mitigate the impacts. As required by the Act, these guidelines address, (1) the safety of the traveling public; (2) CTDOT's general roadside vegetation management activities, including mowing, herbicide use, grassing, replanting with native species whenever practicable, limb management, and tree and debris removal; (3) beautification, enhancements, and the effect on scenic roads; (4) visibility enhancement; and (5) the work's environmental impact, including preventing invasive tree, brush, or plant species' growth and impact; stormwater run-off; erosion; vegetation species replanting to expand and improve pollinator habitats; and reduced mowing.

Additionally, CTDOT is regularly evaluating new equipment, methodologies, and practices that could positively impact these operations, contribute to the protection of the affected environment, and improve the safety and efficiency of this work and our employees. As our practices evolve, so, too, will these guidelines.

Roles and Responsibilities within CTDOT

Vegetation management touches multiple Bureaus and offices within CTDOT. In the **Bureau of Engineering and Construction**, the Division of Highway Design is tasked with balancing improvements to the transportation system with environmental, historic, cultural, community, aesthetic, and economic impacts. The Division includes a dedicated Landscape Design unit, which acts as a support unit to plan, design, and construct roadside elements such as seeding, trees, shrubs and low impact development techniques. This team coordinates with designers and stakeholders to mitigate project impacts, improve sustainability, and develop community spaces along project corridors. The Bureau also includes the Division of Construction, which consists of five District Offices that oversee construction and assist in the design development of road, bridge, facility, and other transportation related infrastructure projects.

The **Bureau of Highway Operations and Maintenance** is responsible for maintaining a safe, efficient, and effective vegetative landscape along the state highway system. This includes the necessary management of overgrowth to allow for the safe operation, inspection and routine maintenance of our roadways, bridges, culverts, drainage systems, signage, lighting and traffic appurtenances, guiderail, and barrier systems.

The **Bureau of Policy and Planning** includes the Office of Environmental Planning, which performs environmental surveillance of construction activities to ensure compliance with applicable laws, regulations, permit conditions and best management practices. This team also acts as the liaison with State and federal regulatory agencies and oversees mitigation measures during construction.

Vegetation Management in Highway Design

Vegetation often is included in transportation projects for environmental, aesthetic, socioeconomic, and traffic calming purposes. The types and locations of plantings must be considered when reviewing the overall safe performance of the highway, as well as other features that may exist within the highway right of way.

The construction of projects is the phase most visible to the public, however, vegetation clearing, and landscape replacement plantings are considered during planning and design and are specific to each project. During the planning and design phases, concerns such as avoidance and protection of listed species, impacts to regulated areas, and strategies to treat stormwater and reduce erosion and sedimentation are evaluated. Each proposed construction activity where vegetation will need to be disturbed undergoes a detailed assessment to identify the limits of vegetation that must be removed, and to evaluate the potential need for the protection of existing native vegetation, removal of invasive

vegetation, and replanting of new vegetation. Limits of tree clearing and protection of existing vegetation, where required, are incorporated into design plans, which are then followed in construction.

Vegetation Management in Construction

CTDOT construction projects are governed by project specific plans and the *Standard Specifications for Roads, Bridges Facilities and Incidental Construction, Form 818* (Form 818) as well as any special provisions unique to the project. These specifications and plans contain requirements for Contractor Best Management Practices, Clearing and Grubbing, Planting, and other pertinent environmental specifications relating to environmental control and vegetation management which must be followed by the Contractor throughout the duration of the construction project.

Special Provisions incorporate permit plans and seasonal restrictions on construction operations (i.e., tree clearing and other environmental restricted work). Additionally, the contracts contain Notice to Contractors (NTCs) which detail specific project requirements, including limits of operations, permits, invasive species and other environmental restrictions, that the contractor must follow and pay particular attention to, during construction operations. Environmental and permit restrictions on the project are reviewed with the contractor at the pre-construction meeting and subsequent meetings as required. Per Section 2-106B of the Construction Manual, a tree clearing meeting and walk through with the Contractor, municipal tree warden, DOT Landscape Design unit, DOT District Maintenance Certified Arborist, Project Engineer, Inspector and District Environmental Coordinator is to be held prior to any clearing at a minimum of 7 days for state-owned property or as per local agencies for municipal property, prior to clearing operations.

The Inspection Staff monitor contract compliance during construction operations according to the Standard Specifications Form 818 and the Department's Construction Manual. Submittals by the Contractor required per specification are reviewed by Department Inspection staff and as required by Contract. Environmental management and permit plans are enforced throughout the course of a project by the Office of Environmental Planning's Resource Compliance Unit. Additionally, the Department's Construction Units have dedicated Environmental Coordinators assigned to each construction District who have responsibility for aiding inspection staff with the oversight and management of all environmental aspects of projects.

Vegetation Management in Highway Operations and Maintenance

The Department's Bureau of Highway Operations and Maintenance continues to prioritize vegetation management by using state forces, contracted tree crews and specialized equipment to remove compromised trees and vegetation within the clear zone which pose an unnecessary safety risk to the traveling public. CTDOT considers the care of trees within the state right of way a high priority. For a complete overview of the Bureau's vegetation management practices, please see the *Bureau of Highway Operations Roadside Vegetation Management Guidelines*, attached as Appendix A.

Trees along roadsides face stresses due to periodic drought, vehicle strikes, disease and decay, encroachment from invasive species, operations necessary during winter operations (plowing and application of deicing materials) and storms. Tree crowns often require trimming by utility companies to keep vegetation clear from power lines and other infrastructure. Numerous invasive species and diseases present in our state, such as Emerald Ash Borer *(Agrilus planipennis)*, Spongy Moth (*Lymantria dispar*) and recently the Spotted Lanternfly (*Lycorma delicatula)* and Beech Leaf Disease (ct.gov) among others are also threatening Connecticut's trees. Some of these invasive pests have been present in Connecticut for many years, and some are new arrivals. Invasive plant species such as Asiatic Bittersweet (*Celastrus orbiculatus*) often girdle the trees on which it grows as the vines thicken and tighten. Highway Operations staff consider these factors in plans for tree removal.

Asiatic Bittersweet overtaking a roadside tree.

Emerald Ash Borer, first identified in Connecticut in 2012, affects Ash trees with larvae and adults both feeding on the trees. Individual trees tend to die within 2-3 years after becoming infested. Spongy Moth (previously known as gypsy moth) has been present in the state since around 1905 and during infestations, the larvae have been well known in their damage to trees, feeding on a wide variety of tree species, with oaks being their favorite. The Spotted Lanternfly (SLF) has established populations in Connecticut since 2020 and will feed on a wide range of trees and plants. Both nymphs and adults of the SLF feed by sucking sap from the stems and leaves of host plants, which can weaken the host

trees. Beech Leaf Disease was first identified in Connecticut in 2019 and is caused by a nematode that affects the leaves of the tree. This condition can kill trees in as little as four years. The presence of such invasive pests and diseases requires vigilance to ensure that the increasing numbers of compromised trees do not pose a hazard to the motoring public.

Removal of overhead trees and vegetation also increases sunlight onto road surfaces, which in turn, allows more sunlight and radiant heating. During winter storms this increase in road surface temperatures has been proven to accelerate improved road conditions, reduce labor and equipment costs as well as the amount of winter deicing materials required.

Safety of the Traveling Public

Safety is a core mission of CTDOT and our agency endeavors to use all available tools to eliminate conditions and behaviors that lead to serious injuries and deaths. Proper vegetation management is critical to CTDOT's safety mission and can help avoid collisions between motorists, trees, and wildlife. Based on a CTDOT analysis of data from the Connecticut Crash Data Repository, from 2016-2018 Connecticut saw an average of 519 crashes involving trees, with an average of 22 fatalities per year. Following implementation of improved vegetation management programs in 2018, those averages dropped to 429 reported incidents and 14 fatalities per year from 2019-2023. While the 36% decline in fatalities is significant, any loss of life along our roadways is unacceptable, and CTDOT strives to eliminate all transportation-related deaths in our state.

Generally, trees removed by CTDOT have been positively identified as a potential hazard to the traveling public. CTDOT will prune, remove or trim dead, dying, decaying, hazardous, or otherwise compromised trees and vegetation in the state-owned right-of-way. Removals may also include healthy trees and brush that are located within the clear zone, obscure sightlines or have the potential to fall onto state roadways. Keeping vegetation clear from the edge of the roadway also provides the opportunity for drivers to be able to see wildlife crossing or with the potential to cross the roadway.

Vehicle struck by a falling pine tree. August 2023.

Sightlines

Maintaining clear lines of sight is essential as a driver needs adequate sight distance along a roadway to make safe and efficient decisions. Several types of sight distances are considered in roadway design and maintenance activities. For example, stopping sight distance is the distance traveled in the time it takes a driver to recognize an object ahead, decide to stop, and then stop their vehicle. Intersection sight distance is the time gap acceptance distance needed for a driver to safely enter an intersection.

Since vehicle paths cross within intersections, the potential exists for various types of crashes. To reduce potential crashes, an area within the roadside, clear of obstructions, should be provided so drivers at an intersection can see drivers on the intersecting road approaching the intersection. This area is referred to as the clear area. CTDOT is

responsible for clearing objects that restrict intersection sight distance on state roads. Municipalities are responsible for clearing sightlines exiting a municipal road (See CGS 13a-99a).

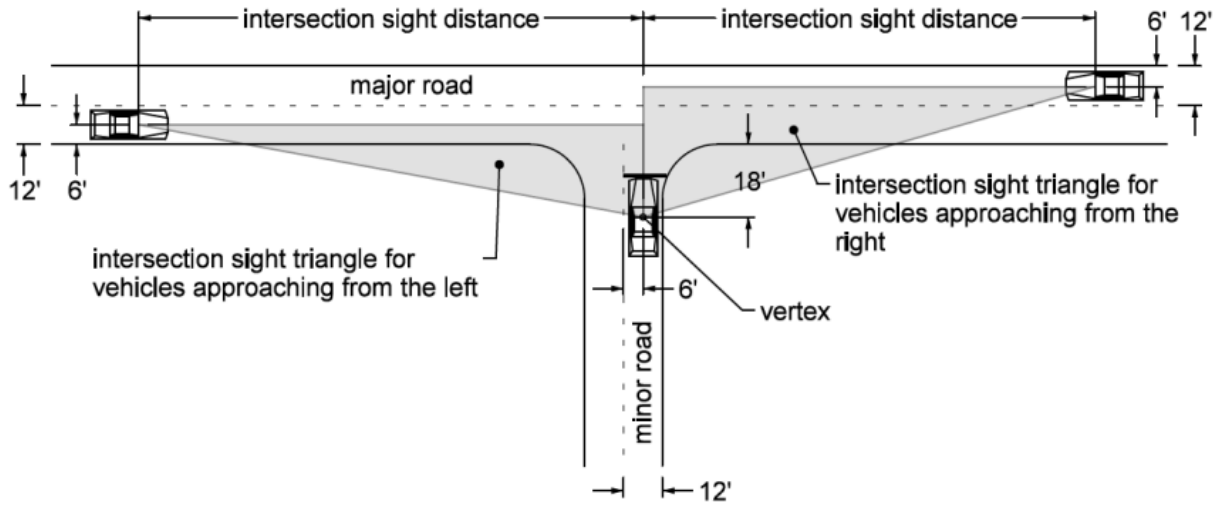


Illustration showing components for departure sight triangles. Credit Iowa DOT Design Manual Sight Distance (iowadot.gov)

As noted in the figure above, intersection sight distance involves a clear sight triangle required for a motor vehicle to safely enter or cross a roadway. Adequate sight triangles shall also be provided at crosswalks.

Potential sight obstructions shall be considered involving proposed or existing vegetation. Vegetation can limit sight lines along horizontal curves and near roadway intersections. Sightlines shall be provided in accordance with the CTDOT Highway Design Manual, Chapter 7 - Sight Distance (Attached as Appendix B). Roadside and median plantings shall be reviewed for sight obstruction.

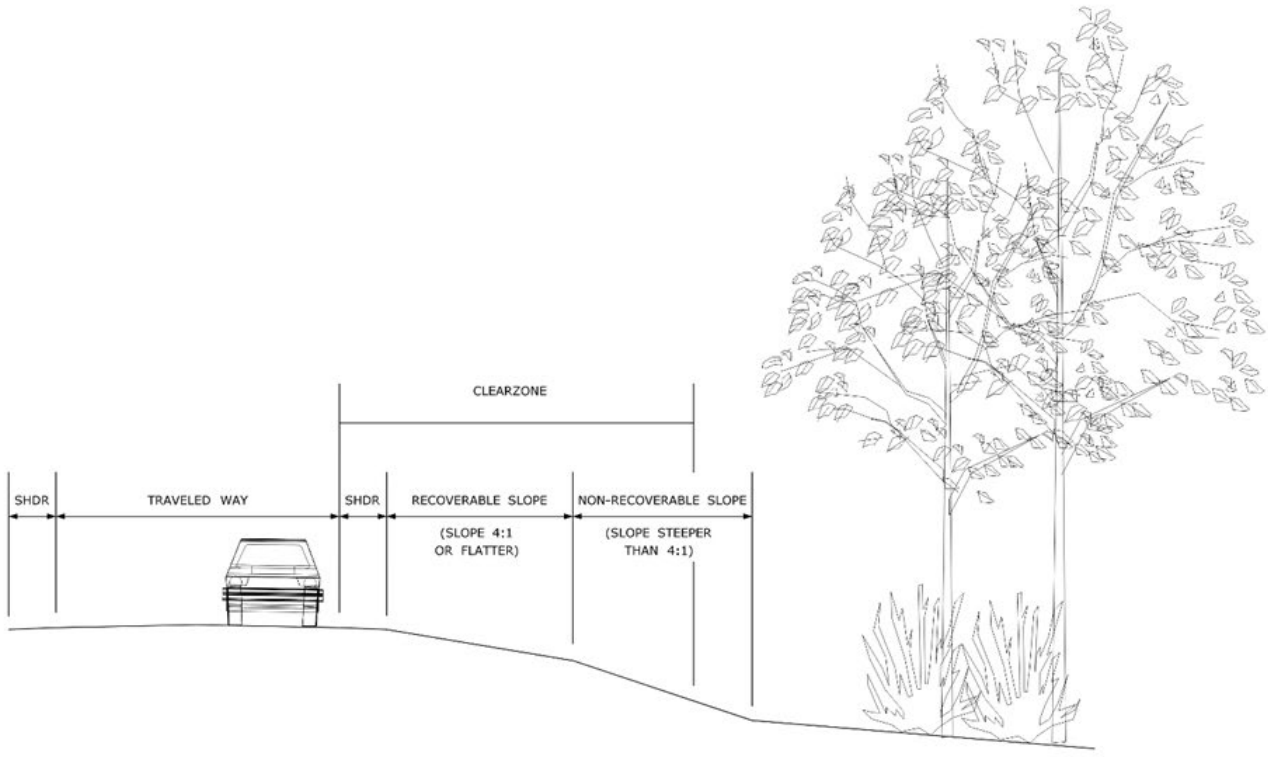
Clear Zone

A car that left the roadway and struck several trees. July 2023

The American Association of State Highway and Transportation Officials (AASHTO) defines a clear zone as a region around the roadway of sufficient width to allow 80 percent of vehicles that inadvertently leave the roadway to safely recover to the roadway. The clear zone varies by location and is determined by several factors, including vehicle speed, traffic volume, and roadside topography. According to AASHTO, for flat, level terrain adjacent to a straight section of a 60mph highway with an average daily traffic of 6000 vehicles, the recommended clear zone range is 30 to 32 feet.

Clear zones should be free of fixed objects and non-traversable road hazards. Existing and proposed vegetation shall be considered with respect to established clear zone parameters. The CTDOT Highway Design Manual, Chapter 13 - Roadside Safety (Attached as Appendix C) outlines specific design details regarding clear zones.

With the use of roadside barriers or guiderail, there may be no need for a clear zone. However, if plantings are added in these areas, trees should be placed outside the vehicle's zone of intrusion and barrier deflection areas and coordinated in consideration of routine maintenance operations.



With respect to the maintenance of clear zones, roadside right of way areas should be maintained to provide motorists an unobstructed, traversable area that will allow an operator to stop safely or regain control of a vehicle that has left a roadway. Deflection distance is the lateral distance that the outside face (side away from traffic) of a barrier will move when struck by an errant vehicle before that barrier system stops the movement of the vehicle away from the road. Each area is mowed or cleared to meet or exceed the deflection distance corresponding to the installed barrier system. When determining the distance to maintain beyond the deflection distance, considerations may be the lean of the

trees, falling distance, previous cut distances, and sunlight onto the roadway. When the area behind the barrier system is steep or a non-recoverable slope, the cutting distance should be determined by the DLD. (A "non-recoverable slope" is a slope which is considered traversable but on which an errant vehicle will continue to the bottom, such as slopes that are steeper than 4:1. Slopes are expressed as ratios such as 4:1. This means that for every 4 feet of horizontal distance there is a 1-foot vertical change either up or down. Most drivers will not be able to recover and return to the highway on this degree of slope.) When reestablishing a clear zone or removing vegetation for a system deflection distance, the District Traffic Engineer should be consulted for a determination of the required distance.

Properly maintained clear zones allow for vehicle recovery.

Tree Health, Management and Removal

Tree Removal

Trees and other vegetation within the state highway right of way are maintained to provide for the safe and efficient movement of the travelling public. CGS 13a-140 grants the Commissioner exclusive authority over all CTDOT rights of way by stating "the Commissioner may cut, remove, prune any tree, shrub or other vegetation situated wholly or partially within the limits of any state highway so far as is reasonably necessary for safe and convenient travel thereon."

Tree or vegetation removal may be performed at any time during the year. The Bureau of Highway Operations forces will engage in a continuing program of selective tree removal, removal of woody vegetation, invasive species and overgrowth situated within the rights of way. Trees within the rights of way that are determined to be dead or compromised and in need of corrective action will be either removed or maintained as deemed necessary.
No vegetation work shall be performed until the proper CTDOT personnel have completed their review and have made reasonable efforts to notify the respective abutters and the Town DPW Director(s). When notifying an abutting property owner, a notification card or business card may be left in the doorway or other conspicuous location. (CTDOT employees are not authorized to place anything inside of a private mailbox). This notification is to advise the abutter of the work to be done and offer contact information in the case of questions or concerns related to the work. Highway boundary line trees may be removed without the abutting property owner's consent if they pose an immediate danger and warrant immediate action.

When conducting tree removal, stumps must be cut as close to the ground as possible, generally to a height of 8" above ground level or lower. Stumps must be cut at the respective angle of the slope. Cut stumps are chipped or removed offsite.
When stumps and roots require complete removal, this may be performed by excavation or stump grinding. If the stump is located on a lawn or other developed area, it will be removed to a minimum of six inches below the ground. Areas where stumps are excavated will require grading and erosion control measures.

For more information on tree removal, please see Section 1 of *Bureau of Highway Operations Vegetation Management Guidelines*, attached as Appendix A.

Vegetation Management Safety Improvement (VMSI)

VMSI operations are performed or overseen by Highway Operations staff and consist of selective tree or vegetation removals where large amounts of compromised trees are present and/or clear zone safety improvements are needed. Tree cutting operations on multi-lane highways are considered VMSI when they include complete removal of trees within the 30-foot clear zone for a total distance of ¼ mile or more. On secondary highways, where the clear zone is variable due to lane widths and right of way constraints, tree cutting operations are considered as VMSI when they include removals of more than 100 trees within a total distance of a ¼ mile or less. AASHTO defines a tree greater than four inches in diameter as a fixed object and suggests removal of all fixed objects within the clear zone.

Maintenance Directive No. 23-02 Tree Cutting dictates planning and processes for VSMI operations The VMSI form and a review of the area must be completed prior to any work being performed. See Maintenance Directive No. 23-02 Tree Cutting – VMSI Standard Operating Procedure (latest revised), attached as Appendix D.

Dead or Compromised Trees

A compromised tree is a tree that has substantial visible decay or substantial visible damage that renders the tree, or a part of the tree, structurally unsound. If during their routine highway patrol activities, a Maintenance General Supervisor observes a tree that visibly appears to be dead or significantly compromised, the Maintenance General Supervisor should document such tree by initiating a Preliminary Tree Report (Maintenance 89)

This apparently healthy tree which was a well-recognized part of the viewshed entering the UCONN Storrs Campus…

and send the form to the DLD for evaluation of the tree. The DLD will complete the form and issue a work order as needed. Maintainers should notify the Maintenance General Supervisor if they observe the above- noted conditions during their course of travel.

…was actually extremely structurally compromised and represented a safety concern!

Dead or compromised trees identified by the Maintenance General Supervisor which have been determined to be situated outside of the highway right of way generally require the district office to initiate a certified letter addressed to the property owner. Notification should include that it has been determined that the tree poses a risk to the state right of way and that it is the property owner's responsibility to prune and/or remove the tree. In cases where the DLD determines that immediate corrective action is necessary for the safety of the traveling public, the District Maintenance Director may establish an immediate course of action including the authorization of state forces to remove the dead or compromised tree(s).

Limb Management

Limb management is necessary to provide for overhead clearance and provide clear sight distances along all state highways. Limbs that are obstructing sight distances, dead, structurally compromised, or are below the minimum overhead height requirement should be removed as necessary.

CTDOT may perform limb management and sightline maintenance at any time during the year. Limb removal and trimming cuts shall be made by approved methods and to standards in accordance with the latest-revised ANSI A300 Tree Care Standards.

Maintenance forces will engage in a continuing program of limb management and sightline maintenance where the following conditions are observed:

- Sightline obstruction to warning, directional, regulatory signs, and traffic control signals.
- Limbs overhanging the highway travel way encroach upon the minimum vertical clearance requirement of 16 feet. Lateral branches extending over the travel way should be pruned or removed to provide the minimum height clearance.
- Dead limbs overhanging the highway originating from state or privately-owned trees.
- The sightline is restricted on the inside of horizontal curves, vertical curves, at intersections, crossovers, or grade crossings. Consult with the District Traffic Engineer or refer to the CTDOT Highway Design Manual (latest revised) for sightline distances.
- Curb and shoulder encroachments are found.

For more information on limb management, please see Section 3 of the Bureau of Highway Operations Roadside Vegetation Management Guidelines, attached as Appendix A.

Brush Management

In addition to tree removal and mowing, control and maintenance of shrubs and other woody vegetation is a necessary part of providing for the safety of the traveling public and maintaining proper access for inspection of structures.

Brush removal may be necessary in the following areas:

- Beyond the routine mowing limits to maintain areas that are included in the actual calculated clear zone.
- Around drainage structures, headwalls, and culverts to maintain proper drainage and provide access for maintenance operations. This may consist of cutting vegetation as required on each side of the ditch, headwall, or culvert.
- Along fences and sound barriers to protect the integrity, performance, and life of the structure.
- In front of rock cut/ledge areas for safety and inspection purposes. Trees and brush growing within the rock cut/ledge area may be susceptible to failure due to poor root system establishment and are removed when determined to pose a risk to the highway system.
- In the vicinity of bridge structures, which should be free of vegetation from ten feet beyond the end of the bridge deck to the toe of the slope beneath the bridge at a width of 10 feet from the structure along its entire length.

For more information on brush management, please see Section 4 of the Bureau of Highway Operations Roadside Vegetation Management Guidelines, attached as Appendix A.

Working with Contractors

Contracted tree crews utilizing specialized equipment may be employed to remove and properly dispose of trees or vegetation. The District Landscape Designer (DLD), Maintenance General Supervisor, or their designee will have oversight of contracted tree crew operations to ensure that the defined tree(s) or area where trees are to be removed is strictly adhered to and these guidelines as well as the terms of the contract are followed.

General Roadside Vegetation Management

Mowing

The primary purpose for mowing is to provide a stabilized turf area adjacent to state highways. This stabilized area helps prevent erosion, allows a safe area for errant vehicles, provides for safe sightlines, reduces possible fire hazards, wildlife collisions, and maintains reasonable aesthetics by providing a transition area from the highway to the surrounding vegetation.

Mowing is a critical part in maintaining the safety of our transportation infrastructure.

Roadside mowing is conducted for approximately 24 weeks beginning around May 1st or when the grass reaches an average height of eight inches. In large grass areas (generally over 60 feet in width) the roadside shoulders and perimeters will be routinely mowed. Mowing the interior of such areas will be deferred until deemed necessary to control encroachment of woody vegetation.

In residential areas and in keeping with maintenance practices on adjacent property, mowing may extend to a width that will blend neatly with the established surroundings.

Conservation Areas

A conservation area is a designated location where planned vegetation management practices provide for pollinator habitat. Mowing practices in these designated areas will include the travelway shoulders and where appropriate the conservation area perimeter. Mowing of the interior of a conservation area will be delayed until late fall but not prior to October 15th or early spring of the new year. In some cases, deferment may extend until late fall of the second or third season depending on the presence of invasive plants within the conservation area. Central Maintenance should be consulted prior to mowing any interior of a conservation area outside of the prescribed deferral time. See Section VII for more information on the CTDOT Pollinator Program.

Sightlines must be considered when determining mowing limits. Additional mowing may be required at on and off ramps, gore areas, and at on and off ramps to improve sightlines with merging or oncoming traffic.

For more information on roadside mowing, please see Section 5 of the *Bureau of Highway Operations Roadside Vegetation Management Guidelines*, attached as Appendix A.

Herbicide Application

Herbicide application is necessary along structures such as median dividers where mowing is impractical.

CTDOT employs an integrated approach to roadside vegetation management utilizing manual, mechanical, and chemical methods. There are areas and aspects of roadside maintenance in which mowing is impractical, or ineffective. In these instances, chemical control of vegetation is at times imperative to ensure the safety of the traveling public as well as prevent vegetation from damaging or impeding visibility or access to, certain roadside appurtenances. Herbicide application is required along guiderail systems, signs and sign supports, light standards, delineators, barriers, and other appurtenances within the highway right of way where mowing would be impractical, and visibility must be maintained. Vegetation taking hold along the base of barriers, capped median dividers, capped islands and other concrete structures can over time lead to damage from the infiltration of water and expansion of root systems. Similar concern is present around traffic signal detection, sound barriers, culverts and bridge structures in regard to vines, brush and trees. This type of control measure may also be used by licensed personnel to maintain sightlines, reduce fire hazards. control invasive plants and selectively preclude the growth of woody vegetation within the right of way. Herbicides are often required in order to treat invasive plants which cannot be controlled by mechanical means alone such as Asiatic bittersweet *(Celastrus orbiculatus),* Tree of Heaven *(Ailanthus altissima*), mile-a-minute vine (*Persicaria perfoliate), kudzu (Pueraria montana), Japanese knotweed (Fallopia japonica), and common reed (Phragmites australis).*

CTDOT personnel must possess and maintain a Governmental Supervisory License (Category 6) to apply or oversee herbicide applications for controlling vegetation within the state right of way. All applications must be in accordance with Product label rates and in conjunction with Sections 22a-46 to 22a-66z of the Connecticut General Statutes. The herbicide program, including the herbicides utilized, are incorporated into an Integrated Pest Management Plan (IPMP) as required by DEEP and state statute.

Connecticut-licensed contractors are also utilized for the application of herbicides on multilane roads, secondary roads, and for spot spray applications. Contractors utilized for herbicide applications are directed by a Landscape Designer or designated licensed personnel. Herbicides typically utilized by CTDOT have the signal word – CAUTION, which is the lowest toxicity label.

The DLD may determine "No Spray Areas" in areas where vegetation is maintained and does not present a concern with standard maintenance practices. The DLD, and/or another approved Connecticut-licensed staff member or contractor may also apply approved herbicides via backpack sprayer or truck-mounted spray rig. These are spot spray applications to control stump regrowth, vines, and invasive vegetation.

For more information on herbicide application, please see Section 6 of the *Bureau of Highway Operations Roadside Vegetation Management Guidelines*, attached as Appendix A.

Storm and Debris Management

The State of Connecticut has established Debris Management Plans for proper management of debris generated by a natural disaster or significant weather event with the goal of facilitating prompt and efficient recovery that is cost effective, protective of the environment and may be eligible for FEMA reimbursement. Examples of natural disasters include flooding, hurricanes, tornadoes, and extreme winter events. The State utilizes monitoring and removal contracts to assist in the state's recovery efforts resulting from a natural disaster debris-producing event.

The *State Disaster Debris Management Plan*, (Annex to the *State Response Framework, Version 4.2*) was prepared by the Department of Emergency Services and Public Protection, Division of Emergency Management and Homeland Security (DEMHS). The Plan establishes the mission assignments of State agencies in responding to natural disasters of a severity and magnitude typical for Connecticut. The Plan describes the interaction of state government with local governments, private response organizations (e.g., utilities, the American Red Cross) and the federal government in natural disaster situations.

The Plan establishes the framework for proper management of debris generated by a natural disaster. The Plan is an important planning document for all levels of government – federal, state, and local and describes the state contracts that are in place to use in response to a catastrophic natural disaster; the contracts are for both debris removal operations and the monitoring of these types of operations Further included in the Plan are the planning and operation functions for temporary debris storage, reduction sites, the two phases of clean-up, and appendices that provide references to waste management resources. For more information, see *State Disaster Debris Management Plan*, attached as Appendix E.

The *State Concept of Operations Plan (ConOps) for Disaster Debris Management, Activation and Use of the State Debris Removal and Monitoring Contracts* (Attached as Appendix F) is a companion document to the State Disaster Debris Management Plan latest edition. This Plan details the steps that will be taken by the state, its contractors, and other parties to facilitate the removal, management, collection and disposal or recycling of all debris generated from a catastrophic natural disaster.

The debris management strategy for the state is divided into four major operational time periods: pre-landfall phase; phase 1; phase 2; and post-recovery. The pre-landfill phase involves planning for the particular event. Phase 1 is the initial response, typically occurring during the first 24 to 70 hours following an event and consists primarily of "pushing" the debris along major roadways to the right of way shoulders that would otherwise hinder immediate life-saving actions and that pose an immediate threat to public health and safety. Phase 2, which can last up to a year or longer, consists of removing, segregating, and disposing or recycling of the debris that hinders the orderly recovery of the community and poses less immediate threats to health and safety. State contracts may be initiated as early as Phase 1 if it is determined that the event may overwhelm state and local emergency response resources. The final phase is post-recovery which involves restoration and reestablishment of the affected debris management areas.

State contracts may be utilized when necessary. These are pre-need and pre-event contracts that can assist the state in disaster debris recovery operations. These contracts: (1) assure the immediate availability of coordinated debris removal support following a debris producing incident, (2) will be used on an as-needed basis; and (3) will be activated on a state-wide basis only by the Governor, typically in the context of an emergency declaration.

For more information on storm debris management, please see Section 10 of the *Bureau of Highway Operations Roadside Vegetation Management Guidelines*, attached as Appendix A.

Scenic Roads

Over the past several years, Connecticut has designated several sections of its rural two-lane highways as Scenic Roads. This designation not only encourages sightseeing along the

road but helps preserve it from modifications that would detract from its appearance, such as rerouting or widening.

A potential state scenic highway must abut significant natural or cultural features such as agricultural land or historic buildings and structures which are listed on the National or State Register of Historic Places, or afford vistas of marshes, shoreline, forests with mature trees, or other notable natural or geologic feature which singularly or in combination, set the highway apart from other state highways as being distinct. The highway shall have a minimum length of one mile and shall abut development which is compatible with its surroundings. Such development must not detract from the scenic or natural character or visual qualities of the highway area.

Vegetation management on scenic roads requires consideration to preserve the roads' notable aesthetics and vegetation distinctions. Coordination by multiple Bureaus is undertaken when a project takes place on a scenic roadway, beginning as early as the planning stage, and continuing through design. All projects on scenic roads and submissions for a road or road segment to be designated as scenic are reviewed by the Scenic Road Advisory Committee.

Routine maintenance of trees and vegetation along state designated scenic roadways is performed in accordance with the Regulations of Connecticut State Agencies 13b-31c-1 to 13b-31c-5, inclusive. Any activity initiated by the Department which takes places on a scenic road must be reviewed by the Scenic Roads Advisory Committee for a determination of

effect. The removal of mature trees is defined as a type of activity and would therefore require a review of the project or activity by the Scenic Roads Advisory Committee, except when the tree must be immediately removed due to safety concerns. Once a determination of either no effect, or adverse effect, has been established, the Committee will provide the designer with a recommended alternate course of action that could avoid, mitigate, or minimize any adverse effect. In some cases, if there are no feasible alternatives, the Committee can recommend the project not be constructed. In all cases where this occurs, the Commissioner shall make final determination as to whether or not the project should continue as proposed.

The Merritt Parkway is one of only two National Scenic Byways in Connecticut. The other is Route 169 (spanning Lisbon, CT to Charlton, MA). A Corridor Management Plan was prepared by the Route 169 Scenic Advisory Committee and the Northeastern Connecticut Council of Governments. A link to that study is here: 2016-2016 Corridor Management Plan.

Merritt Parkway

The Merritt Parkway is a designated Connecticut Scenic Road, National Scenic Byway, and on the National Register of Historic Places. A major component of its historic designation is the landscape design. The Merritt Parkway Conservancy (MPC) is a private stakeholder group formed to protect and maintain a balance between the functionality of the parkway as a major thoroughfare and the preservation of the original design of parkway's distinctive bridges and landscape.

Given its historic designation, the Department formed the Merritt Parkway Advisory Committee (MPAC), for the purpose of advising CTDOT on all matters relative to the Parkway. The MPAC is comprised of representatives from the eight towns the Parkway traverses, various CTDOT bureaus, Metropolitan Planning Organizations, the Federal Highway Administration (FHWA), State Police Troop G Commander, the CT Chapter of the American Institute of Architects, the CT Chapter of American Society of Landscape Architects, the CT Trust for Historic Preservation, and the Merritt Parkway Conservancy (MPC).

The MPAC developed a set of guidelines to manage the Parkway and established *Policy No. P-5* (Attached as Appendix G) which specifies that the Merritt Parkway shall receive special treatment, particularly in the areas of design, landscape, and maintenance. However, these guidance documents do not address specifics pertaining to long-term landscape maintenance.

Over the years, the Parkway's designed landscape continued to mature. Due to the lack of a defined long-term maintenance plan, most large-scale landscape work including tree removal and replanting efforts were incorporated into highway corridor improvement projects. CTDOTs approach to trees within this corridor has developed over time. When the corridor projects began, the amount of tree clearing was kept to a minimum. As these trees grow older and larger, CTDOT continues to modify how its projects approach the cutting and replanting of the Parkway's vegetation.

CTDOT has a responsibility to ensure safe and efficient travel along its roadways. It also has a responsibility to be a good steward to this important historical resource. CTDOT is currently in the process of developing a Merritt Parkway-specific Landscape Management Plan. This plan will define a long-term plan for maintaining this historic landscape. The Plan

is being developed with input from Department subject matter experts and key stakeholder groups. The ultimate goal of the plan is to have a healthy, manageable, and sustainable landscape that maintains a balance between historic preservation and a vital transportation facility servicing Fairfield County.

VMSI operations (See Section II) on the Merritt Parkway shall be in accordance with Regulations of Connecticut State Agencies Sections 13b-31e-1 through 13b-31e-4. In making improvements on the Parkway, CTDOT will act in accordance with the *Landscape Master Plan for the Merritt Parkway* (Attached as Appendix H, published October 1994) and the *Merritt Parkway Guidelines for General Maintenance and Transportation Improvements* (Attached as Appendix I, published June 1994).

For more information on vegetation management along scenic roads, please see Section 8 of the *Bureau of Highway Operations Vegetation Management Guidelines.*

Roadside Vegetation and Noise, Stormwater & Erosion Control

Noise

Although residents often express that tree removal increases highway noise at their property, the amount of noise reduction by trees is usually negligible. Vegetation must be approximately 100 feet wide (deep), dense, and consist of vegetation of sufficient height (as well as extend to ground level) to reduce noise such that a person can perceive the difference. The height, depth, and density of trees needed is typically very difficult to obtain and maintain along the roadside where right of way is often limited; therefore, use of tree planting as a means of reducing noise is not typically feasible. According to FHWA-HEP-10-025, “the planting of trees and shrubs provides psychological benefits and by providing

visual screening, privacy, or aesthetic treatment, but not highway traffic noise abatement". FHWA has not approved utilizing vegetation for noise abatement.

CTDOT oversees traffic noise studies on Federal or Federal-aid Highway Projects in the state. CTDOT Highway Traffic Noise Abatement Policy for Projects Funded by FHWA is based on regulation 23 CFR 772. This regulation outlines the procedures for noise studies and noise abatement measures that highway agencies must meet for federally funded highway projects. For more information on CTDOT's Traffic Noise Program see CTDOT Traffic Noise Program.

When noise barriers or berms are constructed, and if site conditions allow, vegetation can be used to improve the aesthetics of the area; however, the appropriate vegetation should be chosen to withstand roadside conditions, and not impact safety of the traveling public or the integrity of the noise barrier in future years.

Stormwater

Vegetation, when properly chosen, can be effective in improving stormwater runoff from roadways before it reaches downstream regulated areas. CTDOT designers work collaboratively with the Office of Environmental Planning, the Office of Engineering (Landscape Design), and the Office of Environmental Compliance (Municipal Separate Storm Sewer System or MS4 Unit) to provide primary treatment for stormwater from the early stages of design, through construction.

CTDOT projects are designed and constructed in accordance with the Connecticut Stormwater Quality Manual, which is prepared by the Connecticut Department of Energy and Environmental Protection (CTDEEP) and the Connecticut Council on Soil and Water Conservation. This manual provides guidance on the measures necessary to protect the

waters of the State of Connecticut from the adverse impacts of post-construction stormwater runoff. This manual focuses on site planning, source control, and stormwater treatment practices and is intended for use as a planning tool and design guidance document by the regulated and regulatory communities involved in stormwater quality management.

Additionally, the CTDOT designers are required to complete the CTDOT MS4 Project Design Maximum Extent Practicable (MEP) Worksheet (Attached as Appendix J). The CTDOT MS4 Project Design MEP Worksheet is intended to be a living document that follows a project throughout its design. The primary intent of the worksheet is to track the required metrics that must be reported to CTDEEP annually in order to comply with the DOT MS4 General Permit. It also serves as the required documentation to demonstrate that stormwater mitigation was pursued in a project's design to the maximum extent practical. CTDOT's primary goal is to retain or treat the project's water quality volume onsite by utilizing stormwater practices within the project limits. These practices could include but are not limited to rain gardens, vegetative swales, and water quality basins.

Erosion Control

Similar to stormwater, erosion and sedimentation control are considered in the design, and specific project plans are developed and followed during construction. In project design, consideration is given to steepness of slopes, proper slope treatment and seeding to avoid erosion and sedimentation during and post construction. All CTDOT projects must be in conformance with the Soil Erosion and Sediment Control Guidelines (E&S Guidelines) developed jointly by CTDEEP and the Connecticut Council on Soil and Water Conservation and are found here: Guidelines for Soil Erosion and Sediment Control (ct.gov)

CTDOT designers utilize standard erosion control pay items identified in the Form 818 as well as Special Provisions, E&S Highway Standard Drawing Details, and E&S Guide Sheets Details included into the Contract and implemented during construction. Additionally, projects are phased to minimize the amount of ground disturbance at any given time to minimize sediment runoff from the construction site. Phasing will include the use of temporary and permanent seeding / plantings or other measures to stabilize disturbed soil.

Replanting

Landscape architecture and planting for transportation projects often are a collaborative effort between the various bureaus within CTDOT, as well as municipalities, community groups, and other stakeholders. Planting layouts and designs must consider safety as well as access to, maintenance of, and potential interference with all appurtenances and infrastructure within the right-of-way.

Standard Specifications for Planting

All planting work is governed by Article 9.49 of Form 818 and consists of the required specifications for furnishing trees, shrubs, vines and groundcovers, preparation of planting areas, plant layout, installation, staking and guying, fertilizing, mulching, and watering. See *Article 9.49 of Standard Specifications Form 818*, Attached as Appendix K.

For construction projects, tree removal is limited to what is necessary for the project itself, along with what is absolutely necessary for construction access and staging. All construction projects include a landscaping plan to provide for proper landscaping when construction is complete. These landscaping plans are designed by professionals to align with safety, provide visual clues to drivers, as well as aesthetics. A sample construction planting plan is attached as Appendix M.

Control and Removal of Invasive Species

When required, CTDOT Projects include a special provision for development and implementation of an Invasive Vegetation Removal Plan (IVRP) to be provided by the contractor to CTDOT for review and acceptance. The item for control and removal of invasive vegetation that outlines this process is attached as Appendix L. The IVRP identifies the contractors proposed means and methods to control and treat invasive species as identified within the project limits including treatment schedules throughout the duration of the project. The IVRP must be submitted and approved prior to any clearing and grubbing operations and outlines the identification and treatment methods for the control of invasive vegetation on the project. Treatment may include mechanical or chemical (herbicide) means. Specifications also include proper off-site disposal of invasive vegetation to avoid further dispersal of the species. The list of invasive vegetation to be controlled, removed, and disposed off-Site under this item can be found on the following websites:

- Connecticut Invasive Plant Working Group (CIPWG)
- US Army Corps of Engineers (ACOE) New England District Compensatory Mitigation Guidance Appendix K

For CTDOT Construction projects with impacts to regulated areas, permit authorization from State and Federal agencies to conduct activities within wetlands or watercourse areas is required. Typically, as part of the permit approval process, invasive species management and treatment measures are also required as a permit mitigation requirement. Invasive species also may be identified and treated outside of regulated areas as deemed appropriate given the scope and nature of the project. A sample Permit Planting plan can be found in Appendix M.

Use of Native Species

CTDOT selects species for seeding and planting that are native to the region and selected based on their suitability for the site conditions. Considerations in plant species include whether the site is a wetland or an upland area; has highway line-of-sight or other safety concerns; has nearby utilities, and other infrastructure related components. CTDOT selects species of grasses, shrubs and trees which are similar to surrounding native species, and capable of withstanding conditions within the vicinity of the project limits to ensure planting success while maintaining the local habitat value for wildlife species.

One-Year Establishment Period

On all projects with Plantings, CTDOT requires the Contractor to secure a permit bond for work associated with the Plant Items, the necessary replenishment of Wood Chip Mulch and the Control and Removal of Invasive Vegetation in conformance with Section 9.49.15 of Form 818 (One-Year Establishment Period). (See Attachment K, *Article 9.49 of Standard Specifications Form 818*) Given its scenic and historic designation, special provisions are included in all Merritt Parkway projects that require a two-year warranty period for all plantings.

Pollinator Habitats and Reduced Mowing

In accordance with Public Act 16-17, CTDOT implemented a pollinator program by establishing conservation areas in selected locations within the highway system. These locations consist of warm season grasses, native wildflowers, and low-growing vegetation ultimately increasing areas for pollinator habitats. CTDOT, in collaboration with various outside entities, continues to implement best management practices in the establishment, maintenance, and monitoring of these locations. CTDOT is continually evaluating prospective locations for future expansion of the program.

New England Aster, (Symphyotrichum novae-angliae) - a native pollinator species in a DOT conservation area.

Common Milkweed (Asclepias syriaca) within a DOT Conservation Area. This species is a critical host plant for monarch butterflies.

Oversight of the Pollinator Program is conducted by the Central Maintenance Landscape Designer in collaboration with an Environmental Planner and the DLD's. The designation of conservation areas is determined by several factors including available space, sight line distances, terrain characteristics, soil conditions, and the existing presence of invasive plants and woody vegetation. Conservation Area signs

may be strategically placed at each location for visibility to the traveling public and to assist mower operators. Conservation Areas will be established at select highway ramp areas, medians and along selected roadside shoulder areas. Reduced mowing practices are required at all conservation areas. Pollinator plugs or a specialized seed mix may be used to help establish the pollinator corridor. In some cases, transplanting existing wildflowers from the area perimeter into the open, meadow section of the area may be implemented.

Planting and transplanting will occur in early spring or late fall. Seeds planted in the fall will become dormant over the winter and may begin growing the following spring, or, in many cases, 2-3 years later. A cover crop, or nursery crop, will be included in the seed mix to serve as temporary cover and for stabilization before the wildflower seeds germinate.

For more information on CTDOT's pollinator program and reduced mowing, please see Sections 7 and Section 5 of the *Bureau of Highway Operations Vegetation Management Guidelines*, attached as Appendix A.

APPENDIX A: BUREAU OF HIGHWAY OPERATIONS ROADSIDE VEGETATION MANAGEMENT GUIDELINES

Prepared by and for:

Bureau of Highway Operations – Office of Maintenance

January 2024

CONNECTICUT DEPARTMENT OF TRANSPORTATION

Bureau of Highway Operations

OVERVIEW

In accordance with Connecticut Public Act 23-135, Vegetation Management Guidelines have been established by and for the Bureau of Highway Operations to provide maintenance personnel with the necessary information and guidance for maintaining a safe, efficient, and effective vegetative landscape along CTDOT highways. A significant objective is continuing the management of overgrowth along the State highway system imbalance with environmental impacts. Vegetation management is essential for inspection and routine maintenance of our transportation infrastructure including roadways, bridges, drainage systems, signage, traffic impacts, guiderail, and barrier systems. With the exception of the removal of any trees or vegetation necessary to maintain public safety or damage resulting from a weather-related emergency, the goal of these guidelines is to ensure that the impacts of maintenance projects on the environment, landscape and noise pollution are balanced or outweighed by measures taken to avoid and minimize the impacts.

Vegetation management has several positive impacts that improve the movement and safety of the traveling public. Tree removal and limb management helps to decrease the overall failure of trees and limbs from falling onto the roadways. This greatly decreases the likelihood of vehicle strikes as well as increasing sunlight onto our road surfaces resulting in improved driving conditions during the winter months. Brush management, roadside mowing, and controlled herbicide use on targeted invasive plant species manages overgrowth and improves line of sight distances. Additionally, managing vegetative growth greatly reduces the exposure of wildlife, particularly large mammals along CTDOT highways. All of which make travel safer for the highway user.

In response to Federal legislation, and in accordance with CT Public Act 16-17, CTDOT implemented a pollinator program establishing select highway locations throughout the state as conservation areas. Selective vegetation management in these areas is designed to

promote the establishment and propagation of wildflowers and warm season grasses. This has resulted in increased habitat for pollinators, insects, meadow birds, and other species.

It is essential our maintenance operations continue to make reasonable efforts to promote pollinator habitat and preserve the overall aesthetic appeal of the highway landscape. Special consideration is given to preserving our designated scenic highways and the aesthetics of all our roadsides provided that the safety and efficiency of the highway system is not compromised by doing so.

Natural disasters and various weather events may damage vegetation and impede travel along state. highways. The Bureau of Highway Operations is committed to managing storm debris operations to facilitate a prompt and efficient recovery of the highway system. These guidelines are designed to provide information and direction to Bureau of Highway Operations personnel for maintenance activities related to vegetation management. These are designed to be environmentally conscientious while at the same time maintaining public safety.

GLOSSARY OF TERMS

When used in these guidelines, the following words and phrases shall have the meaning that is designated herein:

Boundary Line Tree
A tree growing in whole, or in part, on a boundary line between abutting property owners.

Bounded Highway
A CTDOT Right of Way whose limits are delineated by CTDOT monuments and shown on CTDOT mapping.

Clear Zone
As defined by AASHTO: a region around the roadway of sufficient width to allow 80 percent of vehicles that inadvertently leave the roadway to safely recover to the roadway.

Compromised Tree
A tree that has substantial visible decay or substantial visible damage that renders the tree, or a part of the tree, structurally unsound.

Conservation Area
Designated locations where planned vegetation management practices provide for pollinator habitat.

Dead Tree
A tree which visibly evidences lifelessness due to the lack of leaves or foliage during the summer months (June to September).

Deflection Distance
The lateral distance that the outside face (side away from traffic) of a barrier will move when struck by an errant vehicle before that barrier system stops the movement of the vehicle away from the road.

Emergency
An unexpected and sudden event that must be dealt with urgently.

Encroachment
An intrusion or use of a highway Right of Way for purposes other than for traveling.

Encroachment Permit
A permit issued by the District Maintenance Director, or his assignee allowing use of the highway Right of Way to a permittee who has met certain qualifications, herein referred to as a “permit”.

Environmentally Sensitive Areas
Any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem; these also encompass all state and federal regulated areas.

Herbicide
A substance that is toxic to targeted plants and is used to control unwanted vegetation.

Highway
A highway, bridge, or appurtenance to a highway or bridge designated as part of the state highway system; see also “State Highway System”.

Invasive Species
An organism that causes economic and environmental harm in a new environment where it is not native.

Maintenance Projects
Any activity or operation conducted by the Bureau of Highway Operations for vegetation management of the state highway system.

Major Traffic Generator (MTG)
With the context of CGS 14-311, any open-air theater, shopping center or other development generating large volumes of traffic, shall mean any development providing two hundred or more parking spaces, or a gross floor area of 100,000 square feet or more which substantially affects state highway traffic within this state, and as provided for in the Administrative Regulations promulgated by the Office of the State Traffic Administration (OSTA).

Merritt Parkway Advisory Committee (MPAC)
The MPAC is comprised of representatives from the 8 towns the Parkway traverses, DOT disciplines, Metropolitan Planning Organizations, Federal Highway Administration (FHWA), State Police Troop G Commander, CT Chapter of the American Institute of Architects, CT Chapter of American Society of Landscape Architects, CT Trust for Historic Preservation, and the Merritt Parkway Conservancy (MPC). The committee’s purpose is to advise CTDOT on all matters relative to the Merritt Parkway.

Merritt Parkway Conservancy (MPC)
A program of the Connecticut Trust for Historic Preservation which aims to revitalize the Merritt Parkway.

Non-Recoverable Slope
A slope which is considered traversable but on which an errant vehicle will continue to the bottom, such as slopes that are steeper than 4:1. Most drivers will not be able to recover and return to the highway on this degree of slope.

Permittee
An applicant or person to whom a permit is issued.

Pollinator
An agent (insect or animal) that pollinates flowers.

Pollinator Program
A program consisting of creating or identifying designated conservation areas for pollinator habitat.

Regulated Area
Areas of land where the Regulation applies to protect watercourses, valleys, slopes, streams, flood plains, lake shorelines, and wetlands from flooding, erosion, and other hazards.

Right of Way (ROW)
Real property, reserved for highway purposes, obtained by CTDOT either in fee or through line establishment and containing the travelway, roadside, drainage systems and other appurtenances necessary for public travel.

Roadway
The portion of the highway, including shoulders, intended for the movement of vehicles.

Scenic Road
A designated CT state highway, or portion of it, that (1) passes through agricultural land, or abuts land on which stands an historic building or structure listed on either the federal or state register of historic places, or (2) affords a view of marshes, shoreline, forests with mature trees, or notable geologic or other natural features that, singly or in combination, distinguish the highway.

Shoulder
The part of the roadway between the travel way and edge of pavement, gutter, or ditch.

Sightline
A line of sight along a specific orientation or plane; refer to CTDOT's Highway Design Manual, as revised, for additional information.

Sight Distance
The length of roadway visible to the driver of a vehicle at a given point on the roadway when the view is unobstructed.

State Highway System

A system of highways which includes State primary highways, State secondary highways, State special service highways, and all highways in the interstate highway system, pursuant to the Connecticut General Statutes, as revised.

Swath
A term that refers to the cutting widths as applied to mowing and brush removal.

Travelway
The portion of the roadway for the through movement of vehicles, exclusive of shoulders and auxiliary lanes.

Unbounded Highway
A section of highway which is not delineated by monuments or mapping to show its width or highway lines.

Understory
The underlying layer of vegetation in a forest or wooded area, especially the trees and shrubs growing between the forest canopy and the forest floor.

Vegetation Management Safety Improvements (VMSI)

- On multi-lane highways an operation requiring complete removal of trees within the 30’ clear zone for a total distance of 1/4 mile or more.
- On secondary highways, where the clear zone is variable due to lane widths and right-of-way constraints, tree cutting operations are considered VMSI when they include removals of more than 100 trees within a total distance of 1/4 mile or less.

Volunteer Woody Vegetation
Plants that have begun growing in an area borne by air, water or by birds.

ABBREVIATIONS

AASHTO
American Association of State Highway and Transportation Officials; a nonprofit, nonpartisan association representing Highway and transportation departments in the 50 states, the District of Columbia, and Puerto Rico

ADT

Average Daily Traffic

ANSI
American National Standard Institute

BHO
Bureau of Highway Operations

BMP
Best Management Practice

CAES
Connecticut Agricultural Experiment Station

CGS
Connecticut General Statute

Commissioner
The CTDOT Commissioner of Transportation

CTDOT
Connecticut Department of Transportation (also referred to as Department)

DBH
Diameter Breast Height; diameter of tree measured 4.5 feet up from soil surface

DEEP
Department of Energy and Environmental Protection

DLD
District Landscape Designer

GIS
Geographic Information System: a system designed to capture, store, manipulate, analyze, manage, and present spatial or geographical data

IRMS
Image Records Management System; a CTDOT map records program

Maint. 37

Right of Entry form, used whenever state personnel or equipment need to enter upon private property

Maint. 89
Tree Report; used to evaluate and document condition of tree(s)

PCMP
Pest Control Management Plan

ROW
Right of Way

UCONN
The University of Connecticut

VMSI
Vegetation Management Safety Improvements

GENERAL GUIDELINES

This section provides guidelines which apply throughout the document and should be referred to for all vegetation management practices. Any other existing directives, policies, procedures, or guidelines that involve vegetation management practices are hereby superseded by these guidelines. When reviewing any documents, statutes, or other materials referenced in these guidelines, please check that the most current version of these items is being reviewed. In every CTDOT operation safety is always the highest priority. Always be aware of the ROW line (highway line) in relation to the work limits. We cannot legally work outside CTDOT property unless a right to enter form (Maint. 37) is completed. Note that land posted “State of Connecticut” is not necessarily CTDOT property. Ownership responsibility must be determined before work can commence. Reference should be made to resources such as ROW maps, the District Survey’s unit or Central Surveys in Newington to determine property lines and associated responsibilities. DLD’s are to be notified in advance by Managers, General Supervisors, or Crew Leaders of any

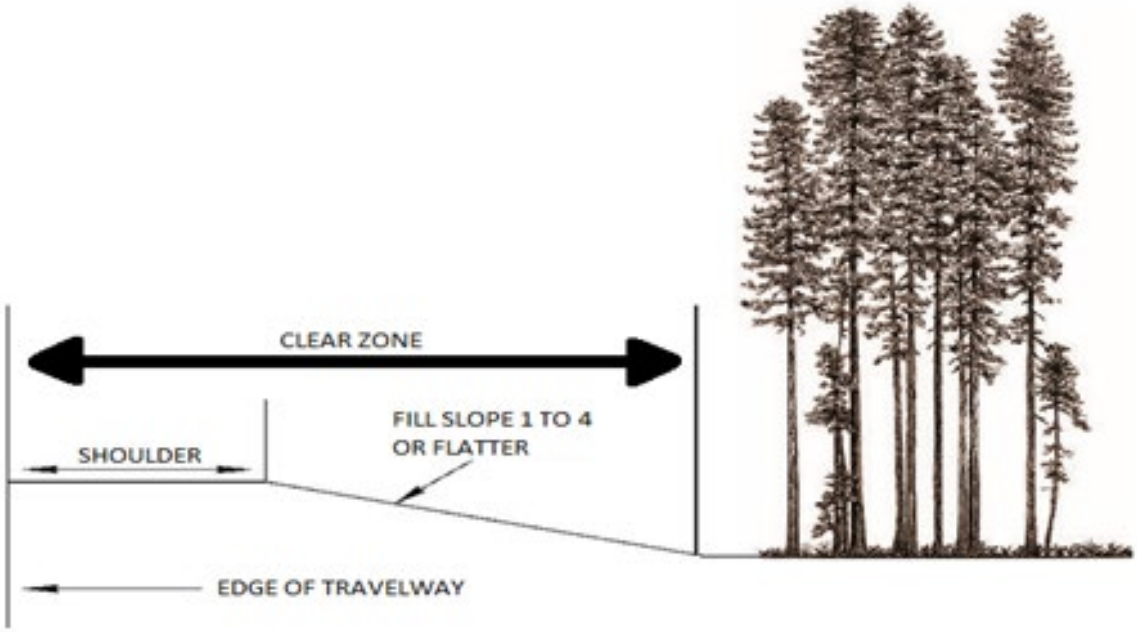
planned, non-emergency vegetation management outside of normal mowing practices and outside of the VMSI definition. Notification to the DLD shall include details such as specific work location and termini, type of work (removals, trimming, etc.), scope of work, type of equipment used to perform the work, and planned start and finish dates. As a reminder a tree is considered a fixed object when greater than 4-inch diameter as defined by AASHTO.

No vegetation work shall be performed until the proper CTDOT personnel have completed their review and the respective abutters and the Town DPW Director(s) have been notified in writing.

Working Near Environmentally Sensitive / Regulated Areas

The Central Maintenance Environmental Planner must be consulted for review and approval prior to any vegetation removal operations proposed within or directly adjacent to environmentally sensitive/regulated areas. When water features are present, we must leave the understory intact—this means small shrubs and small diameter trees must remain. No wood chips or debris shall be dispersed in any regulated area—a lot of areas may not have surface water but are still regulated wetlands or even floodplain. Typically, in an area with a larger watercourse the surrounding low areas are regulated –in these areas any wood chips past the toe of slope is not an acceptable practice. **If you are unsure of Best Management Practices for any particular area, refer to Maintenance Directive 23-07 (see Appendix) or reach out to Central Maintenance to schedule an on-site review.**

Clear Zones/Guiderail Systems



Roadside right of way areas should be maintained to provide motorists an unobstructed, traversable area that will allow an operator to stop safely or regain control of a vehicle that has left a roadway. Each area is cut to meet or exceed the deflection distance corresponding to the installed barrier system. When determining the distance to cut beyond the deflection distance, considerations may be the lean of the trees, falling distance, previous cut distances, and sunlight onto the roadway. When the area behind the barrier system is steep or a non-recoverable slope, the cutting distance should be determined by the DLD. When reestablishing a clear zone or removing vegetation for a system deflection distance the District Traffic Engineer should be consulted for a determination.

Scenic

Vegetation management operations on scenic roads must be reviewed and approved by a member of the Scenic Roads Advisory Committee in advance of the work unless an emergency condition exists. The committee members that must be contacted for this purpose are the current SRAC Chairperson and the Landscape Designer in the Office of Central Maintenance. *Refer to Section 8* Scenic Roads

In accordance with CGS 13a-99a, the municipality is responsible for sight distances at an intersecting, town-owned roadway onto a state road. Similarly, when exiting a private drive onto a state road, the responsibility to provide and maintain adequate intersectional sight distance is placed upon the owner of the private drive. An encroachment permit must be obtained for any work within the CTDOT ROW.

Right of Entry

A right of entry form (Maint. 37) should be used whenever state personnel or equipment will need to enter upon private property to address a tree within the ROW. The form is to be signed by the abutting property owner granting access to their property for the specific purpose of removing / trimming trees on state property. Unless absolutely necessary for the safety of the traveling public as determined by the Maintenance General Supervisor or the DLD, no work should take place until the form is signed and returned to the respective

DLD or Maintenance General Supervisor. Extra care should be exercised to prevent damage whenever entering upon private property.

Handling Complaints

Vegetation complaints or requests received for tree evaluations will be reviewed by the General Supervisor or DLD as soon as practicable. If pruning or removal is deemed necessary, the DLD should determine the location of the tree in relation to the ROW and take the appropriate action depending on whether the tree is within or outside the state highway right of way. The DLD will complete the Tree Risk Assessment form (Maint. 89, page 2). If it is determined that work is needed, the DLD will complete a work order and any other documents (notification card, Right of Entry–Maint. 037) and forward them to the applicable Maintenance Manager for completion of the recommended action.

For locations where the right of way property line is bounded, ownership of the tree(s) or vegetation is determined by using ROW mapping, IRMS, or latest department software. In locations of unbounded highways, town (GIS) mapping may be used. The District Survey Unit may also assist in determining the location of the state highway right of way line.

Late Fall, Early Spring

For these guidelines late-fall is defined as mid-October through mid-December. Early-spring is defined as mid-March to the end of April.

TREE REMOVAL

PURPOSE

Trees within the state highway right of way are to be maintained to provide for the safe and efficient movement of the travelling public. CGS 13a-140 grants the Commissioner exclusive authority over all CTDOT rights of way by stating "the Commissioner may cut, remove, prune any tree, shrub or other vegetation situated wholly or partially within the limits of any state highway so far as is reasonably necessary for safe and convenient travel thereon."

GUIDELINES

Tree removal may be performed at any time during the year. BHO forces will engage in a continuing program of selective tree removal, removal of woody vegetation, invasive species and overgrowth situated within the ROW. Trees within the ROW that are determined to be dead or compromised and in need of corrective action will be either removed or maintained as deemed necessary.

Highway boundary line trees may be removed without the abutting property owner's consent if they pose an immediate danger and warrant immediate action.

Prior to the commencement of tree work, notifications should be made to the abutting property owners when practicable. When notifying an abutting property owner, a notification card or business card may be left in the doorway or other conspicuous location. CTDOT employees are not authorized to place anything inside of a private

mailbox). This notification is to advise the abutter of the work to be done and offer contact information in the case of questions or concerns related to the work.

In instances when a tree falls from state property onto private property, the following position statement is to be applied: It is the Department's position that when a tree falls from State property onto private property, it is the responsibility of the private property owner for the removal of the tree(s). The only exception to this is if it is determined that special, unique circumstances exist; in such case the details are to be given to the Maintenance Manager of the section who will determine a course of action. In the event the complainant requests claim information, the Office of the Claims Commissioner website is available to them for filing instructions. For tree failure incidents where a tree, or portion thereof, fails into the state highway right-of-way or onto abutting property resulting in physical injuries or property damage, the latest-revised Tree Failure Protocol is to be followed.

While performing any tree removal operations, substantial wood debris such as large logs or limbs that remain after the trimming or removal of a tree shall be placed in a safe manner. The butt ends of trees and limbs should be placed on an angle facing away from the direction of travel and removed from the ROW as soon as practicable. Exceptions may occur during extreme weather events.

Wood chips and all resulting debris cannot be cast or dispersed in wetlands, watercourses, and/or drainage ways. Wood chips may be cast in upland areas, except rock cuts, providing they are dispersed evenly. Wood chip piles are not permitted along roadsides. Trees are not to be backfilled or debarked as a result of any Maintenance operations.

When conducting tree removal all stumps must be cut as close to the ground as possible, generally to a height of 8" above ground level or lower. Stumps must be cut at the respective angle of grade / slope. Cut stumps must be chipped or removed offsite. When stumps and roots require complete removal, this may be performed by excavation or stump grinding. If the stump is located on a lawn or other developed area, it will be removed to a minimum of six inches below the ground. Stumps in cleared wooded areas may be removed to a minimum of two inches below ground, depending on the location and the need. Areas where stumps are excavated will require grading and erosion control measures in accordance with the Department's Best Management Practices as identified in the latest edition of the CTDOT *Standard Specifications for Roads, Bridges, Facilities, and incidental Construction.*

Vegetation Management Safety Improvement (VMSI)

When planning for Vegetation Management Safety Improvement operations, *Maintenance Directive No. 23-02 Tree Cutting (see Appendix) – VMSI Standard Operating Procedure (latest revised), must* be followed. The VMSI form and a review of the area must be completed prior to any work being performed. Upon completion of the review the District will be notified of any site-specific restrictions. Once the VMSI operation is completed the DLD will update the associated form and software required.

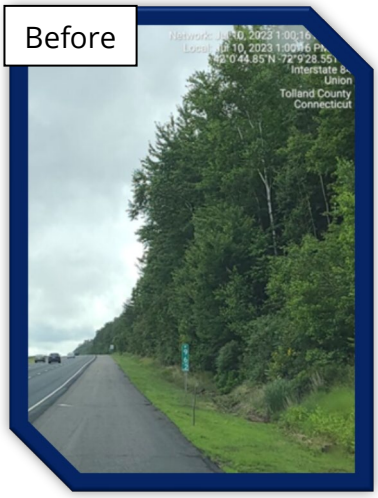
Tree cutting operations on multi-lane highways are generally considered VMSI when they include complete removal of trees within the 30' clear zone for a total distance of ¼ mile or more.

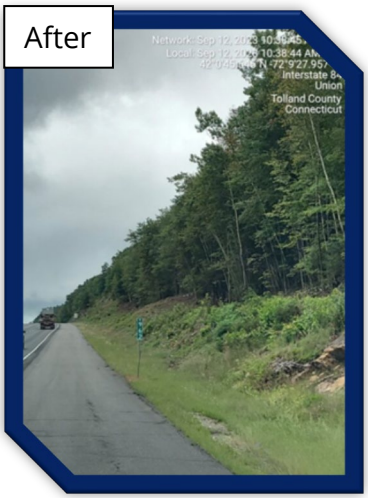
On secondary highways, where the clear zone is variable due to lane widths and right of way constraints, tree cutting operations are considered as VMSI when they include removals of more than 100 trees within a total distance of a ¼ mile or less. (*Refer to Scenic Roads chapter for further guidelines)*

- VMSI operations on the Merritt Parkway shall be in accordance with Connecticut State Regulations Sections 13b-31e-1 through 13b-31e-4. CTDOT should apprise the MPAC and MPC of proposed alterations and improvements in accordance with the Landscape Master Plan for the Merritt Parkway and the Merritt Parkway Guidelines for General Maintenance and Transportation Improvements.

Working with Contractors

Contracted tree crews utilizing specialized equipment may be employed to remove and properly dispose of trees or vegetation. The District Planning office should be consulted for DAS contract information related to contractor tree removal, trimming, or disposal of wood debris services. The DLD, Maintenance General Supervisor, or their





designee will have oversight of contracted tree crew operations to ensure that the defined tree(s) or area where trees are to be removed is strictly adhered to and these guidelines as well as the terms of the contract are followed.

Maintenance personnel should be familiar with contract language and provide routine inspection of contracted operations. Maintenance General Supervisors and Landscape Designers may exercise discretion in establishing cutting limits in relation to abutting property owners or environmentally sensitive / regulated areas such as watercourse crossings, areas adjacent to waterbodies or wetland areas.

Dead or Compromised Trees

If during their routine highway patrol activities, a Maintenance General Supervisor observes a tree that visibly appears to be dead or significantly compromised, the Maintenance General Supervisor should document such tree by completing the front page of a Preliminary Tree Report (Maint. 89) and send the form to the DLD for evaluation of the tree. The DLD will complete the back page of the Maint. 89 form and issue a work order as needed. Maintainers should notify the Maintenance General Supervisor if they observe the above-noted conditions during their course of travel. If deemed necessary by the Maintenance General Supervisor, this information may be communicated to the DLD. In the event the DLD is unavailable and/or conditions warrant immediate action, the Maintenance General Supervisor may contact the Maintenance Tree Crew or maintenance forces directly and request whatever action is deemed necessary.

Dead or compromised trees identified by the Maintenance General Supervisor which have been determined to be situated outside of the highway right of way, generally require the District office to initiate a certified letter addressed to the property owner. Notification should include that it has been determined that the tree poses a risk to the state right of

way and that it is the property owner's responsibility to prune and/or remove the tree. In cases where the DLD determines that immediate corrective action is necessary for the safety of the traveling public, the District Maintenance Director may establish an immediate course of action including the authorization of state forces to remove the dead or compromised tree(s).

WORK NEAR UTILITY WIRES

PURPOSE

The safety of each employee and the travelling public is of paramount importance. Exposure to unprotected energized equipment is extremely dangerous and can cause serious injury or death.

GUIDELINES

ALL UTILITY WIRES ALONG THE HIGHWAYS SHALL BE CONSIDERED TO BE "LIVE" WIRES.

Employees shall not attempt to differentiate between live wires, dead wires, wires carrying high or low voltage, insulated wires, telephone wires, or the like. Employees shall not work in proximity to downed wires, broken wires, low wires, hanging wires, etc. Wires of this sort shall not be touched and if possible, spotters may be posted to prevent

others from approaching these wires. **No CTDOT employee should enter near, or contact, any downed wires unless the utility company explicitly states that the wires are "dead" and "grounded". No other person or company is qualified to determine this**. The utility company shall be immediately notified of the condition so that action may be taken with minimal delay. Treat all downed wires as live.

Whenever state crews are operating bucket trucks in the vicinity of wires, it is imperative that each Supervisor of a bucket truck crew personally review the safe operation of this equipment with the crew, placing special emphasis on the following:

- Always keep the bucket, boom, tools, and all debris a minimum of ten feet away from all wires.
- Dispel any ideas of the crew members that they are perfectly safe because the bucket and upper boom of the truck are insulated.

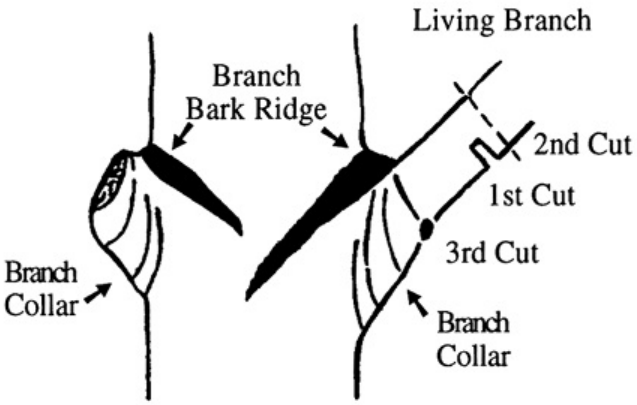
Whenever operating near wires, the ground man shall constantly observe the position of the boom and shall signal its position to the operator in the bucket. Whenever utility wires (wires) are involved, the Maintenance General Supervisor shall contact the appropriate public utility company acting as custodian of the lines to arrange for the utility company's participation in the removal of the tree parts in proximity to their wires.

Refer to Safety Talk ES-4-7-05 (or latest revised) for further guidance.

LIMB MANAGEMENT – SIGHTLINE MAINTENANCE

PURPOSE

Limb management and sightline maintenance is necessary to provide for overhead clearance, allow additional sunlight onto the road surface and provide clear sight distances along all state highways. Limbs that are obstructing sight distances, dead, structurally compromised, or are below the minimum overhead height requirement should be removed or elevated as necessary.



Branch bark ridge and branch collar

GUIDELINES

CTDOT may perform limb management and sightline maintenance at any time during the year. Branch stubs should not be left if possible and final trimming cuts are to be made at the branch collar leaving a clean, neat cut. Slope mowers shall not be used in the vertical position to perform tree trimming. Trees are not to be topped. If more than 25% of canopy limbs require removal due to factors such as disease or storm damage, the entire tree should be scheduled for removal.

Limb removal and trimming cuts shall be made by approved methods and to standards in accordance with the latest-revised ANSI A300 Tree Care Standards. Use chain saws, pole saws, power pruners, and/or an aerial lift when cutting limbs. Over-the-fence type mowers should not be used for limb removal and trimming, except in instances where subsequent proper finish cuts at the branch collar can be achieved. Where a material handler with grapple saw or crane-mounted grapple saw is utilized, final cuts should be made by aerial lift and chain saw at the branch collar.

Maintenance forces will engage in a continuing program of limb management and sightline maintenance as the following conditions are observed:

- Sightline obstruction to warning, directional, regulatory signs, and traffic control signals.
- Limbs overhanging the highway travel way encroach upon the minimum vertical clearance requirement of 16 feet. Lateral branches extending over the travel way should be pruned or removed to provide the minimum height clearance. Dead limbs overhanging the highway originating from state or privately-owned trees.
- The sightline is restricted on the inside of horizontal curves, vertical curves, at intersections, crossovers, or grade crossings. Consult with the District Traffic Engineer or refer to the CTDOT Highway Design Manual (latest revised) for sightline distances.
- Curb and shoulder encroachments are found.

BRUSH MANAGEMENT

PURPOSE

Brush management is the removal or trimming of woody trees and shrubs to maintain their size and proportion in relation to the roadside. This activity may only be performed in areas that predominately consist of brush and may not be performed in locations that predominately contain grasses or other herbaceous vegetation. This activity may also be used to restore desired vegetative cover to protect soil from erosion.

GUIDELINES

Brush management may be performed at any time during the year. Brush is defined as woody plants that may have several stems and have a diameter or caliper, measured single stem with a DBH of six inches or less at a height of four and a half feet above the ground surface. Brush needs to be cut flush with the existing ground.

Maintenance will be continued on a regular basis to suppress the growth of volunteer woody vegetation. When the diameter of woody vegetation exceeds six inches and mechanical control is desired, refer to Section 1 Tree Removal. Depending on the terrain and scale of work, track-mounted equipment with a brush mower or an excavator equipped with a large flail mower may be utilized.

Brush management may be performed in the following locations:

Primary and Secondary Routes

Begins at the outermost limit established for routine mowing and extends to the right of way line or the tree line, whichever is less, regardless of slopes or ditches.

Interstate Routes

Along interstate shoulders and medians to maintain areas beyond the routine mowing limits that are included in the actual calculated clear zone.

Drainage Areas

Along clearly defined drainage ditches to maintain proper drainage and in areas which provide access to headwalls and culverts for maintenance operations. This will consist of cutting vegetation as required on each side of the ditch, headwall, or culvert, regardless of the slope.

Fences and Sound Barriers

Brush removal should be performed along fences and sound barriers to protect the integrity, performance, and life of the asset. When performing this activity, access to the work area shall be obtained from the frontage road when possible.

Rock Cut/Ledge Areas

Brush in front of rock cut/ledge areas is to be removed for safety and inspection purposes. Trees growing within the rock cut/ledge area may be susceptible to failure due to poor root

system establishment and should be removed when it is determined to pose a risk to the highway system.

Bridge Structures

Bridge structures should be free of vegetation from ten feet beyond the end of the bridge deck to the toe of the slope beneath the bridge at a width of 10 feet from the structure along its entire length.

ROADSIDE MOWING

PURPOSE

The primary purpose for mowing is to provide a stabilized turf area adjacent to the state highways. This stabilized area helps prevent wind and water erosion, allows a safe area for errant vehicles, provides for safe sightline, reduces a possible fire hazard, and maintains reasonable aesthetics by providing a transition area from the highway to the surrounding vegetation.

GUIDELINES

Roadside mowing is conducted for approximately 24 weeks beginning around May 1st or when the grass reaches an average height of (8) inches. In areas generally over 60 feet in width the roadside shoulders and perimeters will be mowed. The interior areas will be deferred until control of any encroaching invasive plants or

woody vegetation becomes necessary. To maintain turf areas in a healthy condition, mowers shall be set at a minimum cutting height of three (3) inches. This shall be attained by periodically checking all the mowers during the mowing season to be sure this minimum height is being maintained. Litter should be removed prior to each mowing.
During exceptional growing seasons, mowing frequency may be increased to prevent overworking mowing equipment. Mowing for brush control will be scheduled during the late growing season, preferably after October 1st or as required.

To prevent overworking mowing equipment, mower operators should utilize lower gears when mowing tall grass during the late season. In residential areas and in keeping with maintenance practices on adjacent property, mowing may extend to a width that will blend neatly with the established surroundings.
Mowing sight lines at intersecting town roads may include the swath return up to the end of the Right of Way**.** Refer to the *CGS § 13a-99a.; Town roads lying within, intersecting, or crossing state highway rights of way.*

Slope mowers will be utilized in areas that conventional mowers are unable to maintain. This type of mower may also have the ability to remove small brush and undergrowth year-round.

Conservation Areas

Mowing practices in these designated areas will include the travelway shoulders and where appropriate the conservation area perimeter. Mowing of the interior of a conservation area will be delayed until late fall but not prior to October 15th or early spring of the new year. In some cases, deferment may extend until late fall of the second or third season depending on the presence and pressure of invasive plants within the conservation area. Central Maintenance should be consulted prior to mowing any interior of a conservation area outside of the prescribed deferral time.

Secondary Roads

Roadside mowing on secondary roads will consist of all required sightline areas and generally two swaths along the roadways made two or three times during the growing season. Mowing for brush control will be scheduled as required to protect drainage systems and prevent brush encroachment.

Multi-Lane Roads

Roadside mowing of the multi-lane highways will consist of all required sightline areas and up to fifteen feet alongside the highway. Exceptions would be:

- Mow to the drainage ditches if it is within two additional swaths of the fifteen feet. In this case, mow one additional swath beyond the ditch.

Medians, Ramps, Slopes

Except for wide areas, the entire median will be mowed where possible, and mowing will terminate at the pronounced tree line. Wide median areas may be defined as generally wider than 60 feet.

- Less than 60’ wide: mowed entirely
- 60’ wide or more: a fifteen-foot cut will be mowed on either side of the median or ramp

Sightlines must be considered when determining mowing limits. Additional mowing may be required at on ramps, bowl areas, and the point of the ramp to improve sightlines with merging or oncoming traffic.

Note: On tapered ramps when the average width becomes greater than 60 feet, consideration may be given to defer until late fall mowing mid-October to mid-December or early spring mid-March through the end of April of the following year.

Merritt Parkway and Scenic Roads

Attention will be given to roadsides of specially landscaped highways. The presence of tall grass and weeds growing close to decorative plantings produce an unkempt appearance and detract from the aesthetics of the landscaped area. Additional mowing cycles may be needed in these areas to maintain a park-like appearance. Reference should be made to the *Merritt Parkway Master Landscape Plan* for

details in maintaining a park-like setting along scenic roads, the Merritt Parkway, and other specially landscaped highways. *Refer to section 8 for additional information.*

HERBICIDE PROGRAM

PURPOSE

CTDOT employs an integrated approach to roadside vegetation management utilizing manual, mechanical, and chemical methods. Chemical control of vegetation is imperative to ensuring the accessibility and visibility of the guiderail systems, signs, barriers, and bridge structures. This type of control measure may also be used by licensed personnel to maintain sightlines, reduce fire hazards. control invasive plants and preclude the growth of woody vegetation in designated conservation areas or established grass areas.

GUIDELINES

DOT personnel MUST possess and maintain a Governmental Supervisory License (Cat.6) to apply or oversee herbicide applications for controlling vegetation within the state right of way. The herbicide program, including the herbicides used in the program is incorporated into an Integrated Pest Management Plan (IPMP) as required by state statute. Specific application dates, work descriptions, and approved materials are available in the most current IPMP entitled “Pest Control Management Plan” and on file in the Office of Central Maintenance.

Connecticut-licensed contractors are also utilized for the application of herbicides on multilane roads, secondary roads, and for spot spray applications. Contractors utilized for herbicide applications are directed by a Landscape Designer or designated licensed personnel. Contractors may also be utilized for spot spray applications as directed by the

individual DLDs, and as described in the “Methods of Control”. Herbicides typically utilized by CTDOT have the signal word – CAUTION, which is the lowest toxicity label.
The DLD may determine “No Spray Areas” in areas where vegetation is maintained and does not present a concern with standard maintenance practices. The DLD, and/or another approved Connecticut-licensed pesticide applicator may also apply approved herbicides via backpack sprayer or truck-mounted spray rig. These are spot spray applications to control stump regrowth, vines, and invasive vegetation.

Areas of Control:

- A 3-5-foot width under guiderail systems on multilane and secondary highways
- Along capped median dividers, capped islands and at the base of concrete barriers
- In front of sound barrier walls or along wood-chipped earth berms
- Around light standards, sign supports, delineators, and other appurtenances within the highway right of way
- Regrowth of brush cut the previous season(s)
- Specific undesirable and invasive plant species within the right of way, i.e., poison ivy
- Conservation Areas

Methods of Control:

- Vegetation control under guiderail systems will be accomplished with one herbicide application per calendar year normally between May 1st and August 31st.
- Herbicides used on divided highways shall be determined by the Central Maintenance Landscape Designer and as prescribed in the current DAS contract.
- Herbicides used on secondary highways shall be determined by the DLD and as prescribed in the current DAS contract.

- Within designated watershed areas, an approved aquatic label product will be used. Herbicides used are a tank mix of the approved aquatic label product, a nonionic surfactant, and a drift control agent at the rates recommended on the labels. No chemicals are to be applied directly to any water source.
- The spot application program requires one application per year of the herbicides determined by the DLD. Basal or foliar applications may be performed January 1 to April 1 and from August 15 to December 31. No applications will be made to snow-covered or frozen ground. Brownout should be minimized.

Programs requiring special consideration

The control of some invasive plants such as mile-a-minute, Japanese knotweed, phragmite and kudzu may require broadcast foliar applications of herbicides. Review all product labels for the best and most effective applications of herbicides. The label may require special consideration. The label is the law and must be followed.

POLLINATOR PROGRAM

PURPOSE

CTDOT implemented a pollinator program in accordance with Public Act 16-17 by establishing conservation areas in selected locations within the highway system. These locations consist of warm season grasses, native wildflowers, and low-growing vegetation ultimately increasing areas for pollinator habitats. CTDOT, in collaboration with various outside entities, continues to implement best management practices in the establishment, maintenance, and monitoring of these locations. CTDOT is continually evaluating prospective locations for future expansion of the program.

GUIDELINES

Oversight of the Pollinator Program is conducted by the Central Maintenance Landscape Designer in collaboration with the DLD's.

The designation of conservation areas is determined by several factors including available space, sight distances, terrain characteristics, soil conditions, and the existing presence and pressure of invasive plants and woody vegetation. Conservation Area signs may be strategically placed at each location for visibility to the traveling public and to assist mower operators, however, sign placement must be approved by the DLD or Central Maintenance Landscape Designer.

Conservation Areas will be established at select highway ramp areas, medians and along selected roadside shoulder areas. Reduced mowing practices are required at all conservation areas.

Pollinator plugs or a specialized seed mix may be used to help establish the pollinator corridor. In some cases, transplanting existing wildflowers from the area perimeter into the open, meadow section of the area may be implemented.

Planting and transplanting will occur in early spring or late fall. Seeds planted in the fall will become dormant over the winter and will begin growing the following spring, or, in many cases, 2-3 years later. A cover crop, or nursery crop, will be included in the seed mix to serve as temporary cover before the wildflower seeds germinate. Wildflowers should be planted on either level ground or a slight grade to ensure that the soil is well-drained. This will ensure the vitality of the plants as well as helping to control weeds. New topsoil may be used for conservation areas if the existing soil lacks the necessary nutrients. It is crucial that seeds are planted at a sufficient depth or they will not germinate. The ideal planting depth is 1/8th of an inch. Wildflowers will be planted within the conservation area, excluding areas that will be mowed for sight distance maintenance.

To promote biodiversity and a healthy pollinator habitat, a variety of plants shall be selected. Pollinator plants shall have staggered bloom times to ensure the survival of pollinators in the area. At a minimum, three species shall be flowering at any given time during the growing season. Plants of the same variety shall be grouped within the corridor, as pollinating insects generally visit one type of flower at a time.

SCENIC ROADS

PURPOSE

Vegetation management on scenic roads requires consideration to preserve the roads' notable aesthetics and vegetation distinctions. Designated CT scenic roads are often adjacent to significant natural or cultural features such as agricultural land or historic buildings and structures. These features are listed on the National or State Register of Historic Places. These roads may also afford vistas of marshes, shoreline, forests with mature trees, or other notable natural or geologic features which singularly or in combination set the highway apart from other state Highways as being distinct.

GUIDELINES

Routine maintenance of trees and vegetation along state designated scenic roadways will be performed in accordance with Connecticut State Regulations, Chapter 242, Section 13b-31d through 13b-31 last revised.

In accordance with Maintenance Directive 24-02 (see Appendix) the Scenic Roads Advisory Committee Chairperson should be apprised of significant pre-planned maintenance activities with all the required approvals granted prior to the work being performed. In some instances, alternative means and/or methods will be recommended.

The Merritt Parkway is one of only two National Scenic Byways in Connecticut. The other is Route 169 (spanning Lisbon, CT to Charlton, MA). A Corridor Management Plan was prepared by the Route 169 Scenic Advisory Committee and the Northeastern Connecticut Council of Governments. A link to that study is here: 2016-2016 Corridor Management Plan

ENCROACHMENT-PERMITTED VEGETATION MANAGEMENT

PURPOSE

To provide control of the CTDOT right of way as it pertains to vegetation management performed by other than CTDOT personnel in accordance with CGS 13b-17 and 13a-140.

GUIDELINES

An encroachment permit is required for any vegetation management work within the state right of way performed by a private owner, contractor, developer, or entity not working for CTDOT.

CTDOT personnel should notify their General Supervisor of any instances where it appears work will negatively affect state owned vegetation. Coordination for addressing the issue should be made with District Special Services personnel.

When it is determined that proposed work will compromise the overall health and integrity of vegetation within the ROW, the Special Services Section Manager or designee may require complete removal of the tree or vegetation.

Examples of permit requests as related to vegetation management may include those issued for outdoor advertising, MTG's (Major Traffic Generator), Private homeowner permits, utility permits, and vegetation management for private development. These should be reviewed by the DLD for approval or during for approval of any required changes to the proposed work. For additional information on OUTDOOR ADVERTISING refer to Policy Statement: Policy No. E&C -35 last revised.

In accordance with CGS 13a-140, encroachment permits involving removal of any trees over 18" diameter shall not be issued by the Commissioner of Transportation unless the chief elected official of the municipality in which the tree(s) are situated is notified in writing by the applicant. The notice shall include the location and a description of such tree(s) to be cut or removed.

STORM DEBRIS MANAGEMENT

PURPOSE

The State of Connecticut has established Debris Management Plans for proper management of debris generated by a natural disaster or significant weather event with the goal of facilitating prompt and efficient recovery that is cost effective, protective of the environment and may be eligible for FEMA reimbursement. Examples of natural disasters include flooding, hurricanes, tornadoes, and extreme winter events.

GUIDELINES

The State utilizes monitoring and removal contracts to assist in the state's recovery efforts resulting from a natural disaster debris-producing event.

The **State Natural Disaster Plan**, latest edition, was prepared by the Department of Emergency Management and Homeland Security (DEMHS) . The Plan establishes the mission assignments of State agencies in responding to natural disasters of a severity and magnitude typical for Connecticut. The Plan describes the interaction of state government with local governments, private response organizations (e.g., utilities, the American Red Cross) and the federal government in natural disaster situations.

The **State Disaster Debris Management Plan, latest edition (Annex to the State Natural Disaster Plan)** establishes the framework for proper management of debris generated by a natural disaster.

The Plan is an important planning document for all levels of government – federal, state, and local and describes the state contracts that are in place to use in response to a catastrophic natural disaster; the contracts are for both debris' removal operations and the monitoring of these types of operations (see below for more information on the state contracts).

Further, included in the Plan are the planning and operation functions for temporary debris storage, reduction sites, the two phases of clean-up, and several appendices that provide references to waste management resources.

The **State Concept of Operations Plan (ConOps) for Disaster Debris Management, Activation and Use of the State Debris Removal and Monitoring Contracts** is a companion document to the State Disaster Debris Management Plan latest edition. This Plan details the steps that will be taken by the state, its contractors, and other parties to facilitate the removal, management, collection and disposal or recycling of all debris generated from a catastrophic natural disaster.

The debris management strategy for the state is divided into four major operational time periods: pre-landfall phase; phase 1; phase 2; and post-recovery. The pre-landfill phase involves planning for the particular event. Phase 1 is the initial response, typically occurring

during the first 24 to 70 hours following an event and consists primarily of "pushing" the debris along major roadways to the right of way shoulders that would otherwise hinder immediate life-saving actions and that pose an immediate threat to public health and safety. Phase 2, which can last up to a year or longer, consists of removing, segregating, and disposing or recycling of the debris that hinders the orderly recovery of the community and poses less immediate threats to health and safety. State contracts may be initiated as early as Phase 1 if it is determined that the event may overwhelm state and local emergency response resources. The final phase is post-recovery which involves restoration and reestablishment of the affected debris management areas.

Consult with Central Maintenance or the District Planning Office for guidance on contracts related to Storm Debris removal.

State contracts for the monitoring of the disaster debris removal operations and for the removal of disaster debris may be utilized when necessary. These are pre-need and pre-event contracts that can assist the state in disaster debris recovery operations. These contracts:

- Assure the immediate availability of coordinated debris removal support following a debris producing incident.
- Will be used on an as-needed basis; and,
- Will be activated on a state-wide basis only by the Governor, typically in the context of an emergency declaration.

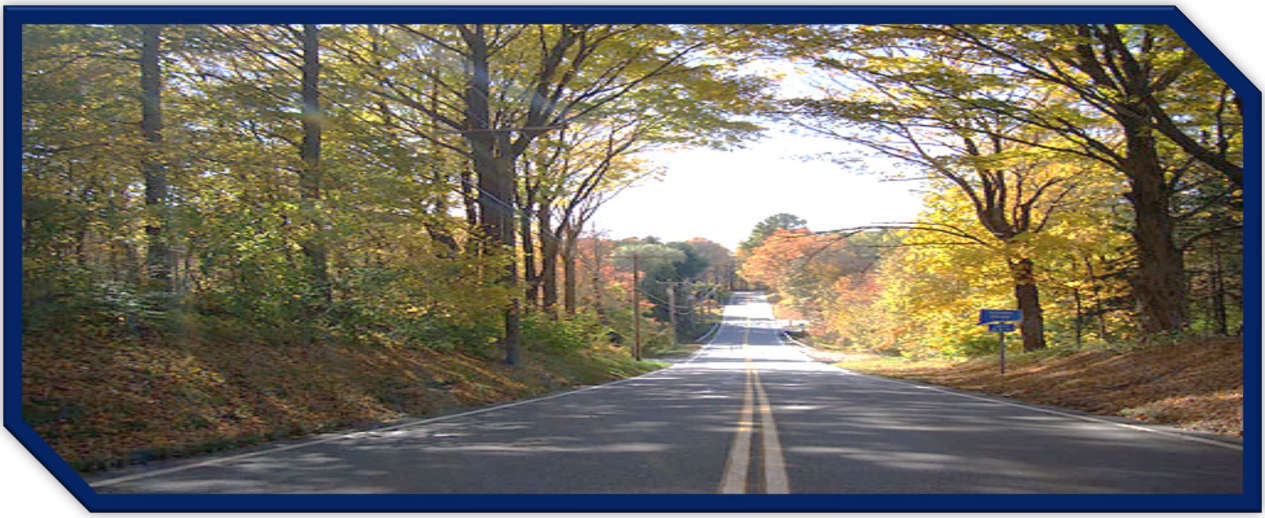
Debris Removal

Provides for clearing, collecting, and transporting debris, establishing, and operating temporary debris management sites, and ensuring ultimate recycling or disposal of debris.

Debris Monitoring (Reimbursement Documentation)

Provides for monitoring of debris removal operations and debris site management. The monitoring contract also provides comprehensive oversight, guidance, and documentation services. This monitoring is required to receive potential federal reimbursement for disaster debris management expenditures.

SUMMARY OF VEGETATION MANAGEMENT GUIDELINES



Vegetation management encompasses a multifaceted approach to environmental stewardship. It involves not only the preservation of crucial habitats for pollinators which are vital for maintaining biodiversity and ecosystem health, but also the responsible maintenance of roadside vegetation. Striking a delicate balance between safety and conservation, effective vegetative management improves safe passage for motorists and pedestrians while minimizing ecological impact. Integrating safety improvements within vegetation management strategies is paramount. Well-maintained vegetation not only improves the functionality of the highway system but also fosters overall community

relationships. Adhering to local, state, and federal regulations is the linchpin of responsible vegetation management, ensuring that practices are conducted sustainably and in accordance with established environmental standards. This comprehensive approach ensures that our natural landscapes flourish, benefiting both wildlife and human communities alike.

These Vegetation Management Guidelines were created by and for the Bureau of Highway Operations personnel to establish an efficient and effective maintenance strategy to standardize the vegetative landscape along Connecticut's highways. By providing clearly defined guidelines for roadside maintenance and vegetation control, Bureau of Highway Operations can achieve state-wide uniformity in maintaining the integrity and aesthetic appeal of the vegetative landscape while improving the safety of the traveling public.

QUICK REFERENCE GUIDE

Best Management Practices (BMPs) for Vegetation Management Operations

Bureau of Highway Operations (BHO) personnel and any vendor contractor working under our direction should be conducting activities in compliance with the latest BHO Vegetation Management Guidelines. All employees should be familiar with these guidelines prior to conducting any vegetation removal. The following Quick Reference Guide provides a summary of general BMPs to follow when working with vegetation within our right-of-way. If you are unsure of BMPs for a certain location, you should contact your DLD or Central Maintenance for guidance.

- **No vegetation work shall be performed until the proper CTDOT personnel have completed their review and the respective abutters and the Town DPW Director(s) have been notified in writing.**

- Always be aware of the ROW line (highway line) in relation to the work limits. We cannot legally work outside CTDOT property unless a right to enter form (Maint. 37) is completed. Note that land posted "State of Connecticut" is not necessarily CTDOT property. Ownership responsibility must be determined before work can commence. Reference should be made to resources such as ROW maps, the District Survey's unit or Central Surveys in Newington to determine property lines and associated responsibilities.

- When working in and around wetlands or any visible standing water, the ground cover consisting of small diameter trees and shrubs (understory), must be left undisturbed.

- When conducting tree removal all stumps must be cut as close to the ground as possible, generally to a height of 8" above ground level or lower. Stumps must be cut at the respective angle of grade / slope. Cut stumps must be chipped or removed offsite.

- Limb removal and trimming cuts shall be made by approved methods and to standards in accordance with the latest-revised ANSI A300 Tree Care Standards. Use chain saws, pole saws / power pruners, and/or aerial lift when cutting limbs. Over-the-fence type mowers should not be used for limb removal and trimming, except in instances where subsequent proper finish cuts at the branch collar can be achieved.

Where a material handler w/ grapple saw or crane-mounted grapple saw is utilized, final cuts should be made by aerial lift and chain saw at the branch collar.

- Any area which requires multiple tree cuttings or removals must be reviewed by the DLD prior to commencing the work. As a reminder a tree is considered any vegetation greater than 4-inch diameter.

- Wood chips and all resulting debris cannot be cast or dispersed in wetlands, watercourses, and/or drainage ways. Wood chips may be cast in upland areas, except rock cuts, providing they are dispersed evenly. No wood chip piles are permitted along roadsides. Trees are not to be backfilled or debarked as a result of casting wood chips.

- Substantial wood debris such as large logs or limbs that remain after the trimming or removal of trees shall be placed in a safe manner along roadsides. The butt ends of trees and limbs should be placed on an angle facing away from the direction of travel and removed from the ROW as soon as practicable. Exceptions may occur during extreme weather events.

This Quick Reference Guide is not to be considered all inclusive. Refer to the latest BHO Vegetation Management Guidelines for further information. Consult with CTDOT resources such as District and Central Survey Units for property line determinations, DLD's and Drainage Engineers for site determinations, and Central Maintenance for technical assistance and guidance for all other matters.

REFERENCES

A Landscape Master Plan for the Merritt Parkway; Milone & MacBroom, Inc.; October 1994

American Association of State Highway and Transportation Officials; "Roadside Design Guide", 4th Edition, 2011

CGS 13a-140 Removal of Trees Along State Highways. Penalties Established by Municipalities

Connecticut Department of Transportation "An Overview of Snow and Ice Control Operations on State Highways in Connecticut", June 2015

Connecticut Department of Transportation Bureau of Engineering and Highway Operations "Manual of Organization, Functions and Procedures, 1997

Connecticut Department of Transportation "Connecticut Scenic Roads"

http://www.ct.gov/dot/cwp/view.asp?a=2094&q=305520

Connecticut Department of Transportation, FORM 816 and 817 – Standard Specifications for Roads, Bridges, Facilities, and Incidental Construction, 2004 and 2016

Connecticut Department of Transportation "Guidelines for Tree Maintenance and Removal", rev. November 2000

Connecticut Department of Transportation - Encroachment Permit Regulations 1992

Connecticut Department of Transportation "Highway Design Manual 2003 Edition", rev. to February 2013

Connecticut Department of Transportation "Merritt Parkway Guidelines" For General Maintenance and Transportation Improvements, June 1994

Manual on Uniform Traffic Control Devices for Streets and Highways 2009 Edition

http://mutcd.fhwa.dot.gov/pdfs/2009r1r2/mutcd2009r1r2edition.pdf

Maintaining Roadsides for Pollinators Establishment, Restoration, Management and Maintenance, A Guide for State DOT Managers and Staff, Technical Manual, Mary Galea, Vicki Wojcik, Ph.D., Laurie Davies Adams, and Evan Cote, 2016

Merritt Parkway Guidelines for General Maintenance and Transportation Improvements; The Merritt Parkway Working Group; June 1994

Report of the Committee on Management of Roadside Trees, John Jasinski, Bradford Robinson, Chris Donnelly, February 22, 2012

"Report of the Two Storm Panel" presented to Governor Dannel P. Malloy, January 2013

http://www.ctsprague.org/resources/two_storm_panel_final_report.pdf

State of Connecticut "Substitute Senate Bill No. 231: Public Act No. 16-17"

https://cga.ct.gov/2016/act/pa/pdf/2016PA-00017-R00SB-00231-PA.pdf

The Xerces Society for Invertebrate Conservation in collaboration with ICF International "Pollinator Habitat Enhancement and Best Management Practices in Highway Rights-of-Way", May 2015

ADDITIONAL RESOURCES FOR DISASTER DEBRIS MANAGEMENT

Department of Emergency Management and Homeland Security (DEMHS)

Department of Energy and Environmental Protection (DEEP)

Federal Emergency Management Agency (FEMA)

US Environmental Protection Agency (EPA)

Northeast Recycling Coalition (NERC)

CT Department of Public Health (DPH)

APPENDIX B - CTDOT HIGHWAY DESIGN MANUAL

Chapter Seven

SIGHT DISTANCE

Table of Contents

Section **Page**

Chapter Seven

SIGHT DISTANCE

7-1.0 STOPPING SIGHT DISTANCE

Stopping sight distance (SSD) is the sum of the distance traveled during a driver's perception/reaction (or brake reaction) time and the distance traveled while decelerating to a stop. Figure 7-1A presents the SSD values used in design. The designer is referred to AASHTO *A Policy on Geometric Design of Highways and Streets* for the criteria and assumptions used to develop the SSD. The designer should also consider the following:

1. Height of Eye. When applying the SSD values, the height of eye is assumed to be 3.5 ft.

2. Height of Object. The height of object is assumed to be 2 ft.

3. Rounding. The SSD values, as determined from the AASHTO equations, have been rounded up to the next highest 5-ft increment. A design exception is not required if the SSD meets the computed value, and, if due to rounding, does not achieve the value in Figure 7-1A.

4. Grade Adjustments. Because of gravitational forces, downgrades require greater distances for braking and upgrades require lesser distances. Figure 7-1A provides adjusted SSD values for grades. Selection of the appropriate gradient and SSD will be based on the longitudinal gradient at the site of the brake application. Note that, for design exception purposes, only those values that do not meet or exceed the "Level" SSD criteria will require a design exception as discussed in Section 6-5.0.

Design Speed (mph)	Downgrades			Level	Upgrades		
	-9% (ft)	-6% (ft)	-3% (ft)	0% (ft)	+3% (ft)	+6% (ft)	+9% (ft)
20	130	120	120	115	110	110	105
25	175	165	160	155	150	145	140
30	230	215	205	200	200	185	180
35	290	275	260	250	240	230	225
40	355	335	315	305	290	280	270
45	430	400	380	360	345	335	320
50	510	475	450	425	405	390	375
55	595	555	520	495	470	450	435
60	690	640	600	570	540	515	495
65	790	730	685	645	615	585	565
70	895	825	775	730	690	660	635

Notes:

1. *For grades intermediate between columns, use a straight-line interpolation to calculate SSD. For example:*

   V = 55 mph
   G = -4.3%

   $$SSD = 520 + \left(\frac{4.3 - 3}{6 - 3}\right)(555 - 520)$$

   = 520 + 15.2
   = 535.2 ft

2. *See Section 9-3.0 for application of SSD to crest and sag vertical curves.*

STOPPING SIGHT DISTANCE

Figure 7-1A

7-2.0 DECISION SIGHT DISTANCE

7-2.01 Application

At some sites, drivers may be required to make decisions where the highway environment is difficult to perceive or where unexpected maneuvers are required. These are areas of concentrated demand where the roadway elements, traffic volumes and traffic control devices may all compete for the driver's attention. This relatively complex environment may increase the required driver perception/reaction time beyond that provided by the SSD values (2.5 seconds) and, in some locations, the desired vehicular maneuver may be a speed/path/direction change rather than a stop. At these locations, the designer should consider providing decision sight distance to provide an additional margin of safety. Decision sight distance reaction times range from 3 to 10 seconds depending on the location and expected maneuver. The various avoidance maneuvers assumed in the development of Figure 7-2A are:

1. Avoidance Maneuver A: Stop on rural road.

2. Avoidance Maneuver B: Stop on urban road.

3. Avoidance Maneuver C: Speed/path/direction change on rural road.

4. Avoidance Maneuver D: Speed/path/direction change on suburban road.

5. Avoidance Maneuver E: Speed/path/direction change on urban road.

Design Speed (mph)	Decision Sight Distance for Avoidance Maneuver (ft)				
	A	B	C	D	E
30	220	490	450	535	620
35	275	590	525	625	720
40	330	690	600	715	825
45	395	800	675	800	930
50	465	910	750	890	1030
55	535	1030	865	980	1135
60	610	1150	990	1125	1280
65	695	1275	1050	1220	1365
70	780	1410	1105	1275	1445

DECISION SIGHT DISTANCE

Figure 7-2A

In general, the designer should consider using decision sight distance at any relatively complex location where the driver perception/reaction time may exceed 2.5 seconds. Example locations where decision sight distance may be appropriate include:

1. freeway exit/entrance gores;
2. freeway lane drops;
3. left-side entrances or exits;
4. at-grade intersections near a horizontal curve;
5. railroad/highway grade crossings;
6. approaches to detours and lane closures;
7. along high-speed, high-volume urban arterials with considerable roadside friction; or
8. traffic signals on high-speed rural highways.

As with SSD, the driver height of eye is 3.5 ft and the height of object is typically 2 ft. However, candidate sites for decision sight distance may also be candidate sites for assuming that the "object" is the pavement surface (e.g., freeway exit gores). Therefore, the designer may assume a 0.0-in height of object for application at some sites.

7-2.02 Examples

* * * * * * * *

Example 7-2.1

Given:

An exit on a suburban freeway under design (design speed = 60 mph) is located just beyond a bridge. The freeway passes over. The grade on each side of the overpass is 3%. The freeway will carry high traffic volumes.

Problem:

Determine the needed sight distance to the exit gore.

Solution:

A freeway exit is a major decision point for the driver, and the highway design should provide decision sight distance to the exit gore. The avoidance maneuver is a speed/path/direction change (i.e., Avoidance Maneuver D).

1. From Figure 7-2A, the decision sight distance = 1125 ft.

2. Calculate the length of the crest vertical curve for the freeway overpass. The algebraic difference in grade change is 6%. A height of object of 0.0 in to the exit gore will be used. Section 9-3.0 provides the following equations for vertical curve lengths:

$$L = \frac{AS^2}{200\left(\sqrt{h_1} + \sqrt{h_2}\right)^2}$$

$$L = \frac{(6)(1125)^2}{200\left(\sqrt{3.5} + \sqrt{0.0}\right)^2}$$

$$L = 10{,}848 \text{ ft}$$

3. The calculated length of vertical curve is obviously unrealistic for normal design. Therefore, to meet the decision sight distance value, the designer should attempt to flatten the upgrade and downgrade of the crest vertical curve.

Example 7-2.2

Given:

An at-grade intersection is located just beyond a horizontal curve on an urban 2-lane highway. Both the highway and the intersection carry heavy traffic volumes. Frequent driveway entrances exist on the highway. The design speed is 45 mph. The intersection has experienced a disproportionate number of rear-end crashes on the mainline. The existing conditions are:

R = 1500 ft

Middle ordinate = 33 ft

Available Sight Distance = 500 ft

Problem:

Determine the need for any sight distance improvements.

Solution:

The combination of a horizontal curve, an intersection, high traffic volumes and frequent driveways presents a relatively complex situation for the driver. The high crash rate at the intersection indicates that the existing sight distance around the horizontal curve may be inadequate. This is true even though the existing sight distance exceeds the criteria for stopping sight distance at 45 mph. Therefore, improvements should be considered to provide decision sight distance for a stop condition (i.e., Avoidance Maneuver B):

1. From Figure 7-2A, the decision sight distance = 800 ft.

2. Calculate the middle ordinate needed for the horizontal curve (see Chapter Eight):

$$M = R\left(1 - \cos\frac{28.65S}{R}\right)$$

$$M = 1500\left(1 - \cos\frac{(28.65)(800)}{1500}\right)$$

$$M = 53 \text{ ft}$$

3. Therefore, the roadside obstructions along the horizontal curve should be cleared approximately an additional 20 ft to provide the extra sight distance. If this is impractical, warning signs should be provided to give the driver advance warning of the situation consistent with the values for decision sight distance.

* * * * * * * *

7-3.0 INTERSECTION SIGHT DISTANCE

Section 11-2.0 discusses the design requirements of sight distance for intersections at-grade.

7-4.0 REFERENCES

1. *A Policy on Geometric Design of Highways and Streets*, AASHTO, 2018.

APPENDIX C - CTDOT HIGHWAY DESIGN MANUAL
Chapter Thirteen
ROADSIDE SAFETY

This Chapter provides the Designer with guidance on measures to reduce the number and/or severity of crashes when vehicles leave the traveled way.

The “forgiving roadside” concept, developed in the 1960s, has been a long-standing philosophy in Connecticut. As a result, many of Connecticut’s State highways have been constructed to meet this design philosophy. In addition, guidance for installing roadside safety hardware has gradually evolved to reflect the results of crash test programs.

The American Association of State Highway and Transportation Officials (AASHTO) has incorporated many of the crash test results and roadside safety design concepts into the *Roadside Design Guide*.

Chapter Thirteen is a supplement to the *Roadside Design Guide*. Where there is a discrepancy between the two, Chapter Thirteen will take precedence.

On October 1, 1998, FHWA mandated that all new roadside safety hardware installed on the National Highway System (NHS) meet crash testing criteria found in the National Cooperative Highway Research Program (NCHRP) Report 350, Recommended Procedures for the Safety Performance Evaluation of Highway Features. FHWA further recommended that all roadside safety appurtenances installed on all public roads meet the testing criteria found in NCHRP Report 350. On November 20, 2009, AASHTO published a successor to that manual entitled Manual for Assessing Safety Hardware (MASH), with an update in 2016.

FHWA requires all roadside safety hardware to be MASH 2016 compliant on NHS roadways in order to receive federal reimbursement as a means to phase out some of the NCHRP Report 350 compliant products. The Department is applying this requirement with TL-3 as a minimum standard on all roadways unless otherwise specified. For example, TL-2 is allowed in certain applications on low speed roadways as described in the following sections.

13-1.0 DEFINITIONS

1. Recoverable Parallel Slope: Slopes that can be safely traversed, and upon which the driver of an errant vehicle has a reasonable opportunity to stop and return to the roadway. The Department considers slopes *flatter* than 1:4 as recoverable.

2. Non-Recoverable Parallel Slope: Slopes that are traversable, but are too steep to recover and return to the roadway. The Department considers 1:4 slopes as non-recoverable.

3. Critical Parallel Slope: Slopes upon which a vehicle is likely to overturn. Under the Department's roadside criteria, slopes *steeper* than 1:4 and slopes of 1:4 with curbing at the top are critical.

4. R-B: Roadside Barrier

5. MD-B: Median Barrier

6. MASH: Manual for Assessing Safety Hardware

These definitions vary slightly from those in the *Roadside Design Guide*

13-2.0 CLEAR ZONES

13-2.01 Background

The clear zone concept was first established in the 1967 AASHTO report entitled Highway Design and Operational Practices Related to Highway Safety, known as the Yellow Book and was revised in 1974. It provided the Designer with a numerical value of 30 ft as the lateral extent needed for 80%-85% of run-off-the-road vehicles to recover. The 30 ft clear zone was predicated on the following set of conditions:

1. 60-mph vehicular speed,
2. tangent section, and
3. flat side slope.

If these conditions vary, the 30 ft clear zone should be adjusted accordingly. For example, at higher speeds, vehicles will travel farther before recovering; at lower speeds, vehicles will travel less before recovering.

Section 13-2.02 presents clear zone distances for various roadway conditions. The overall objective of these clear zone values is to achieve the 80%-85% target recovery area for run-off-the-road vehicles on any given roadway.

13-2.02 Application

The calculated clear zone widths presented in Figure 13-2A are recommended values and need not be achieved at all costs. The methodology used to determine the values in this chart is valid and provides the Designer with a good frame of reference for making decisions to design safer roadside recovery areas. However, the Designer must exercise judgment when applying the distances because they do not apply to every conceivable set of highway conditions. Each application of the clear zone distance must be evaluated individually.

When applying the clear zone distance, the Designer must consider right-of-way availability, environmental concerns, economic factors, identification of potential hazards, safety needs and crash history. The following items further describe the proper usage of the clear zone distances presented in Figure 13-2A:

1. Boundaries: The Designer should not use the clear zone distances as boundaries for introducing roadside hazards such as bridge piers, non-breakaway sign supports or utility poles. These should be placed as far from the roadway as practical. At locations where roadside hazards must be placed along the highway, at a minimum they should be placed at the clear zone boundary and possibly shielded.

2. Fill Slopes: Figure 13-2B illustrates the clear zone application on fill slopes with a negative shelf. Barn-roof fill slopes may be designed with two slope rates where the second slope is steeper than the slope adjacent to the shoulder. See Figure 13-2B(b). This design requires less right-of-way and embankment material than a continuous, flatter slope. Although a “weighted” average of the slopes may be used, a simple average of the clear zone distances for each slope is sufficiently accurate if the variable slopes are approximately the same width. If one slope is significantly wider, the clear zone computation based on that slope alone may be used.

   Because non-recoverable slopes are still traversable, it can be expected to have vehicles reach the toe of the slopes. Therefore, the clear zone cannot logically end along the slope.

The slope, as well as a 10 ft runout area at the toe of the slope, should be clear of any hazards. It is preferred to grade the runout area with a recoverable slope.

3. Cut Slopes:

   The outside limit of rounding for the backslope should be outside of the clear zone. This is illustrated in the typical section figures in Chapters Four and Five. When this is not achievable, the following approach should be used to calculate the clear zone for a ditch section:

   a. Calculate the percentage of the clear zone from Figure 13-2A (negative shelf) available to the toe of the backslope.

   b. Subtract this percentage from 100 percent and multiply the results by the clear zone for the backslope from Figure 13-2A (positive shelf).

   c. Add the available clear zone to the toe of the backslope to the value determined in b. This yields the required clear zone from the edge of traveled way to a point on the backslope.

   The Designer must reference Section 13-3.06 for guidance on the proper treatment of drainage features encountered within the clear zone.

4. Urban Facilities: A minimum horizontal obstruction-free clearance of 1.5 ft should be provided as measured from the gutter line to any utility pole, sign or traffic signal pole. This distance is not considered a clear zone, but an operational offset. Clear zones to other fixed objects such as buildings should conform to Figure 13-2A. Refer to Section 13-2.03 - Utility Setback Procedures.

5. Auxiliary Lanes: For auxiliary lanes, such as climbing lanes, passing lanes, etc., the clear zone will be the same as for the mainline and will be measured from the outside edge of the auxiliary lane. The clear zone will not normally apply to left- and right-turning lanes at intersections. When evaluating crossover crash potential for undivided roadways, the clear zone will be measured from the left edge of the through traveled way.

6. Horizontal Curves: Additional clear zone may be provided on the outside of horizontal curves by the use of curve correction factors that are included in the *Roadside Design Guide*. These increases should be considered only where crash histories indicate a need or where specific investigations indicate a high potential for crashes and where the increase to the clear zone is cost effective.

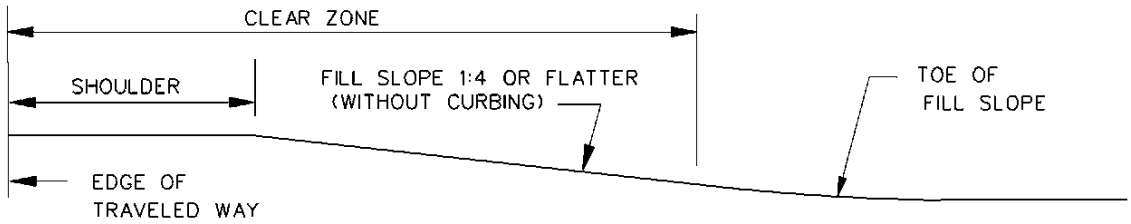
Design Speed	Design Year ADT	Cuts or Fills (Negative Shelf)		Cuts or Fills (Positive Shelf)	
		1:6 or flatter	1:4	1:4	1:6 or flatter
40 mph or less	Under 750	7	7	7	7
	750-1500	10	12	10	10
	1500-6000	12	14	12	12
	Over 6000	14	16	14	14
45 – 50 mph	Under 750	10	12	8	10
	750-1500	14	16	12	14
	1500-6000	16	20	14	16
	Over 6000	20	24	18	20
55 mph	Under 750	12	14	10	10
	750-1500	16	20	14	16
	1500-6000	20	24	16	20
	Over 6000	22	26	20	22
60 mph	Under 750	16	20	12	14
	750-1500	20	26	16	20
	1500-6000	26	30	18	24
	Over 6000	30	30	24	26
65 – 70 mph	Under 750	18	20	14	14
	750-1500	24	28	18	20
	1500-6000	28	30	22	26
	Over 6000	30	30	26	28

Notes:

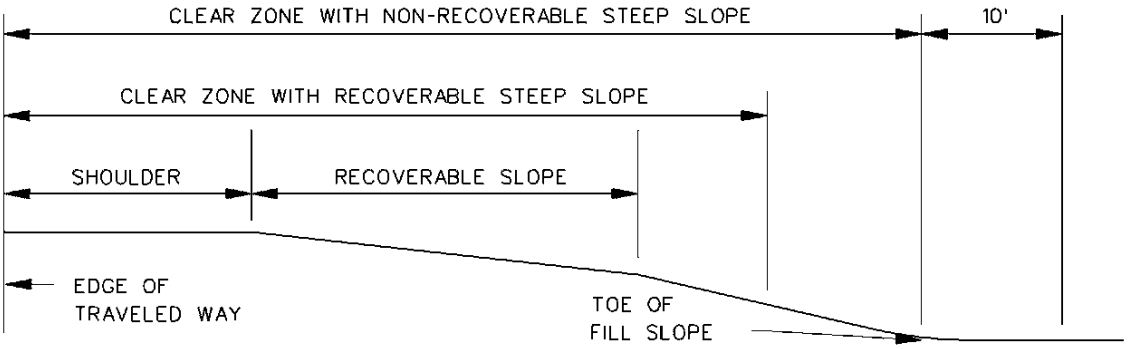
1. All distances are measured from the edge of traveled way. See Section 13-2.02, Comment #5.
2. See Section 13-2.02, Comment #2, for application of clear zone criteria on fill slopes.
3. See Figure 5H for illustration of a cut section with a positive shelf. See Section 13-2.02, Comment #3, on cut slopes and ditch sections.
4. The values in the table apply to all facilities both urban and rural. See Section 13-2.02, Comment #4, for utility poles in urban areas.

RECOMMENDED CLEAR ZONE DISTANCES (ft)

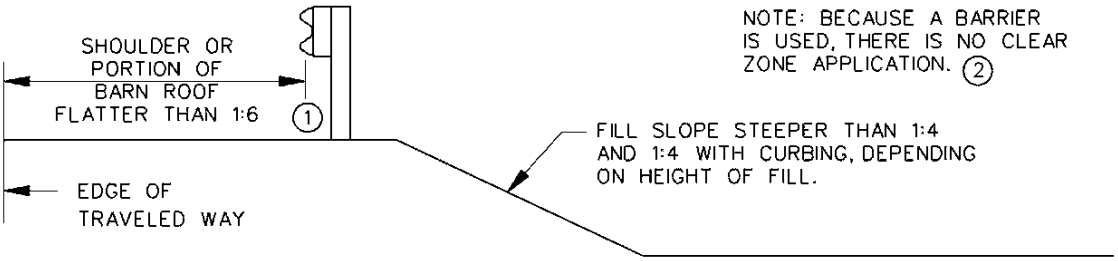
Figure 13-2A



RECOVERABLE PARALLEL SLOPE (a)



BARN-ROOF PARALLEL SLOPE (b)



CRITICAL PARALLEL SLOPE (c)

(1) WHEN GUIDERAIL IS NOT USED AND THE CLEAR ZONE EXTENDS BEYOND THE TOP OF THE SLOPE, A MINIMUM DISTANCE OF 10 FT WILL BE CLEARED AT THE TOE OF SLOPE.

(2) SEE FIGURE 13-3A TO DETERMINE BARRIER NEED.

CLEAR ZONE APPLICATION FOR FILL SLOPES

(Negative Shelf)

Figure 13-2B

13-2.03 Utility Setback Procedures

There will be many sites where it will be impractical to locate utility poles outside the clear zone. This is especially prevalent in urban areas but could apply to any project, depending upon the circumstances.

The following are options, in order of priority, that are to be followed for the placement of permanent utility poles:

1. Utility poles should be positioned outside the clear zone whenever practical. The Department may require a setback up to a maximum of 30 ft if conditions such as, but not limited to, a high frequency of crashes related to the presence of utility poles exists.

2. A maximum utility pole setback of 10 ft from the edge of the road, irrespective of the clear zone, is permissible. This setback dimension is consistent with the capabilities of the utility company's installation and maintenance equipment. The maximum 10 ft setback is also consistent with the utility company's corporate strategy of providing a quick response to power outages, etc.

3. Along urban highways, the Department will require poles to be placed as close to the right-of-way line as practical. If sufficient space is not available, the Department may allow poles to be placed between the curb and sidewalk at a minimum of 1.5 ft behind the face of curb. In general, when sidewalks are present, it is the Department's preference to place poles behind the sidewalk.

A design exception for utility poles within the clear zone is not required when the preceding guidance is followed.

13-3.0 BARRIER WARRANTS

Existing conditions may limit the Designer's options when determining the need for guiderail. Factors such as project cost, environmental impacts and right-of-way involvement should be considered in the decision-making process.

Section 1.2 of the *Roadside Design Guide* provides the Designer with six design options, in order of priority, for redesigning the roadside to eliminate roadside hazards or determining the need for guiderail. These steps (provided below) should become an integral part of all Department projects.

1. Remove the hazard to eliminate the need for guiderail.
2. Redesign the hazard so it can be safely traversed.
3. Relocate the hazard to a point where it is less likely to be struck.
4. Reduce impact severity by using an appropriate breakaway device.
5. Shield the hazard with a longitudinal barrier designed for redirection or use a crash cushion.
6. Delineate the hazard if the previous alternatives are not appropriate.

The following Sections illustrate where guiderail may be warranted.

13-3.01 Embankments

The severity of the roadside condition depends upon the rate and height of the fill slope. Refer to Figure 13-3A – Warrants for Embankments. This figure is a modified version of Figure 5.1 of the *Roadside Design Guide*. Depending on the height of fill slope, guiderail may be needed to shield a fill slope steeper than 1:4 and slopes of 1:4 with curbing. See Section 13-9.04 for curb and curb/barrier combinations. Guiderail is not required on fill slopes flatter than 1:4 if there are no roadside hazards within the clear zone as calculated from Section 13-2.0. Barrier with deflections of 8 ft or greater should not be placed atop embankments of 1:2 or steeper.

13-3.02 Roadside Hazards

The recommended clear zone distances for various roadway conditions presented in Section 13-2.0 should be free of any fixed objects and non-traversable hazards. Roadside hazards that may warrant guiderail include, but are not limited to, the following:

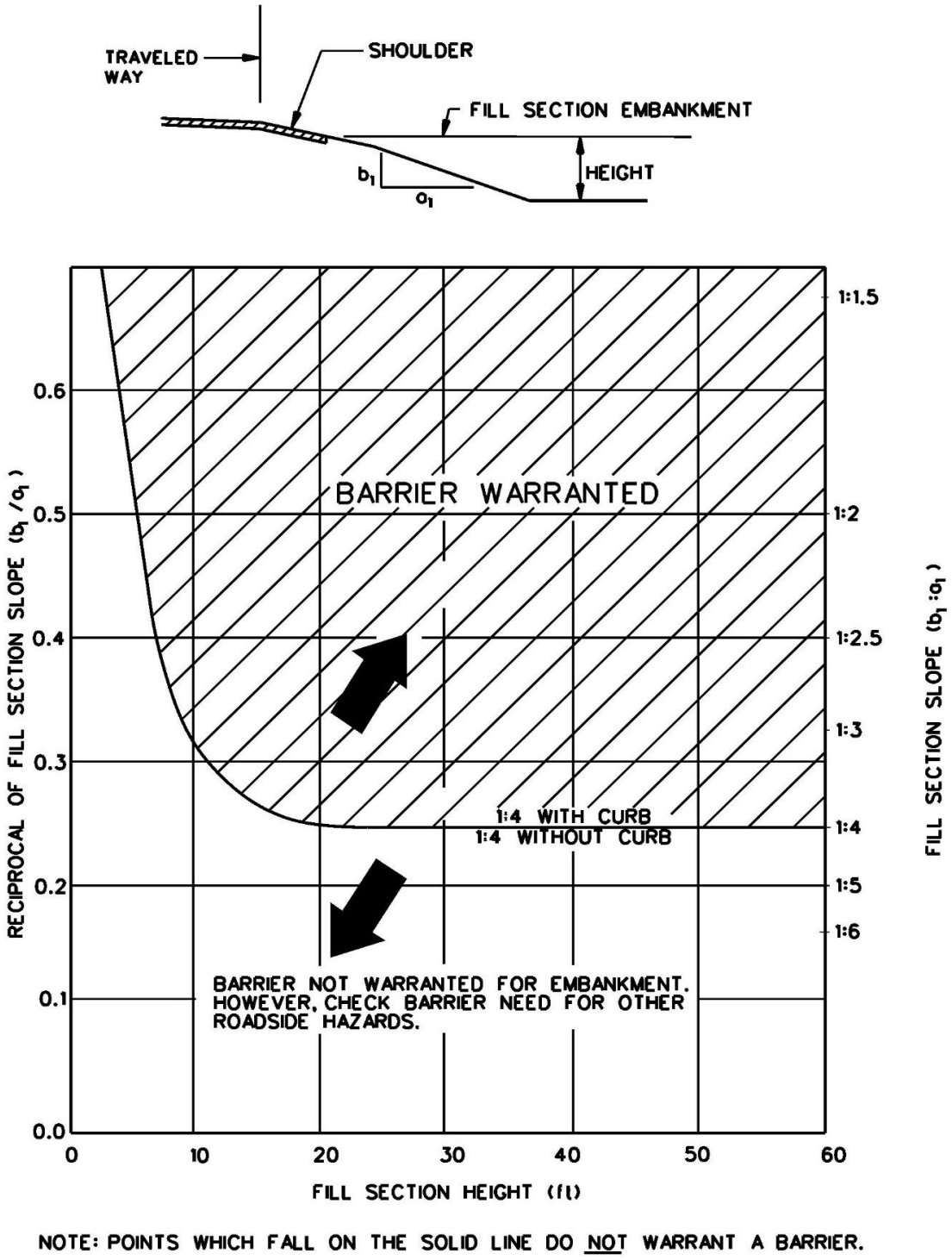
1. Non-breakaway sign and luminaire supports,
2. concrete bases extending more than 4 in. above the ground,
3. bridge piers and abutments at underpasses,
4. retaining walls,
5. culvert end-walls,
6. trees with diameter greater than 4 in. (at maturity),
7. rough rock cuts,
8. large boulders,
9. streams or permanent bodies of water,

10. stone fences,
11. blunt ends,
12. vertical drop-offs, and
13. embankments as explained in 13-3.01

Isolated hazards at the edge of the clear zone may not always warrant guiderail. For example, to install guiderail to protect an errant vehicle from an isolated tree at the edge of a 30 ft clear zone may not be practical.

The Designer should recognize that even barriers installed to deflect errant vehicles away from fixed objects may be hazards themselves. Preference should therefore be given to eliminating or relocating the potential hazard rather than placing guiderail in front of it whenever possible. Guiderail should only be placed if it is considered to be less of a hazard than the potential hazard the guiderail is shielding.

It is not the Department's policy to design guiderail to protect the traveling public from utility poles. However, if guiderail is provided for other reasons and utility poles exist within the deflection distance of the guiderail, then strengthening of the guiderail for the utility poles is required.



NOTE: POINTS WHICH FALL ON THE SOLID LINE DO NOT WARRANT A BARRIER.

WARRANTS FOR EMBANKMENTS

Figure 13-3A

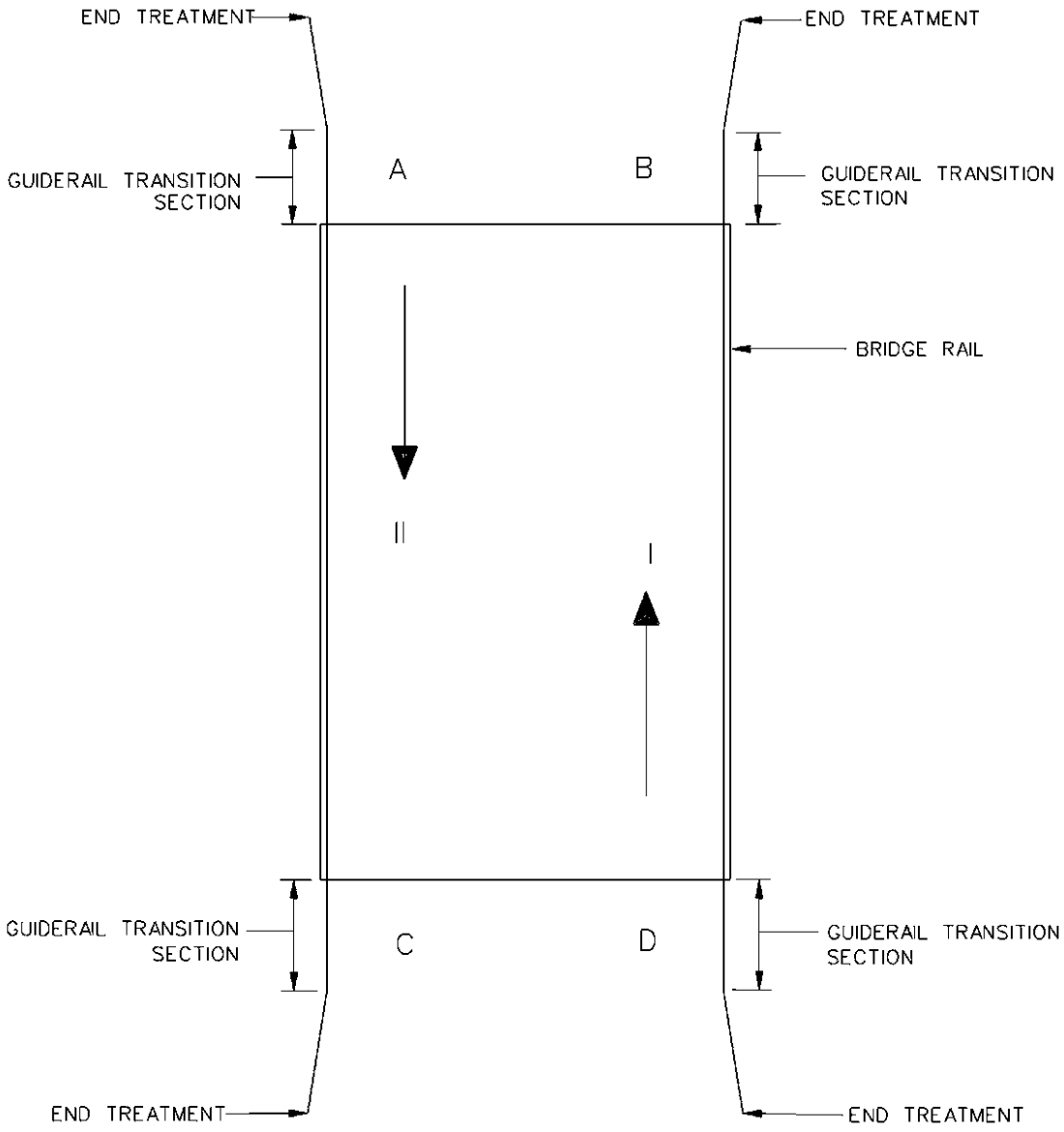
13-3.03 Bridge Rails and Approaches

The leading and trailing ends of bridge rails normally warrant protection. The blunt ends on all four corners of a bridge on a bi-directional roadway shall be considered a hazard and therefore treated with a leading end transition, regardless of clear zone requirements. Figure 13-3B illustrates warrants for providing guiderail approaching a bridge rail.

13-3.04 Bridge Piers, Abutments and Overhead Sign Structures

Structures should normally be placed outside the design clear zone. However, many bridge piers, abutments and overhead sign support structures are within the design clear zone and cannot be relocated. Where this occurs, guiderail or concrete barrier protection is warranted. Where full-height abutments are immediately outside the clear zone, guiderail treatment may be warranted.

The Designer shall determine whether zone of intrusion clearance considerations (Section 13-8.0) are applicable. Designers should then coordinate their roadside designs in the vicinity of structures with the Bridge Design Unit.



TRAFFIC DIRECTION	LEADING END TRANSITION REQUIRED AT
I and II	A B C D
II Only	A B *
I Only	C D *

* FOR THESE CASES, TRAILING END TRANSITIONS MAY BE WARRANTED FOR THE TRAILING END OF THE BRIDGE.

WARRANTS FOR GUIDERAIL APPROACH TO BRIDGE RAIL

Figure 13-3B

13-3.05 Vertical Drop-Offs

Barrier should be considered for a vertical drop-off within the clear zone that exceeds 2.5 ft. Figure 13-3C provides details on where barrier may be required.

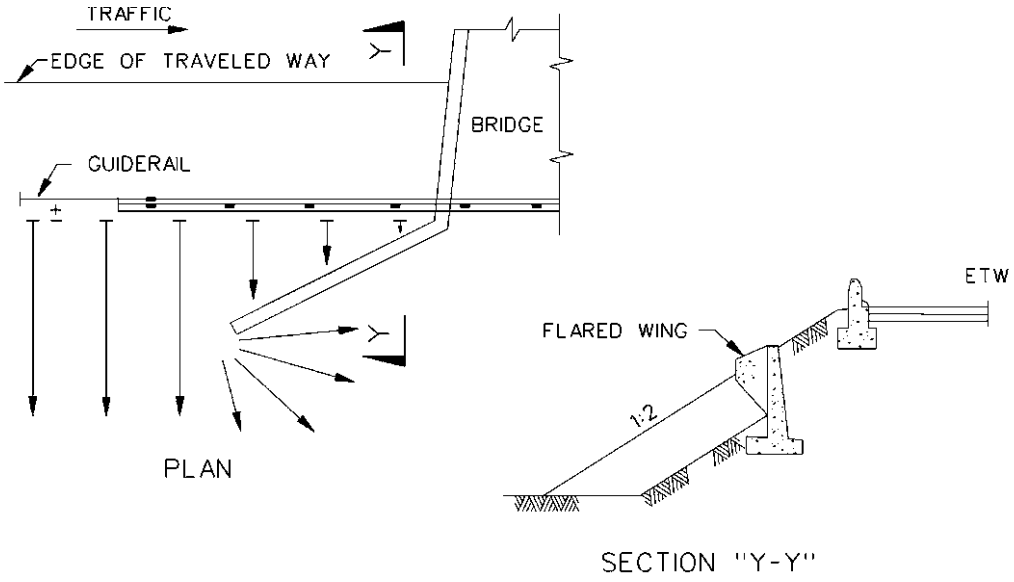
13-3.06 Roadside Ditches, Channels and Swales

If a vehicle departs the roadway and encounters ditches, channels or swales, the roadside configuration may introduce abrupt changes in vehicular direction that can result in destabilization of the vehicle. Figure 13-3D illustrates the relative traversability of various combinations of front slopes, ditch widths and backslopes for roadside channels, ditches and swales.

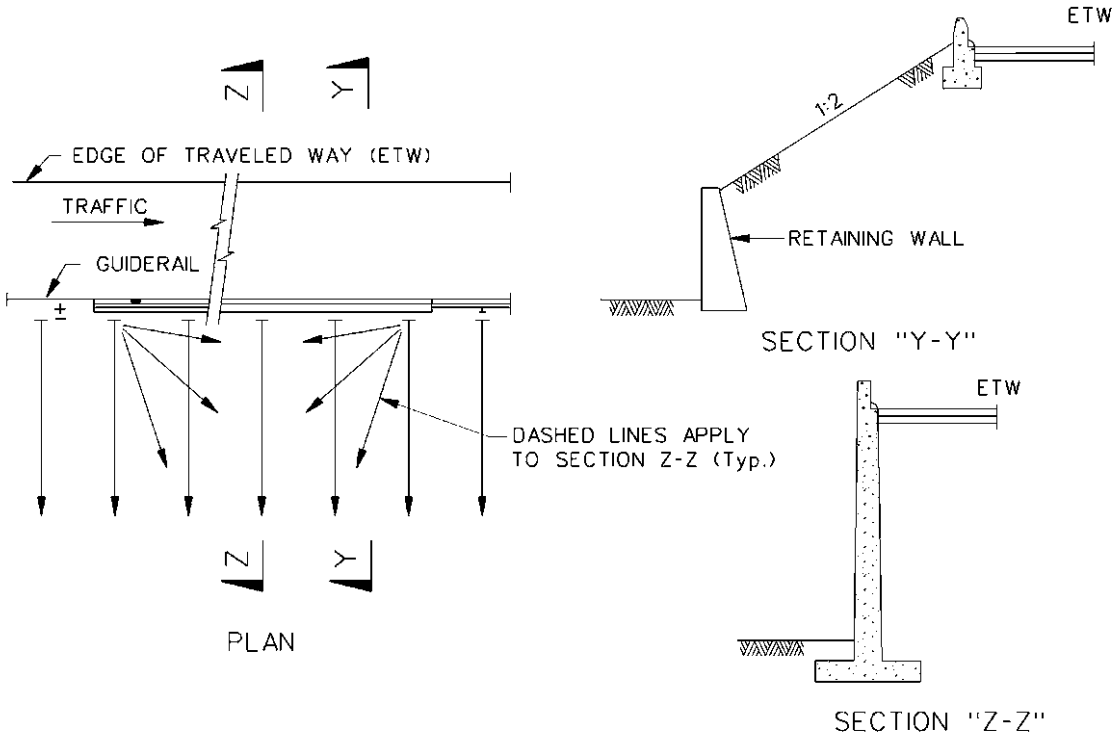
The typical section figures in Chapters Four and Five illustrate the standard roadside swales in a cut section. For highways without curbs, the front slope is 1:12, the rounded ditch width is 10 ft and the backslope is variable but not to exceed 1:2. The typical sections also show that the outside limit of rounding for the backslope should be outside the clear zone distance determined from Section 13-2.0. Where this limit is within the clear zone, the Designer should attempt to relocate the outside limit of rounding to beyond the clear zone.

Ditch sections that fall within Zone 1 in Figure 13-3D may warrant guiderail. However, the Designer should consider the cost effectiveness of installing lengthy sections of guiderail to shield a ditch. This is not always desirable and may warrant revising the ditch cross section to eliminate the need for guiderail.

If the dimensions of an existing or proposed ditch section fall within Zone 2 in Figure 13-3D, the backslope should be flattened if practical. If this is not feasible, guiderail is not warranted because of the ditch cross section alone. In this Zone, guiderail is considered more of a hazard than the ditch itself and, therefore, may not be warranted.



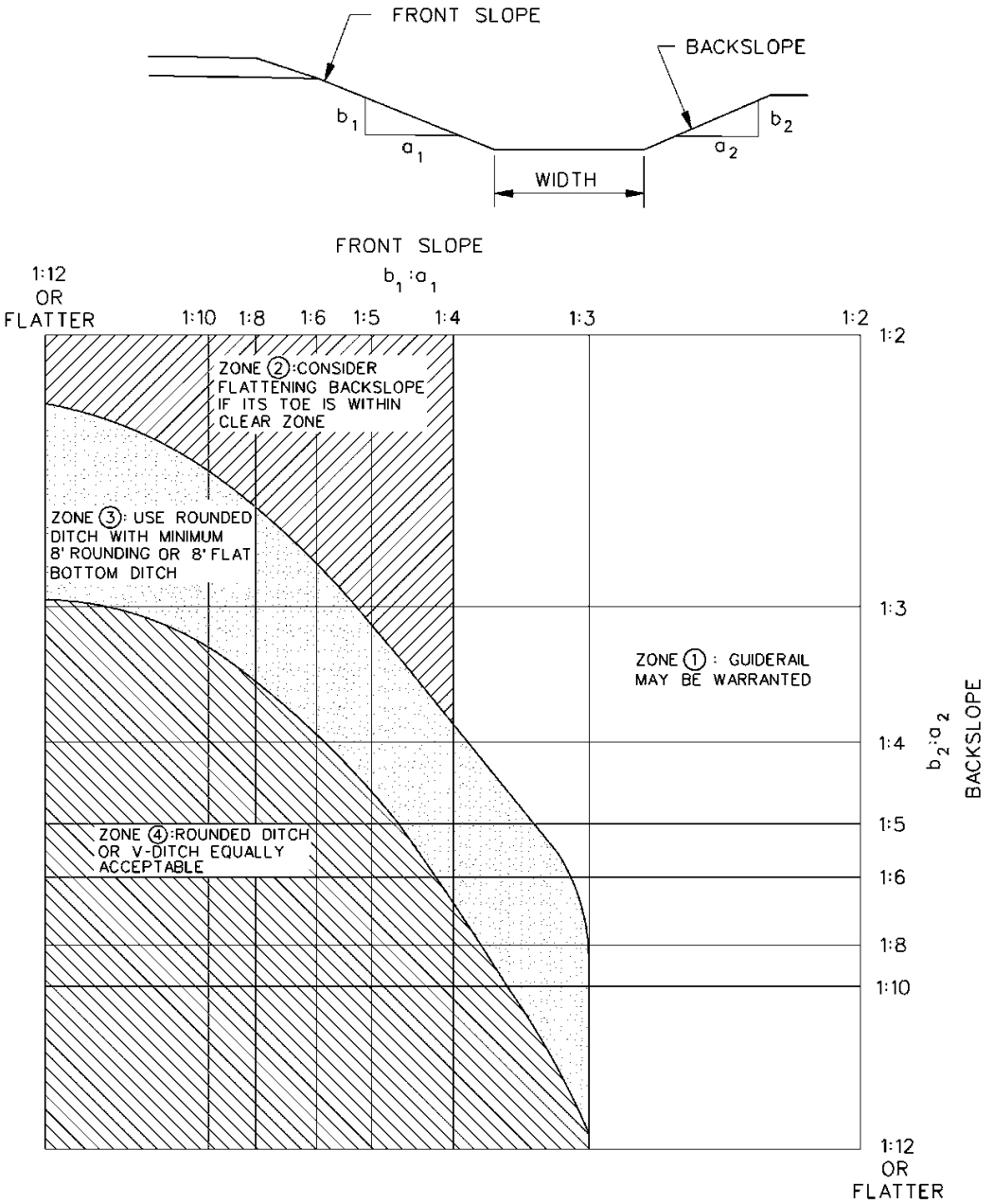
ROADSIDE BARRIER TREATMENT AT FLARED WINGS



ROADSIDE BARRIER TREATMENT AT EMBANKMENT RETAINING WALLS

BARRIER WARRANTS FOR VERTICAL DROP-OFFS

Figure 13-3C



Notes:

1. Figure is based on impacts at 60 mph and 25 degrees.
2. Zones in figure are numbered indicating their relative hazard with Zone 1 being the most hazardous.

TRAVERSABILITY OF ROADSIDE DITCHES, CHANNELS AND SWALES

Figure 13-3D

13-3.07 Transverse Slopes

Where the highway mainline intersects a driveway, side road, or median crossing, a slope transverse to the mainline will be present. See Figure 13-3E. The exposure of transverse slopes is less than that of foreslopes or backslopes, yet they are generally more critical to errant motorists because run-off-the-road vehicles typically strike them head-on. Transverse slopes can typically result in vehicular vaulting, or in the case of steep transverse slopes, “catching” of the bumper in the slope, resulting in an abrupt stop and high occupant deceleration forces.

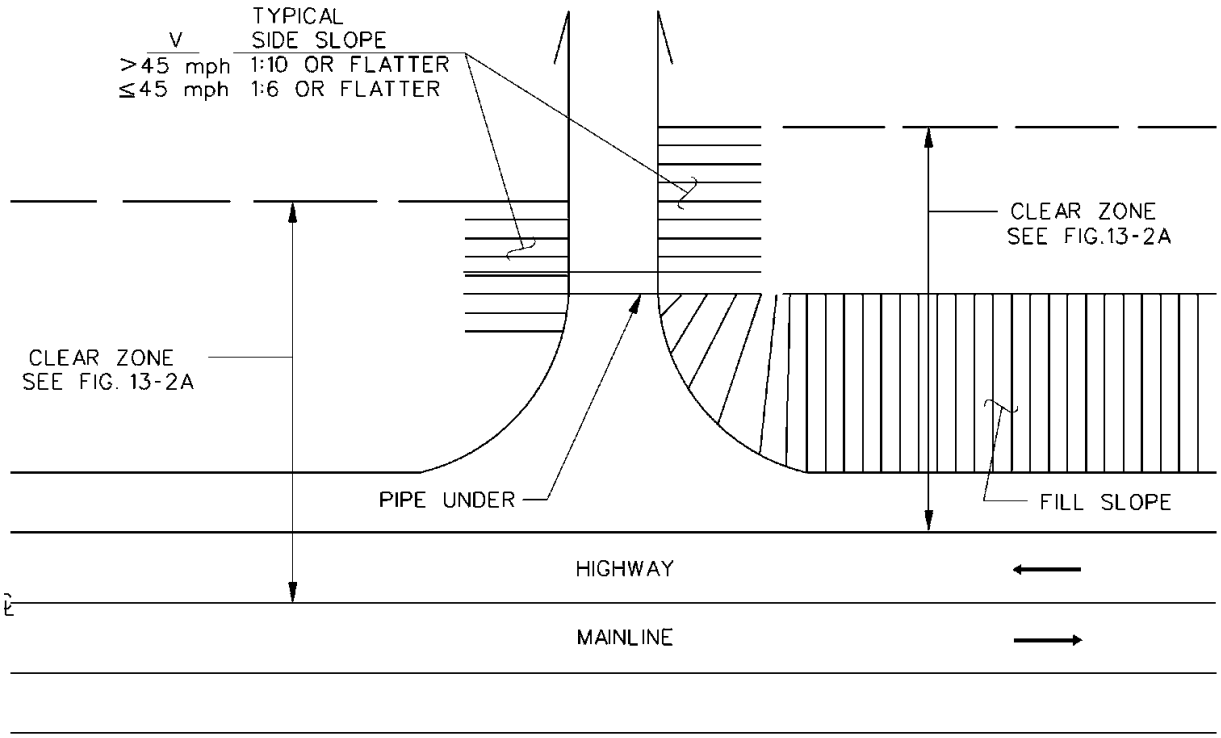
For these reasons, transverse slopes should be as flat as practical. For design speeds greater than 45 mph, the slope should be 1:12 typical or 1:10 maximum or flatter. For 45 mph or below, the slope should be 1:6 or flatter. If these criteria cannot be met practically, guiderail may be considered. The decision to use guiderail should be made on a case-by-case basis considering costs, traffic volumes, severity of the proposed transverse slope and other relevant factors. If guiderail is needed around the corners of intersecting roads or driveways, see Figure 13-9D for placement criteria on radii. The Designer should also investigate the use of the “Curved Guiderail Treatment” on roadways with design speeds less than or equal to 50 mph. See Section 13-5.04 – Curves Guiderail Treatment.

13-3.08 Median Barrier Warrants

1. Freeways: Median barrier is warranted on all medians with a width of 66 ft or less, as measured from edge of travelway to edge of travelway, to avoid a head-on collision of two departing vehicles. A median barrier may also be warranted on wider medians if a significant number of crashes have occurred. Medians may vary in width. If a section warrants a median barrier and the adjacent wider section does not, the barrier should be extended into the wider median section by approximately 100 ft.

2. Non-Freeways: The Designer should evaluate the crash history, traffic volumes, travel speeds, median width, alignment, and sight distance to determine if median barrier is warranted. It is recommended to include documentation in the project files when it is determined that median barrier is not warranted.

3. Hazards: The roadside clear zone discussed in Section 13-2.0 applies to each direction of travel for median applications.



TRANSVERSE SLOPES

Figure 13-3E

13-4.0 DISPOSITION OF EXISTING BARRIER

13-4.01 Application

All projects must consider appropriate ways to maintain or enhance safety. There are many factors that should be considered when evaluating whether safety appurtenances should be installed, removed or upgraded. The project scope, roadway classification, design speed, right-of-way availability, crash history, etc., all contribute to this decision making process to determine if a safety enhancement is warranted. When a proposed improvement relies on the functionality of existing barrier, any obsolete barrier must be upgraded to current standards. It is recognized that enhancing roadside safety may be beyond the scope of certain project types; however, the project improvements must not degrade highway safety.

Preventive maintenance type projects, such as pavement striping and pavement preservation, do not require the replacement of obsolete longitudinal barrier as long as they are not negatively impacted. Isolated or obvious deficiencies should be addressed.

Designers must apply the guidelines in Section 13-3.0 when evaluating existing barrier to provide the most forgiving roadside environment possible, consistent with the scope of the project.

13-4.02 Longitudinal Barrier

The following longitudinal barriers are classified as obsolete and their replacement is required in accordance with Chapter 2, Chapter 3 and Section 13-4.01:

- Two-cable on wood posts.
- Three-cable with steel brackets on steel strong-posts or wood posts.
- R-I W-beam guiderail on weak steel posts with rail splice at each post.
- R-B and MD-B W-beam guiderail with steel blockouts and rail splice at posts.
- Concrete Barrier less than 32 in. height.
- R-B 350 and MD-B 350 with a rail height less than or equal to 27 in. with plastic blockouts and rail splices at posts.

The following longitudinal barriers are acceptable to remain provided that they meet length-of-need, deflection requirements and condition, but require replacement when impacted by construction activities:

- Modified R-I W-beam guiderail at 32 in. ±1 in. rail height, 12 ft - 6 in. post spacing, mid-span rail splice, on weak steel posts without blockouts.
- MD-I W-beam guiderail at 32 in. ±1 in. rail height, on weak steel posts with rail splice at each post.
- R-B 350 and MD-B 350 with a rail height greater than 27 in., rail splice at posts with plastic blockouts.
- Three-cable guiderail with 29 in. height to the top wire.
- Concrete Barrier greater than or equal to 32 in. height.
- Thrie-Beam 350 guiderail at 34 in. ±1 in. rail height

The Designer should review Section 13-7.0 for general guidance to determine if there are any hazards within the deflection distance of any existing guiderail that is to remain.

13-4.03 End Treatments

The following end treatments, within the project limits, shall be replaced or upgraded to an approved end treatment in accordance with Section 13-10.0:

1. Leading end turned-down end anchors within the clear zone, except three-cable guiderail on weak steel posts.

2. Leading end blunt ends.

3. Trailing end turned-down end anchors for W-beam guiderail on bi-directional roadways shall be replaced/upgraded if it is within the clear zone for the opposite direction of travel.

Designers should also consider replacing an existing impact attenuator with an end anchor if it only requires extending the rail up to 200 ft. Grading adjacent to existing end treatments should be reviewed and corrected in accordance with Section 13-10.0.

13-4.04 Bridge Attachments

All existing bridge attachments not meeting NCHRP Report 350 within the limits of a project shall be converted to one of the bridge attachments meeting the MASH 2016 criteria. NCHRP Report 350 attachments may be considered when MASH attachments are not available or cannot be installed within the existing site constraints. Designers shall consult with the Bridge Design Unit to determine the extent of bridge modifications that would be required.

13-4.05 Curbs and Curb/Barrier Combinations

See Section 13-9.04 for evaluating existing curbing within the project limits.

Granite stone transition curbing shall be replaced with the Department’s current standard curbing when installing a new bridge attachment.

13-5.0 ROADSIDE BARRIERS

13-5.01 Three-Cable Guiderail (I-Beam Post)

Three-cable guiderail is a weak-post flexible system with a large dynamic deflection. The tensile forces developed in the cable strands supply most of the resistance to impact. Upon impact, the cables break away from the posts, and the vehicle is able to knock down the posts as it is redirected by the cables. The detached posts do not contribute to controlling the lateral deflection. However, the posts that remain in place do provide a substantial part of the lateral resistance to the impacting vehicle and are therefore critical to proper performance.

Three-cable guiderail is the most forgiving of the available systems because of its large dynamic deflection. Its use should be tempered by the following considerations:

1. Transitions: Do not use three-cable guiderail for leading end transitions into bridge rails.
2. Slopes: Do not use three-cable guiderail on fill slopes steeper than 1:2, unless the distance between the back of the posts and the break in the fill slope is at least 8 ft.
3. Minimum Radius: Three-cable guiderail shall not be used on radii less than or equal to 440 ft. See Figure 13-9E for guiderail curvature criteria.
4. Cable Tension: For three-cable guiderail to provide full impact performance, the cables must be tensioned properly. Therefore, maintenance forces should ensure that the cable strands are tensioned properly at all times.
5. Minimum Length: Post spacing shall not vary within a run of three-cable guiderail. The following minimum lengths shall apply:

Post Spacing (ft)	Minimum Length (ft)
16	248
12	248
8	156

Three-Cable Minimum Lengths

Figure 13-5A

Three-cable guiderail is ineffective after one impact and is therefore not the appropriate guiderail to use where crash history shows a significant number of run-off-the-road crashes have occurred.

13-5.02 Metal Beam Rail (Type R-B 350)

Metal beam rail (Type R-B 350) is a strong-post semi-rigid system with steel posts and routed recycled plastic block outs. This system is oriented such that the rail element splices are at the posts and the rail height is installed at 29 in. The deflection distance of R-B 350 guiderail is much less than that of three-cable guiderail. The deceleration forces on vehicular occupants when impacting R-B 350 are significantly higher than impacts with three-cable guiderail. R-B 350 guiderail has significant maintenance advantages by safely sustaining a second impact even after a first major impact.

R-B 350 may only be installed when a transition length is not available for the installation of R-B MASH, such as at short lengths of rail followed by a bridge attachment, curved guiderail treatment,

earth cut slope anchor, or rock cut slope anchor. See section 13-4.0 for disposition of existing barrier.

The Designer should provide a minimum of 2 ft between the back of post and the hinge point. This distance is especially important atop embankments because it provides the soil support to help resist or limit deflection of the barrier during impact. The post length can be increased to provide the necessary soil support when installing the back of post at the hinge point of an embankment of 1:2 or steeper. Crash tests have been successfully performed with installing longer posts spaced at 3 ft-1.5 in. placed at the hinge point resulted in deflections similar to that of the standard post spacing. The 7 ft-6 in. post detailed on the Connecticut Highway Standard Drawings should be used when Designers specify this application.

13-5.03 Metal Beam Rail (R-B MASH)

Metal beam rail (R-B MASH) is a strong-post semi-rigid system with steel posts and routed recycled plastic block outs. This system is oriented such that the rail element splices are between the posts and the rail height is installed at 31 in. The R-B MASH guiderail passed the TL-3 testing criteria according to the MASH. The deflection distance is similar to that of metal beam rail (R-B 350). The deceleration forces on vehicular occupants when impacting R-B MASH are significantly higher than impacts with three-cable guiderail. R-B MASH guiderail has significant maintenance advantages by safely sustaining a second impact even after the first major impact. For this reason, R-B MASH guiderail should be strongly considered where a site has a history of frequent run-off-the-road incidents, or where the greater deflection distance required for three-cable guiderail is either not available or is only available intermittently.

The Designer should provide a minimum of 2 ft between the back of post and the hinge point. This distance is especially important atop embankments because it provides the soil support to help resist or limit deflection of the barrier during impact. Crash tests have been successfully performed with installing standard sized posts at standard post spacing placed at the hinge point of a 1:2 embankment resulted in deflections of approximately 5 ft-1 in. from the back of the post. When that deflection is not feasible, it is recommended to propose the half-post spacing system which results in a 4 ft-3 in. deflection distance.

There are two reduced post spacing options available to reduce the deflection of R-B MASH at isolated locations within the length of guiderail. The quarter post spacing requires 25 ft of half post spacing on either end for strength transitioning purposes. See Figure 13-7C for deflection distances for each respective reduced post spacing options. Also see the Connecticut Highway Standard Drawings for details.

Where isolated underground conflicts exist, crash tests have shown that one post can be omitted every 25 ft without affecting system performance.

13-5.04 Curved Guiderail Treatment

The curved guiderail treatment is a TL-2 NCHRP Report 230 device meant to be used when specific radii less than or equal to 35 ft is required. It should only be used on roadways with design speeds less than 50 mph with the designated clear area as noted on the Connecticut Standard Drawings. The system uses controlled releasing terminal (CRT) post along its radius. A minimum 12.5 ft of R-B 350 is required at either end of the system with appropriate transitions when used within the length of R-B MASH, followed by a reduced post spacing system, or following a bridge attachment. Figure 13-9D in Section 13-9.08 provides guidance on laying out this treatment. Also

see the Connecticut Highway Standard Drawings for the available radii and associated designated clear areas.

13-5.05 Span Sections Type II and Type III

R-B MASH has been successfully crash tested with omitting two or three posts for TL-3 testing criteria according to the MASH. This system may be used to avoid any underground conflicts. Each system uses controlled releasing terminal (CRT) posts on either side of the omitted posts. Each system also has a specific length of R-B MASH required, which extends beyond the length of the CRT post limits. A minimum of 12.5 ft of R-B MASH on either end of the system is required before introducing any other guiderail types. These systems are not intended to be used in conjunction with curbing and they should not be installed with a radius. Note that these systems use a 12 in. blockout and still requires 2 ft between the back of post and the hinge point; therefore, impacting the embankment grading. Any headwall within the deflection distance of 6 ft behind the post should have a 2 in. reveal or less.

13-5.06 Metal Beam Rail (Box Beam)

The box beam guiderail passed the TL-3 crash test criteria in NCHRP Report 350. It is a weak-post semi-rigid guiderail with a TS 6 in x 6 in x 0.25 in steel box tube. In the absence of a standard drawing for 6 in. x 6 in. Box Beam, 8 in. x 6 in. Box Beam may be installed on roadside applications. The deflection distance for either box beam guiderail can be reduced by reducing the post spacing. These additional posts are only driven behind the box beam guiderail and are not fastened to it. Either type may be used at selected sites on a case-by-case basis with approval of the Designer's Division Chief and coordination with the Bureau of Highway Operations.

13-5.07 Precast Concrete Barrier Curb (PCBC)

PCBC may be used on the roadside in front of rigid objects or vertical drop-offs where a higher performing barrier with minimal deflection distance is required. A 42 in. high single slope PCBC is the Department's preferred rigid barrier type on new construction projects due to its advantage over the F-shape in its ability to accommodate pavement elevation changes without affecting performance. It has been successfully crashed tested for TL-4 testing criteria according to the MASH 2016. Short runs of new 45 in. F-Shape PCBC can be considered if 45 in. F-Shape PCBC currently exists at the limits of construction. The half-section PCBC may be used on the roadside when installed with backfill. The full-section PCBC shall be used on the roadside if the barrier cannot be backfilled, see Section 13-6.03. See Connecticut Standard Drawings for details of each barrier type and appropriate transitions.

13-5.08 Merritt Parkway Guiderail

The Merritt Parkway Guiderail is a steel-backed timber guiderail that combines aesthetic appeal with acceptable safety performance. It passed the TL-3 crash testing criteria in NCHRP Report 350. The Department has approved this rail for use solely on the Merritt Parkway. However aesthetically appealing, this rail has a high maintenance and installation cost which precludes its widespread application on other State-owned roadways. There are also no end treatments available for this guiderail which limits its use on other roadways.

The Merritt Parkway guiderail with standard post spacing may be installed on either side of the median greater than 13 ft wide on the Merritt Parkway. The Merritt Parkway Guiderail System 2 with a 5 ft post spacing may be used on either side of a median that is between 9ft - 6 in. and 13 ft wide. The Merritt Parkway Guiderail System 3 with a 2 ft - 6 in. post spacing may be used on either side of a median that is between 6 ft - 6 in. and 9 ft - 6 in. wide. Refer to the Connecticut

Highway Standard Drawings for details. Ideally, Designers should install the appropriate steel-backed timber guiderail system with the proper deflection needed for the site.

13-5.09 Merritt Parkway Concrete Barrier

The Merritt Parkway Concrete Barrier combines aesthetic appeal with acceptable safety performance. It is a vertical wall barrier that meets the TL-3 crash testing criteria in the NCHRP Report 350. The Department has approved this barrier for use solely on the Merritt Parkway.

13-5.10 Bridge Attachments

13-5.10.01 Thrie-Beam Attachment

The Thrie-Beam attachment is a strong-post transition system with steel posts and routed recycled plastic block outs. This attachment has passed the TL-3 testing criteria according to the MASH 2016. It is installed at a 34 in. height and includes a thrie-beam to w-beam transition element where the w-beam portion of the system is installed at a 31 in. height to continue with R-B MASH. The Designer should provide a minimum 2 ft shelf between the back of post and the hinge point. Only 4 in. curbing is allowed with this attachment. See the Connecticut Highway Standard Drawings.

13-5.10.02 R-B 350 Bridge Attachment

The R-B 350 Bridge Attachment is a strong-post transition system that uses a w-beam element with steel posts and routed recycled plastic block outs. This attachment also includes a rubrail to prevent wheels from snagging the blunt end of whatever structure it is attached to. This attachment meets the TL-3 crash testing criteria according to the NCHRP-Report 350 and therefore can only be used where applications prevent the installation of the Thrie-Beam Attachment. See the Connecticut Highway Standard Drawings.

13-6.0 MEDIAN BARRIERS

13-6.01 Metal Beam Rail (Type MD-B 350)

Metal beam rail (Type MD-B 350) is a strong-post semi-rigid median barrier with steel posts and routed recycled plastic block outs. Its performance is similar to Metal Beam Rail (Type R-B 350). MD-B 350 median guiderail is most applicable in medians with narrow or intermediate widths. One special application for MD-B 350 is to separate adjacent on/off ramps at interchanges. MD-B 350 should only be installed when the transition length between MD-B MASH and NCHRP Report 350 systems is not available.

13-6.02 Metal Beam Rail (MD-B MASH)

Similar to MD-B 350, MD-B MASH is a strong-post semi-rigid median barrier with steel posts and routed recycled plastic block outs. This system is oriented such that the rail element splices are between the posts and the rail height is installed at 31 in. MD-B MASH guiderail passed the TL-3 testing criteria according to the MASH and performs similar to MD-B 350. MD-B MASH is most applicable in medians with narrow or intermediate widths. Another application for MD-B MASH is to separate adjacent on/off ramps at interchanges.

13-6.03 Precast Concrete Barrier Curb (PCBC)

PCBC may be used in the median in front of rigid objects, vertical drop-offs or on freeways with narrow medians where a higher performing barrier with minimal deflection distance is required. Median PCBC shall be located 12 ft or less from the traveled way as illustrated in Chapter 4 Figure 4I and Chapter 5 Figure 5K, except for the Incident Management section for urban freeways as illustrated in Chapter 5 Figure 5M. A full-section 42 in. high single slope PCBC is the Department's preferred rigid barrier type on new construction projects due to its advantage over the F-Shape because of its ability to accommodate pavement elevation changes without affecting performance. It has been successfully crashed tested for TL-4 testing criteria according to the MASH 2016. Short runs of new 45 in. F-Shape PCBC can be considered if 45 in. F-Shape PCBC currently exists at the limits of construction. Half-sections of PCBC may be used in the median when installed with backfill. See Connecticut Highway Standard Drawings for details of each barrier type and appropriate transitions.

13-6.04 Merritt Parkway Median Guiderail

As with the Merritt Parkway roadside guiderail, the Merritt Parkway median guiderail combines aesthetic appeal with acceptable safety performance. It meets the TL-3 crash testing criteria in NCHRP Report 350. This guiderail may be used in medians where the overall width is greater than or equal to 10 ft, excluding shoulders. The use of individual sections of roadside Merritt Parkway Guiderail may be considered so long as the deflection, flare rate and maximum cross slope criteria are met. See Section 13-5.08 for additional guidance. As with the roadside Merritt Parkway Guiderail, the Department has approved the use of this rail solely on the Merritt Parkway.

13-6.05 Merritt Parkway Concrete Median Barrier

Where the median width is too narrow to accommodate the deflection of the Merritt Parkway Median Guiderail, the Merritt Parkway Concrete Median Barrier may be used. This is a vertical shape barrier that meets TL-3 crash testing criteria in NCHRP Report 350 that also provides an aesthetic appeal. The Department has approved the use of this barrier solely on the Merritt Parkway.

13-6.06 Metal Beam Rail (8"x6" Box Beam)

The 8 in. x 6 in. Box Beam guiderail is a semi-rigid median guiderail with a S3 x 5.7 weak steel post and a TS 8 in. x 6 in. x 0.25 in. steel tube. This box beam guiderail passed the TL-3 crash test criteria in NCHRP Report 350. See 13-5.06 for discussion on reduced post spacing when 8 in. x 6 in. box beam rail is installed in a roadside application. Reduced post spacing cannot be installed in a median application. The 8 in. x 6 in. box beam rail may be used at selected sites on a case-by-case basis with approval of the Designer's Division Chief and coordination with the Bureau of Highway Operations.

13-6.07 Median Bridge Attachments

13-6.07.01 MD-B 350 Median Barrier – Safety Shape Attachment

The MD-B 350 Median Barrier – Safety Shape Attachment is a strong-post transition system that uses a steel post, and is double sided with a w-beam element and routed recycled plastic block outs. This attachment is used on roadways with narrow medians and can be attached to a Jersey Shape or F-Shaped structure. It is available in two different types: Type I and Type II. The Type I is used for bi-directional roadways where a rubrail is used to prevent wheels from snagging the blunt end of whatever structure it is attached to on the leading end. Whereas Type II provides a rubrail on both sides of the system for use on roadways where traffic is traveling in the same direction. This attachment meets the TL-3 crashing testing in NCHRP-350 Report and therefore can only be used when a MASH 2016 attachment is not available. See the Connecticut Highway Standard Drawings.

13-7.0 BARRIER DEFLECTIONS

The “deflection distance” is defined as the lateral distance that the outside face (side away from traffic) of a barrier will deflect when struck by an errant vehicle before that barrier system stops the movement of the vehicle away from the road. The available deflection distance for strong-post systems is measured from the back side of the posts. This distinction is made because weak-post rail systems usually separate from the posts when struck, while the rail on strong-post systems will usually remain attached. The clear distance to an obstruction must therefore include an allowance for the width of the strong-post system.

The deflection distance is an important parameter for two reasons. First, it determines the magnitude of the lateral deceleration. Rigid systems, such as concrete barriers, produce essentially instantaneous lateral decelerations that are more likely to result in occupant injuries. Therefore, the use of a less rigid system is favorable. The second reason is that it determines the space that must be maintained between the hazard and the barrier. All hazards should be kept outside of the deflection distance. The potential for vegetation to grow within the deflection distance should be considered.

Figure 13-7C presents the deflection distances expected when various barrier systems are impacted with a standard vehicle. These dimensions are based on crash test research and have been selected as a representative and conservative singular deflection value. However, vehicles traveling at lower speeds on narrow roadways with reduced lateral offsets tend to impact guiderail at flatter angles thereby creating a smaller deflection in the guiderail. For this reason, Figure 13-7A is used when needed to determine the maximum lateral offset for narrow roads. Figure 13-7B should be used to establish applicable reduction factors that may be used to decrease the deflection distance of guiderail when proposed for installation on lower speed, narrow roadways. Refer to the example problem in Figure 13-7B.

The Department’s policy for selecting guiderail with respect to deflection needs is summarized below:

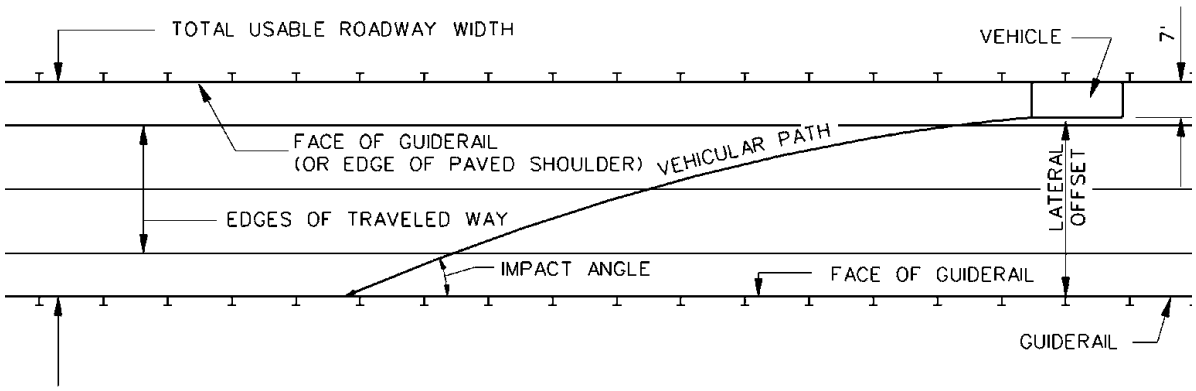
1. The barrier system with the largest acceptable deflection should be selected when a barrier is required.

2. The deflection of the selected guiderail system must be less than the distance from the back of the guiderail post to the nearest hazard that cannot be removed or relocated.

All removable hazards must be removed from the area within the deflection distance of the selected guiderail. Maintenance work may be needed to prevent trees within the deflection distance from growing to more than 4 in. in diameter. Because the Department cannot control development beyond the right-of-way (ROW) line, the selection of a barrier system should ensure that its deflection will not extend beyond the ROW.

The Designer should note that when a vehicle impacts a barrier, the vehicle may lean over the top of the barrier and strike bridge piers, sign supports, light poles, etc., that have been placed behind the barrier.

If practical, fixed objects should be placed beyond the clear zone, instead of behind and above the barrier. Designers should refer to Section 13-8.0 and the Connecticut Highway Standard Drawings for placement of PCBC adjacent to bridge piers, abutments and sign supports.



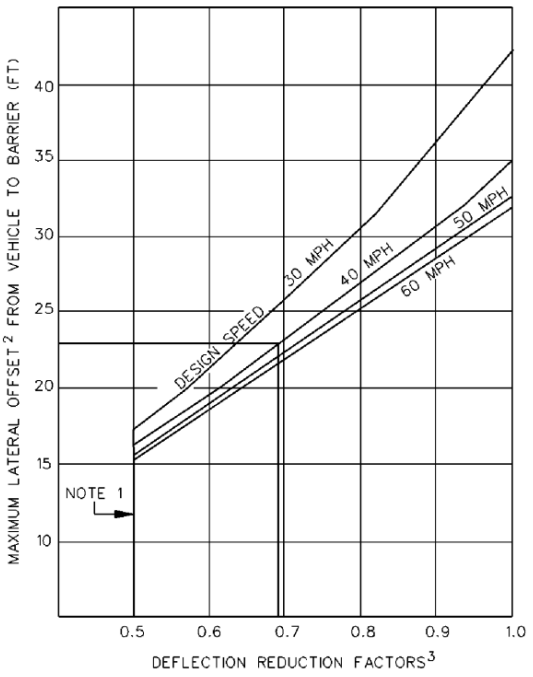
MAXIMUM LATERAL OFFSET

(For use with Figure 13-7B)

Figure 13-7A

Notes:

1. Factors will not be less than 0.5.
2. As illustrated in Figure 13-7A.
3. Reduction factors are used at specific locations when a smaller deflection is needed on a lower speed roadway to protect motorists from immovable objects.



Example:

1. Determine that the maximum lateral offset (as defined in Figure 13-7A) equals 23 ft.
2. Determine that the guiderail's standard deflection (obtained from Figure 13-7C) is 8 ft.
3. Determine the design speed to be 40 mph.
4. From the graph in this figure, the reduction factor is 0.69.
5. Multiply 8 ft by 0.69 = 5.52 ft.
6. Use a reduced deflection of 5.5 ft, due to the narrow offset

DEFLECTION REDUCTION FACTORS

Figure 13-7B

System Name (Post)	Barrier Type and Category	Post Spacing	Deflection Distances
Three-cable Guiderail (S3x5.7) weak-post	3-3/4" Dia. steel cables Flexible System	16′-0″ 8′-0″,	12′-6″ 8′-0″
Type R-I Type Modified R-I (S3x5.7) weak-post	Steel W-Beam Element Flexible System	12′-6″ 6′-3″ 3′-1½″	8′-0″ 6′-0″ 4′-6″
Type R-B 350 Type R-B MASH (W6 x 8.5) strong-post	Steel W-Beam Element Semi-rigid Systems	6′-3″ 3′-1½″ 1′-6¾″	4′-3″ 2′-8″ 1′-10″
Span Section Type II & III	Steel W-Beam Element Semi-rigid Systems	N/A	6'-0"
Type MD-I (S3x5.7) weak-post	Steel W-Beam Element Flexible Systems	12′-6″ 6′-3″	6′-0″ 4′-0″
Type MD-B 350 Type MD-B MASH (W6 x 8.5) strong-post	Steel W-Beam Element Semi-rigid Systems	6′-3″	2′-0″
6" x 6" Box Beam (S3x5.7) weak-post	Steel 6" x 6" Tube Semi-rigid System	6′-0″ 3′-0″	4′-10″ 4′-0″
8" x 6" Box Beam (S3x5.7) weak-post	Steel 8" x 6" Tube Semi-rigid System	6′-0″ 3′-0″	6′-6″ 4′-0″
Thrie-beam 350 (W6 x 8.5) strong-post	Steel Thrie-beam Element Semi-rigid System	6′-3″	4'-4"
Merritt Parkway Guiderail (W6 x 15) strong-post	Rough Sawn Timber Element Semi-rigid System	10′-0″ 5′-0″ 2′-6″	4′-0″ 2′-6″ 1′-0″
Merritt Parkway Median Guiderail (W6 x 15) strong post	Rough Sawn Timber Element Semi-rigid System	10'-0"	3'-0"
Safety, F-Shape, Single Slope and Vertical Shapes	Concrete Barriers, Rigid	N/A	0

Notes:
1. Deflection distance measured from the back of post for w-beam guiderail systems.
2. Minimum Lengths:
   a. Three-Cable guiderail = See Section 13-5.01
   b. W-Beam guiderail systems (Roadside and Median) = 62.5 feet (Excluding anchors)
   c. Box Beam guiderail systems = 130 feet

BARRIER DEFLECTION DISTANCES

Figure 13-7C

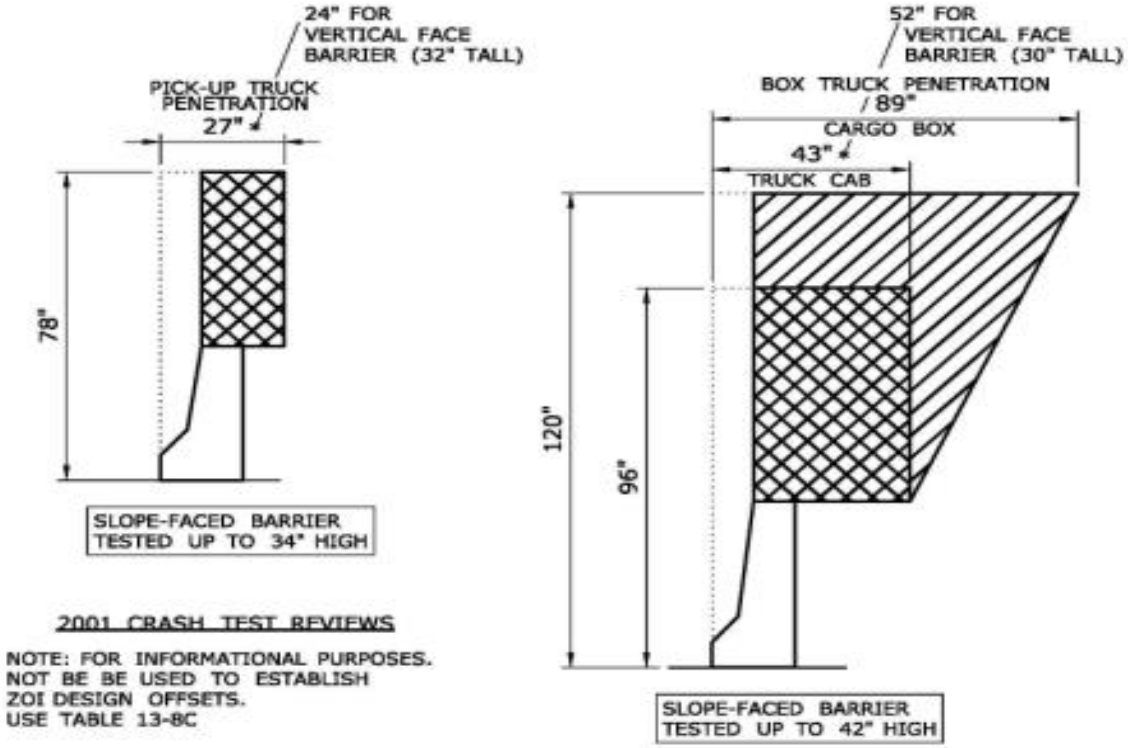
13-8.0 ZONE OF INTRUSION (ZOI) BACKGROUND

Crash testing and field experience has shown that during an angled impact, a large truck or similar high-center-of-gravity vehicle will typically lean over and extend for some distance behind a rigid or semi-rigid barrier and may strike an object placed on or just behind the barrier (Figure 13-8A). The expected distance of this intrusion behind a barrier is called “Zone of Intrusion” (ZOI). Depending on the barrier type and height, the roll or lean of an impacting large truck cargo box can reach obstacles up to as much as 10 ft behind a rigid barrier.

Infrastructure or objects which exist or are placed within this Zone of Intrusion distance may be impacted by the vehicle causing injury to vehicle occupants, or possible secondary crashes after the initial impact (Figure 13-8B).

Box Truck Crash Test

Figure 13-8A



Typical Intrusion Zones from Crash Test Reviews

Figure 13-8B

13-8.01 Application

Due to the higher volumes, speeds, percentage of trucks, and the greater number of bridge piers, abutments, cantilever and full-span overhead sign support structures typically encountered on freeways, ZOI distances, as discussed below, should be considered on all freeways (excluding the Merritt Parkway).

13-8.01.01 Scope of Projects for ZOI Evaluation

The application of ZOI criteria should be evaluated on freeways (excluding the Merritt Parkway) for all major projects and projects that will provide a general upgrading of the facility, including the following project types:

- new construction or reconstruction
- addition of lanes
- lane or shoulder reconstruction or widening
- complete bridge replacement
- safety improvements, including the installation of concrete median barriers and/or roadside barrier replacement
- pavement rehabilitation (placing more than 3 in. of new bituminous concrete)

However, it is recognized that ZOI considerations may be beyond the scope of certain project types, such as spot improvements or projects intended to address a single type of deficiency on the freeway. Accordingly, the application of ZOI criteria need not be considered for the following project types:

- spot improvements
- sign support replacements
- pavement striping
- pavement preservation (placing up to 3 in. of new bituminous concrete)
- other limited scope improvements

13-8.01.02 Evaluation

Although objective warrants for applying ZOI criteria do not presently exist, the following subjective factors should be considered at each specific location:

- roadway geometry,
- crash history and existing barrier performance,
- design, construction and maintenance costs (i.e. barrier systems, longer bridges, and larger overhead sign support structures).

13-8.01.03 ZOI Design Guidance

Engineering judgment is required when choosing, placing, and designing barrier systems to provide a balance between risk and cost. If the determination is made that ZOI distances will be applied at a specific location, Designers should first consider:

1. modifying the design to place the object out of the ZOI distance for the selected barrier system; or,
2. using a higher performing barrier (barrier height or shape) to reduce vehicular lean during an impact.

Based on crash test reviews and research reports, the observed intrusion by pickup truck and box truck cabs was used to develop ZOI distances. The ZOI distances shown in Table 13-8C have been established for use by Designers as practical design parameters.

Object Distance (d) (measured from toe of barrier face)	Barrier Type
d ≥ 8’	W-Beam Guiderail [1] 32” Jersey Shape [2]
4’ ≤ d < 8’	42” Jersey Shape
2’ ≤ d < 4’	42” – 45” F-shape 45” Vertical Shape
d < 2’	54” Vertical Shape[3]

Notes:

1. Although crash test reviews for ZOI distances on semi-rigid systems are not available, it is considered reasonable for a Designer to combine the dynamic deflection of the system with a ZOI distance of 4 ft until more information becomes available. This combined distance is measured from the front face of the rail system. It should be noted that R-B MASH and R-B 350 Guiderail is not specifically designed to meet test level 4 and higher criteria.
2. Existing 32 in. Jersey barrier at this distance may remain in place as directed in 13-4.0. New installations of concrete barrier shall be in accordance with Sections 13-5.07 and 13-6.03.
3. A minimum of 10 ft of 54 in. barrier is required in advance of the object.

ZOI Distances

Table 13-8C

ZOI distances shall not be directly applied to flexible railing systems. At locations where ZOI is a concern and the object distance is beyond 12 ft from the face of the guiderail system, ZOI is considered to be met.

13-9.0 BARRIER LAYOUT

13-9.01 Length-of-Need

The Department's criteria for determining the length-of-need is found in the AASHTO Roadside Design Guide, Section 5.6.4.

13-9.02 Flare Rate

It may be necessary to laterally relocate a run of guiderail to terminate the end anchorage outside the clear zone or to meet a bridge parapet. This lateral relocation may increase the angle of impact on the guiderail. Therefore, guiderail flare rates should be based on Figure 13-9A.

13-9.03 Lateral Placement

Guiderail should be placed as far as practical from the edge of the traveled way. This will minimize the chance that it will be struck, and provides the driver with a chance to regain control of the vehicle before impacting the guiderail. The following factors should be considered when determining guiderail lateral placement:

1. The deflection distance of the guiderail, as shown in Figure 13-7C, should be met. The Zone of Intrusion of a vehicle getting over and behind the rail should also be considered when it is applicable.

2. Designers should refer to Sections 13-5.0 and 13-6.0 for guidance when designing the lateral placement of a selected barrier type.

3. Drivers tend to reduce speed and change the vehicle's position when roadside objects appear as an obstacle. The distance between the edge of travel way and the object is known as the shy-line offset. Figure 13-9B illustrates this suggested distance in relation to design speed. It is recommended to laterally place short lengths of guiderail beyond the shy-line offset. The distance is not as critical for long runs of guiderail, especially when the guiderail is introduced beyond the shy-line. Note that the shy-line offset is not a controlling criteria when designing the guiderail.

4. Guiderail should typically be placed with the rail element flush with the back of the sidewalk.

Design Speed (mph)	Flare Rate for Barrier Inside Shy-Line	Flare Rate for Barrier Beyond Shy-Line	
		Rigid	Flexible/Semi-Rigid
30	13:1	8:1	7:1
40	16:1	10:1	8:1
45	18:1	12:1	10:1
50	21:1	14:1	11:1
55	24:1	16:1	12:1
60	26:1	18:1	14:1
70	30:1	20:1	15:1

BARRIER FLARE RATES

Figure 13-9A

Design Speed (mph)	Shy-Line Offset (ft)
30	4.0
40	5.0
45	6.0
50	6.5
55	7.0
60	8.0
70	9.0

SUGGESTED SHY-LINE OFFSETS

(from Edge of Traveled Way)

Figure 13-9B

13-9.04 Curbs and Curb/Barrier Combinations

When the tires of an errant vehicle strike a curb, the impact tends to bounce the vehicle upwards which may contribute to vaulting or penetration of the rail. This problem is increased when curbs are located between 1 ft and 10 ft in front of guiderail. As a result, curbing should not be installed when guiderail is in this range, including when guiderail is flared. Where curbing is required, the Designer should consider using a curb no higher than 4 in.

The following criteria will apply for curbing and curb/barrier combinations:

1. Curbing of any height is not permitted for use in conjunction with either concrete barriers, end treatments, or Span Sections.

2. Curbing shall not be used in gore areas.

3. Curbing with a maximum height of 4 in. may be used in combination with barrier when it is necessary for drainage purposes in accordance with the following:

   a. Any w-beam guiderail shall be installed flush with the face of curbing. See Connecticut Highway Standard Drawings.

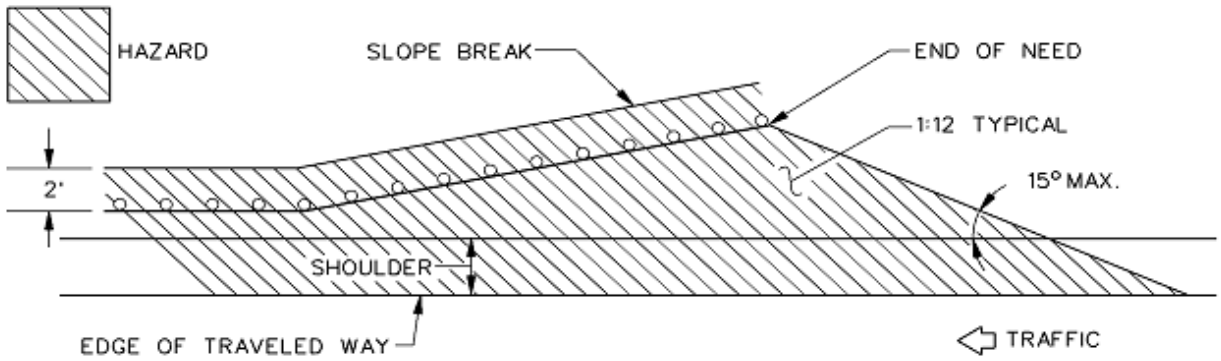
   b. Three-cable guiderail shall be installed a maximum of 1 ft from the face of curbing. See Connecticut Highway Standard Drawings.

13-9.05 Required Grading

If guiderail is improperly located on slopes, an errant vehicle could impact the rail too high or too low, causing destabilization of the vehicle. Therefore, the following criteria will apply:

1. It is preferred to place w-beam guiderail on slopes 1:12 or flatter. This also applies to the areas in front of the flared section of guiderail. See Figure 13-9C. A 1:10 slope may be considered where grading is restricted.

2. Three-cable guiderail may be placed on slopes between 1:10 and 1:6 when needed (i.e., barn-roof sections). It has been demonstrated through crash test evaluation that the cable engages vehicles better than other rail systems for this range of slopes.



GRADING IN FRONT OF GUIDERAIL

Figure 13-9C

13-9.06 Processed Aggregate for Railing

Processed Aggregate should be included in construction contracts underneath any guiderail. The Designer should include a detail in the plans to show a depth of approximately 6 in. of Processed Aggregate to be installed under all new guiderail. Processed Aggregate should be placed as needed to correct any rutting/wash-outs and to back-up any curbing/edge of road when an obsolete longitudinal barrier is being replaced or converted.

13-9.07 Guiderail Gaps

Short gaps between runs of guiderail are undesirable. In general, gaps less than 200 ft between guiderail termini should be connected into a single run. However, this may not be possible on roadways with numerous driveway openings. Removing the need for guiderail should always be investigated to prevent short runs of guiderail or multiple short gaps of guiderail.

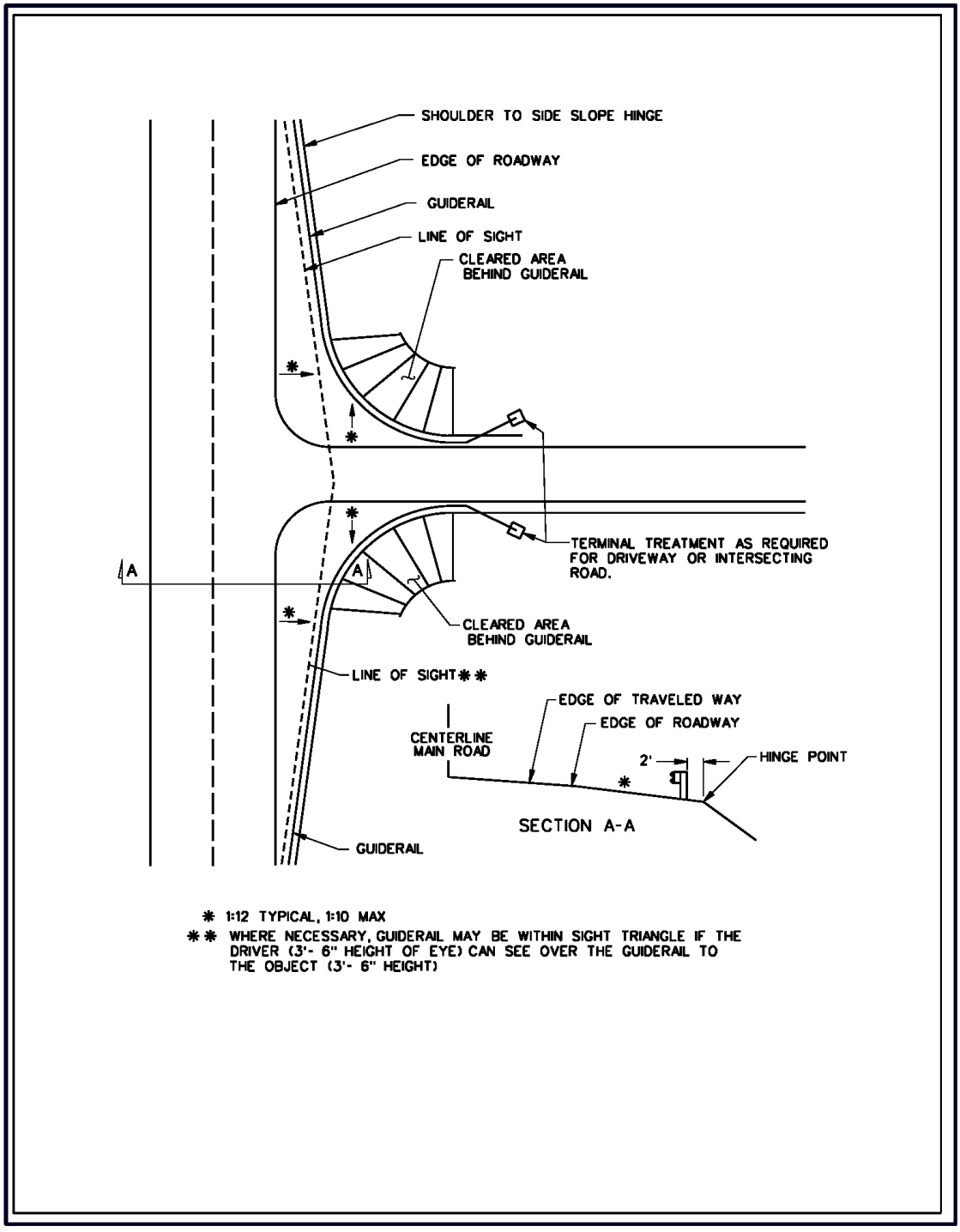
13-9.08 Treatment at Intersecting Roads and Driveways

Guiderail runs on non-freeway facilities are most often interrupted by intersecting roads and driveways. Figure 13-9D presents the typical treatment that should be used for terminating guiderail at intersecting roads and driveways. When using this figure, the Designer should consider the following:

1. Studies have shown that there is an increased chance for vehicles to impact this type of guiderail installation at 90 degrees. Three-cable guiderail should not be used because of the potential for high-angle impacts.

2. The guiderail should be flared away from the main road whenever possible to allow sufficient sight distance for vehicles on the intersecting road or driveway. Do not install curbing where guiderail is flared for sight line.

3. On roadways and driveways with design speeds of less than or equal to 50 mph, Designers should investigate the possibility of using the Curved Guiderail Treatment as discussed in Section 13-5.04 or an R-B Terminal section as detailed in the Connecticut Highway Standard Drawings. Each of these systems require appropriate transitions when attached to R-B MASH guiderail.



GUIDERAIL TREATMENT AT INTERSECTING ROADS AND DRIVEWAYS

Figure 13-9D

13-9.09 Guiderail Curvature Criteria

Guiderail must sometimes be placed on the inside of radii at, for example, interchange ramps. This condition presents a problem when standard post spacing is used because a vehicle may impact the guiderail at close to 90 degrees. Figure 13-9E illustrates the appropriate curved guiderail treatment for a corresponding radius. It is important to note that w-beam guiderail must be shop fabricated for radii less than or equal to 150 ft; therefore, the Designer should callout the radius on the plans.

Radius of Curve	Curved Guiderail Treatment For ≤ 50 mph
R > 720 ft	Three cable @ 16-ft post spacing Type R-B 350/MASH
720 ft ≥ R ≥ 440 ft	Three cable @ 12-ft post spacing[2,3] Type R-B 350/MASH
440 f t> R >35 ft	Type R-B 350/MASH[1]
R = 35 ft, 25.5 ft, 17 ft or 8.5 ft	Refer to *Connecticut Highway Standard Drawing* for tCurved Guiderail Treatment Details[4]

Notes:

1. W-Beam guiderail must be shop fabricated for radii less than or equal to 150 ft. The radius should be called out on the plans.
2. Three-cable guiderail should not be used for radii less than 440 ft. For radii less than 440 ft, use the appropriate w-beam guiderail.
3. Three-cable guiderail installed on a radius with 12 ft post spacing has a design deflection of standard post spacing.
4. Curved Guiderail treatment is a TL-2 system and requires a transition when connecting to any w-beam guiderail system. Refer to the appropriate Connecticut Highway Standard Drawing.

CRITERIA FOR GUIDERAIL CURVATURE

Figure 13-9E

13-9.10 Transitions

13-9.10.01 Transitions Within Same Barrier Type

Where conditions allow, Designers should always choose the guiderail with the largest deflection distance possible. The available distance between the guiderail and the hazard will govern this selection. However, there may be sites where this distance is interrupted by short sections where the available deflection distance is less. The desirable treatment, if practical, is to stiffen the existing guiderail by reducing the post spacing through the section of reduced deflection distance. This treatment does not apply with Three-Cable Guiderail as described in Section 13-5.01. Transitions for metal beam rail are illustrated in the Connecticut Highway Standard Drawings, and the deflection distance associated to reduce post spacing for different rail types are listed in Figure 13-7C.

13-9.10.02 Transitions Between Different Barrier Types

Overlapping of three cable and metal beam rail shall be avoided. See the Connecticut Highway Standard Drawings for details of all approved transitions for longitudinal barrier. Designers shall review Section 13-3.03 when attaching guiderail to any concrete structure or barrier.

13-9.11 Median Barrier Placement

13-9.11.01 General

The ideal location for the median barrier is in the center of the median, which will provide a maximum clear recovery area for each direction of travel. The presence of excessive slopes or existing drainage in the center may make it impossible to locate a barrier there. Therefore, a median barrier should not be placed where the roadside slope leading up to the barrier exceeds 1:10. For Precast Concrete Barrier Curb, the slope leading up to the barrier will be the shoulder slope. Existing median slopes greater than 1:10 should be flattened to a desirable 1:12 rate or maximum 1:10 rate.

13-9.11.02 Basic Application

Figure 13-9F varies slightly from Figure 6-18 of the *Roadside Design* Guide which illustrates three basic types of sloped medians. The following discusses each type and also varies slightly from *Roadside Design Guide* where it assumes a median barrier is warranted:

1. For Cross Section I, the Designer should determine if the individual slopes warrant protection based on the criteria in Section 13-3.0. If both slopes warrant protection (Illustration 1), guiderail should be placed at “b” and “d”. If one slope warrants protection, a median barrier should be placed to shield that slope. If neither slope warrants protection and both slopes are steeper than 1:10 (Illustration 2), a median barrier should be placed at “b” or “d”, whichever is shielding the steeper slope. If the slopes are 1:10 or flatter (Illustration 3), the median barrier should be placed slightly to one side of the center of the median so that it does not interfere with highway drainage.

2. For Cross Section II, the slope in the median will determine the proper treatment. If the slope is between 1:10 and 1:4 (Illustration 4), the median barrier should be placed at “b.” If the median slope is 1:4 or steeper, guiderail at “b” is the only necessary treatment. If the median slope is a roadside hazard (e.g., rough rock cut) (Illustration 5), guiderail should be placed at both “b” and “d.” If the median slope is 1:10 or flatter (Illustration 6), the median barrier should be placed in the center of the median.

3. For Cross Section III (Illustration 7), the redirective capacity of the median slope will determine the proper treatment. If the median slope is 1:4 or steeper and greater than 3 ft in vertical height, no roadside nor median barrier is necessary. If the median slopes are flatter than 1:4 and/or less than 3 ft in vertical height, the median barrier should be placed at the apex of the cross section.

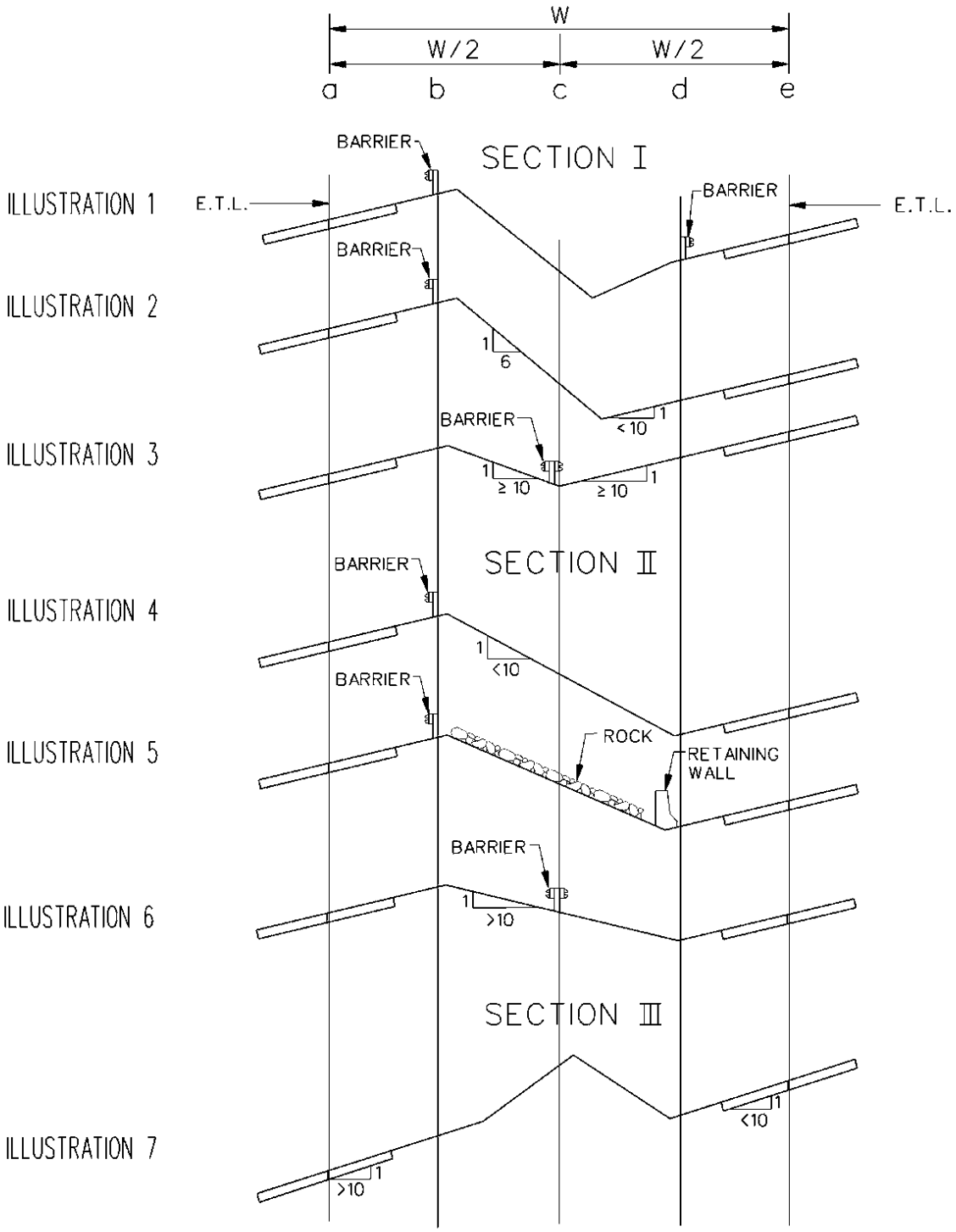
13-9.11.03 Divided Median Barriers

It may be necessary to intermittently divide a median barrier. The slope criteria in Section 13-9.11.02 or a fixed object in the median may require this. The median barrier may be divided by one of these methods:

1. An F-shaped PCBC may encase a fixed object.

2. A single-faced F-shaped PCBC may be used on both sides to shield a fixed object. Backfilling may be necessary.

Median metal beam rail may be split into two separate runs of guiderail passing on either side of the median hazard (fixed object or slope). Designers should consider access for maintenance purposes. When maintenance access is not a concern, reference the applicable Connecticut Highway Standard Drawings and adhere to the acceptable flare rates (Figure 13-9A). Where practical, the flare rate should be 50:1.



SLOPED MEDIANS

Figure 13-9F

13-9.12 Glare Screens

Headlight glare from opposing traffic can be bothersome and distracting. Glare screens can be used in combination with median barriers to eliminate this problem.

The typical application, however, is on urban freeways with narrow medians and high traffic volumes or between on/off ramps at interchanges where the two ramps adjoin each other. Here, the sharp radii of curvature and the narrow separation may make headlight glare especially bothersome. Designers should consider the use of glare screens at these sites especially if the Department has received a significant number of public complaints.

Blocking headlight glare can be achieved in several ways:

1. Vegetation can be used; however, the Designer should not introduce hazardous fixed objects in a narrow median.

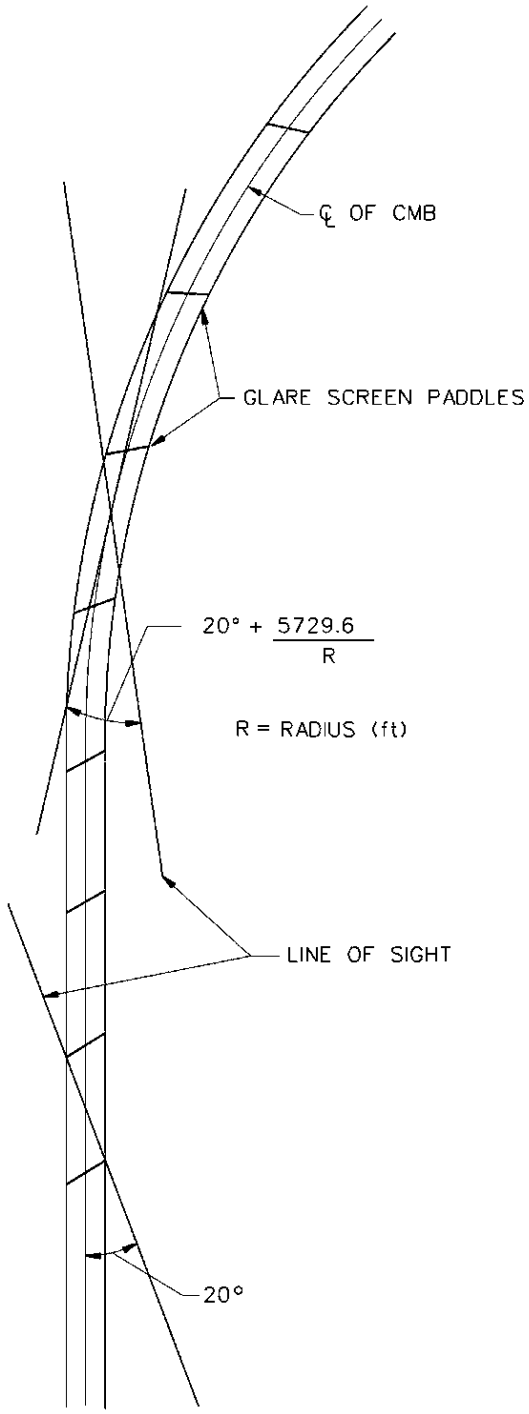
2. Several commercial glare screens are available. Considering both effectiveness and ease of maintenance, the paddle glare barrier may be the best choice. These are a series of plastic paddles that are usually mounted to a PCBC.

Glare screens should be designed for a cutoff angle of 20 degrees. This is the angle between the median centerline and the line of sight between two vehicles traveling in opposite directions. The glare screen should be designed to block the headlights of oncoming vehicles up to the 20 degrees cutoff angle. On horizontal curves, the design cutoff angle should be increased to allow for the effect of the curvature on headlight direction. See Figure 13-9G. The criteria is:

Cutoff Angle = 20° + 5729.6/R

where R = Curve radius, ft.

The Designer should also evaluate the impact of a glare screen on horizontal sight distance on curves to the left. The screen could significantly reduce the available middle ordinate for stopping sight distance. See Section 8-2.0 for a discussion of sight distance at horizontal curves.



CUTOFF ANGLE FOR GLARE SCREENS

Figure 13-9G

13-10.0 END TREATMENTS

13-10.01 Definitions

Designers are encouraged to fully understand the following definitions before specifying impact attenuators:

1. Length of Need (LON). That part of a longitudinal barrier or terminal designed to contain and redirect an errant vehicle.

2. Anchorages. These devices anchor a flexible or semi-rigid barrier to the ground to develop its tensile strength during an impact. Anchorages are not considered crashworthy and should be located outside the clear zone on the leading end of a flexible or semi-rigid barrier.

3. Terminals. These devices are essentially crashworthy anchorages which are used to anchor a flexible or semi-rigid barrier where the end of a barrier is located within the clear zone. Most terminals are designed for vehicular impacts from only one side of the barrier; however, a few terminal designs have been developed for median applications and may be installed where there is a potential for impact from either side.

4. Crash cushions. These devices typically are attached to or placed in front of rigid concrete barriers (i.e., median barriers, roadside barriers, or bridge railings) or other rigid fixed objects, such as bridge piers.

5. Redirective End Treatment. A device designed to contain and redirect a vehicle impacting downstream from the nose of the system.

6. Non-Redirective End Treatment. A device designed to contain and capture a vehicle impacting downstream from the nose of the system.

7. Gating End Treatment. A device designed to allow controlled penetration of the vehicle when impacted between the nose and the beginning of the LON of the device.

8. Non-Gating End Treatment. A device designed to contain and redirect a vehicle when impacted along its entire length.

9. Energy-Absorbing Device. A device designed to dissipate significant amounts of kinetic energy in a head-on crash and to stop impacting vehicles in a relatively short distance (usually 50 feet or less). Where typical guiderail run-out lengths are not available or limited, an energy absorbing system should be chosen.

13-10.02 General

End treatments for longitudinal barrier are needed to provide tensile strength to the system and or to safely redirect or decelerate a vehicle upon impact. End treatments present a potential roadside hazard if not designed appropriately. End treatments used by the Department are categorized as either anchorages or impact attenuators.

Anchorages are used to anchor the ends of flexible or semi-rigid barrier to the ground so that it develops tensile strength during impact. Standard anchorages used by the Department are generally not crashworthy and are typically used in the following applications:

- The trailing end of a roadside barrier on one-way roadways,

- The approach or trailing end of a barrier located outside the clear zone,
- Buried in an earth cut slope,
- Attached to a rock cut,
- Shielded by another barrier system.

If a crashworthy end treatment is not required, an anchorage is generally a lower-cost alternate to an impact attenuator.

When an end treatment is required to be crashworthy, an impact attenuator will be used. Terminals and crash cushions are types of impact attenuators used by the Department.

Terminals are essentially crashworthy anchorages and are typically used at the end of flexible or semi-rigid roadside and median barrier. Tangential, Flared and Median-Gore Impact Attenuation Systems are the approved types of terminals listed on the Department's Qualified Product List (QPL). See the Connecticut Highway Standard Drawings for specific grading requirements in advance of and adjacent to each terminal type. Some terminals are designed to dissipate significant amounts of the kinetic energy in a head-on crash and are considered to be energy-absorbing. In high-speed, head-on impacts on the terminal nose, energy-absorbing terminals have demonstrated their ability to stop impacting vehicles in relatively short distances; typically, 50 ft. or less. Other terminals, including most flared designs, are classified as non-energy-absorbing designs and allow vehicles to travel a long distance beyond the terminal head when struck at high speeds. The decision to use either an energy-absorbing terminal or a non-energy-absorbing terminal should be based on the likelihood of a near head-on impact and the nature of the recovery area immediately behind and beyond the terminal.

Crash cushions significantly reduce the severity of impacts with fixed objects by gradually decelerating a vehicle to a safe stop for head-on impacts and by redirecting a vehicle away from the fixed object for side impacts. Crash cushions are typically used at the end of rigid concrete barrier and may also be used at the end of semi-rigid barrier in cases where a terminal does not provide adequate protection from a fixed object. Crash cushions are designed to absorb the energy of the vehicle by the progressive deformation or crushing of the elements of the system. Non-Gating and Non-Gating-High-Incident impact attenuation systems are approved types of crash cushions on the QPL. Sand barrel arrays are also a type of a crash cushion; however, these systems are typically not used by the Department for new permanent installations. See Chapter 14 for the temporary application of sand barrel arrays.

13-10.03 End Treatment Selection

13-10.03.01 W-Beam Metal Beam Rail (Type R-B 350 & R-B MASH)

For the leading ends of w-beam metal beam rail, the following shall apply:

1. Anchorage Outside Clear Zone: The preferred end treatment is to flare the guiderail to outside the clear zone and use an End Anchorage Type I for design speeds greater than 45 mph or an End Anchorage Type II for design speeds less than or equal to 45 mph. See the Connecticut Highway Standard Drawings for details of the end anchorages.

2. Anchorage within the Clear Zone: When the approach slope is sufficiently steep (1V:2H or steeper), and the required grading can be provided, a buried anchor in earth cut or rock cut slope may be used. Refer to the Connecticut Highway Standard Drawings for the details associated with these anchorages with the R-B 350. When using R-B MASH, a R-B 350 transition is required prior to the installation of an Earth Cut or Rock Cut Slope anchorage.

3. Terminal Within Clear Zone (High speed ≥45 mph): If a crashworthy end treatment is required to terminate a W-beam guiderail within the clear zone, choose the appropriate type of terminal based on the advanced and adjacent grading that can be provided as well as runout length available. Tangential or flared systems are typically used for roadside barrier; however, a median-gore system may be considered if there is a potential for the terminal to be struck from the back side. Refer to the Connecticut Highway Standard Drawings for required grading.

4. Terminal Within Clear Zone (Low speed < 45 mph): If a crashworthy end treatment is required to terminate a W-beam guiderail within the clear zone, Designers should choose an appropriate impact attenuator type as noted in the previous section or consider installing a R-B Terminal Section as detailed in the Connecticut Highway Standard Drawings.

See Figure 13-9D for guiderail treatment at intersecting roads and driveways.

For the trailing ends of metal beam rail guiderail, the following will apply:

1. Undivided Facilities: The above criteria for the approach ends also apply to its trailing end on a two-way facility and on an undivided multi-lane facility.

2. One-Way Roadways: The trailing end may be the End Anchorage Type I for design speeds greater than 45 mph or the End Anchorage Type II for design speeds less than or equal to 45 mph and may be placed within the clear zone.

13-10.03.02 Three-Cable Guiderail

Three-cable guiderail End Anchor Type I is considered NCHRP Report 350 TL-3 crashworthy and may be placed within the clear zone. Refer to the Connecticut Highway Standard Drawings for additional details of this anchorage.

13-10.03.03 Merritt Parkway Guiderail

The anchorage used with Merritt Parkway Guiderail is not considered crashworthy. One of the following methods shall be used to terminate the leading-end:

1. Anchor the rail to a rock face.
2. Bury the anchorage in an earth cut slope or built-up berm that is 1V:2H or steeper.
3. Place the anchorage outside the clear zone and bury the end.

Trailing end of Merritt Parkway Guiderail may use an anchorage buried within the clear zone. See the Connecticut Highway Standard Drawings for additional details.

13-10.03.04 Median Metal Beam Rail (Type MD-B 350 & MD-B MASH)

For the leading ends of median beam rail, the following apply:

1. Anchorage Outside Clear Zone: An MD-B End Anchorage Type I is used when the median metal beam rail can be flared to a point outside the clear zone. Refer to the Connecticut Highway Standard Drawings for details of this end treatment type.
2. Terminal Within Clear Zone: A Median-Gore Impact Attenuation System is typically used when the terminal must be placed within the clear zone. Refer to the Connecticut Highway Standard Drawings for grading requirements associated with this terminal. At locations where historical crash data indicates a high probability of high speed head-on impact, a crash cushion may be considered. Refer to Section 13-5.0 – Roadside Barriers or 13-6.03 – Precast Concrete Barrier Curb (PCBC) for additional details.

When the median rail extends onto an on/off ramp to a “T” type intersection, the end treatment shall be placed so that the sight line is not compromised and that the clear zone requirements for the intersecting road are met.

13-10.03.05 Metal Beam Rail (6X6 or 6X8 Box Beam)

When terminating box beam guiderail, the following will apply:

1. Anchorage Outside Clear Zone: A box beam end assembly is used if the anchorage can be placed outside the clear zone. Refer to the Connecticut Highway Standard Drawings for details.
2. Terminal Within the Clear Zone: A Median-Gore or Tangential Impact Attenuation System is typically used when the terminal must be placed within the clear zone. Refer to the Connecticut Highway Standard Drawings for grading details.

13-10.03.06 Concrete Median or Roadside Barrier

When a concrete median or roadside barrier does not transition to another type of longitudinal barrier, a crash cushion is typically required. A Non-Gating Impact Attenuation System is typically used; however, sites with a crash history, or with limited work area available for repairs, a Non-Gating-High-Incident Impact Attenuation System may be considered.

When determining the appropriate type of crash cushion, the following shall be considered:

1. Width of the hazard to be shielded,
2. Grading requirements in advance of, adjacent to, or runout beyond the system,

3. Required transitions,

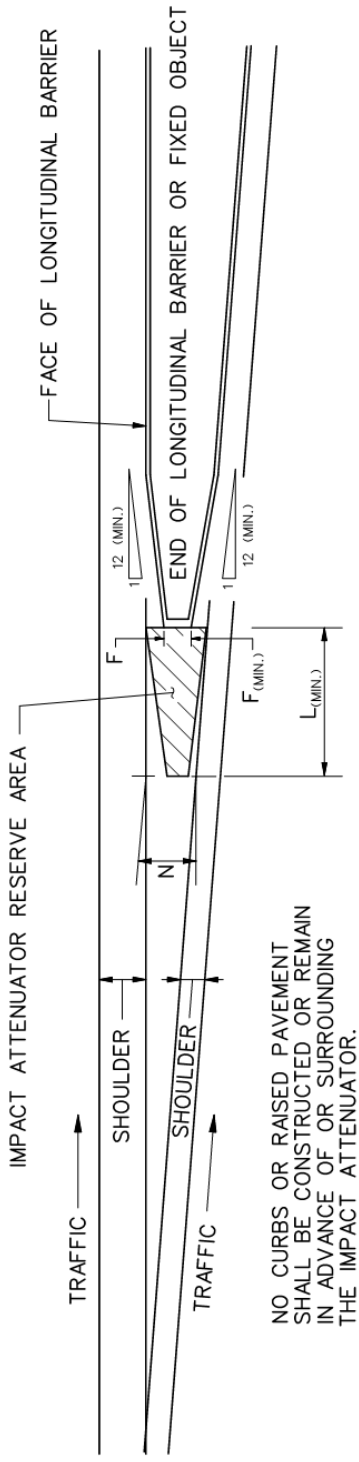
4. Anticipated frequency of impact,

5. Available work area for repairs,

6. Need for low maintenance and/or self-restoring system, i.e. High-Incident Systems.

The Designer should, as early as practical in the project design process, determine the need for and approximate dimensions of an impact attenuator. This will avoid late changes that could significantly affect the project design. Figure 13-10A provides recommended criteria for the impact attenuator reserve area. Installation of crash cushions on bridge superstructures should be avoided due to potential performance problems. To minimize future maintenance problems, crash cushions should be installed on a concrete pad.

The Designer should refer to the Department's Qualified Product List for available approved systems. Depending on site constraints, not all approved systems may be compatible and a proprietary item may be required. On low-speed roadways where there is limited space for the crash cushion, a TL-2 system may be considered.



NOTE(S) THE MINIMUM RESERVE AREA DIMENSION(S) FOR PRELIMINARY DESIGN PURPOSES;
N=6 FOOT WIDTH OF SPACE FOR PLACEMENT OF CRASH CUSHION.
F=2 FOOT CRASH CUSHION WIDTH FOR THE SYSTEM TO SHIELD A FIXED OBJECT.
L= LENGTH OF SPACE REQUIRED FOR PLACEMENT OF CRASH CUSHION.

REFER TO THE DEPARTMENT'S QUALIFIED PRODUCT LIST (QPL) FOR THE APPROVED NON-GATING AND NON-GATING-HIGH INCIDENT IMPACT ATTENUATION SYSTEM'S DIMENSIONS.

Design Speed (V) (mph)	Impact Attenuator Speed (mph)	
	Freeways	Non-Freeways
≥ 45	60	60
< 45	--	45

RESERVE AREA FOR IMPACT ATTENUATOR IN GORES

Figure 13-10A

13-11.0 REFERENCES

1. Roadside Design Guide, AASHTO, 2011.

2. Guide for Selecting, Locating, and Designing Traffic Barriers, AASHTO, 1977.

3. A Supplement to A Guide for Selecting, Locating, and Designing Traffic Barriers, Texas Transportation Institute, March, 1980.

4. Safety Design and Operational Practices for Streets and Highways, FHWA, May, 1980.

5. FHWA-IP-83-4 A Procedure for Determining Frequencies to Inspect and Repair Highway Safety Hardware, December, 1983.

6. Research Report 67-1 New Highway Barriers, The Practical Application of Theoretical Design, New York Department of Public Works, May, 1967.

7. NYSDOT-ERD-76-RR38 Testing of Highway Barriers and Other Safety Appurtenances, New York State Department of Transportation, December, 1976.

8. Transportation Research Record 970, “Development of Proposed Height Standards and Tolerances for Light-Post Traffic Barriers,” James E. Bryden, 1984.

9. “A Roadside Design Procedure,” James Hatton, Federal Highway Administration, January, 1974.

10. FHWA/NY/RR-80/83 Crash Tests of Sharply Curved Light-Post Guide Rail, New York State Department of Transportation, July, 1980.

11. NCHRP Report 150 Effect of Curb Geometry and Location on Vehicle Behavior, Transportation Research Board, 1974.

12. NCHRP Report 158 Selection of Safe Roadside Cross Sections, Transportation Research Board, 1975.

13. NCHRP Synthesis 66 Glare Screen Guidelines, Transportation Research Board, December 1979.

14. NCHRP Report 350 Recommended Procedures for the Safety Performance of Highway Features, Transportation Research Board, 1993.

15. Impact Attenuators – Selection and Design Criteria, FHWA, 1975.

16. “Impact Attenuators, Safety Systems,” Technical Notebook, Energy Absorption Systems, Inc.

17. American Association of State Highway and Transportation Officials Manual for Assessing Safety Hardware (MASH), 2016

18. Midwest Roadside Safety Facility Research Report No. 03-320-16 & 03-185-10

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Subject: Maintenance Directive No. 23-02 Vegetation Management Safety Improvements - Standard Operating Procedure

Date: March 17, 2023

To: Mr. Richard Reagan, Trans. Maintenance Administrator
Mr. James Chupas, Central Maintenance Director
Mr. Barry Julian, District Maintenance Director
Mr. Eoin McClure, District Maintenance Director
Mr. Stephen Moran, District Maintenance Director
Mr. Douglas Harris, District Maintenance Director

From: Paul T. Rizzo
Bureau Chief
Bureau of Highway Operations

This Maintenance Directive No. 23-02 Vegetation Management Safety Improvements – Standard Operating Procedure **replaces** Maintenance Directive No. 20-02 (Rev.) Tree Cutting (Large Scale Operations), reissued July 26, 2022. Maintenance Directive No. 20-02 is now obsolete. Please eliminate all copies of the former directive and replace with this Maintenance Directive No. 23-02.

The following procedures shall be followed for the preparation, review, and accomplishment of vegetation management safety improvement (VMSI) operations along CT DOT highways. This Directive supersedes any related information found in the Vegetation Management Guidelines. The definition of VMSI takes into account both the length of highway to be cut (termini) as well as the quantity of trees 4" diameter and greater to be cut within that length (termini). Tree cutting operations on multilane highways are generally considered VMSI when they include complete removal of trees within the 30' clear zone for a total distance of 1/4 mile or more. On secondary highways, where the clear zone is variable due to lane widths and right-of-way constraints, tree cutting operations are considered VMSI when they include removals in excess of 50 trees on one side of the travel way within a total distance of 1/4 mile or less, or 100 trees on both sides of the travel way within a total distance of 1/4 mile or less. Prior to the commencement of tree work, notifications will be made to the abutting property owners as is practicable. When notifying an abutting property owner, a notification card or business card may be left in the doorway or other conspicuous location (not in a mailbox). This is to advise the abutter of the work to be done and offer contact information in case of questions or concerns related to the work.

- The General Supervisors (GS) and District Maintenance Manager's (DMM) will select locations to perform VMSI operations.
- The locations will be clearly defined and placed on a priority list **(*see attached form)**.
- The priority list will be shared with the District Landscape Designer (DLD) for review and comments. Areas where cutting is required beyond the 30' clear zone, as measured from the shoulder line, will be noted on the form*.
- The DLD will submit comments to the GS and DMM. They will review the comments and update the priority list (form*) if needed.
- The updated priority list (form*) will be reviewed by the District Maintenance Director (DMD), or his designee.
- Upon the DMD or his designee's approval, the DLD will submit a VMSI Review form (*see attached form) to the Central Maintenance Landscape Designer 3 (LD3/Adam Boone) and Maintenance Environmental Planner (EP/Christopher Samorajczyk) for review.

- In advance of commencing each VMSI operation, the DLD will send notification to the Public Works Director, or designee, and Tree Warden of the City(s) or Town(s) in which VMSI operations will take place to advise them of the scheduled work. A press release will also be issued at least (10) days in advance of work commencement.
- The LD3 and EP comments will be sent back to the DMD or his designee to address prior to the start of work; with a cc to Bureau Chief Paul Rizzo and Maintenance Administrator Richard Reagan.
- The provided comments and directives from the reviews will be adhered to during all phases of the operation.
- Trees and understory vegetation which are deemed to not pose a concern to the highway system at the time of review, will be left intact near watercourse areas to prevent erosion and maintain habitat and water quality.
- Woodchips will be dispersed evenly along roadsides, leaving no piles, and maintaining distance from watercourse areas, private properties, and commercial developments. Where necessary, and as advised, chips will be hauled off site. No woodchips will be placed on rock cut areas or in drainage ways, wetlands, and watercourse systems.
- The GS will keep documents current throughout the operation as well as take photos before, during, and at completion of the operation. The photos will be kept as documentation with the operation file/folder.
- The GS will advise the DMM, DLD, LD3 and EP upon completion of the operation.
- Where applicable, the EP will provide special conditions for work being performed in or adjacent to environmentally sensitive areas. These areas shall include, but are not limited to, watersheds, aquifer protection areas (APA's), reservoirs, and listed species habitat (NDDB).

GS – General Supervisor
DMD – District Maintenance Director
DMM – District Maintenance Manager
DLD – District Landscape Designer
LD3 – Central Maintenance Landscape Designer 3
EP – Central Maintenance Environmental Planner

If you have any questions concerning this directive, please contact Andrew Morrill at (860) 594-2614.

Attachment (Form*)-Revised

Andrew Morrill:bm
cc: Paul T. Rizzo - Richard Reagan - James M. Chupas - Andrew S. Morrill - Adam Boone
- Christopher Samorajczyk - George Santos - Rick DiNardi
Eric Belanger – John Haggerty
Daniel DiReinzo - Nicholas Supina
Carlos Wimberly - Gregory Gallup
Allan Dodge – Donald DeZenzo
Aron Steeves - Steve Geddes

APPENDIX E

State of Connecticut
Disaster Debris Management Plan
(ESF 3 - State Response Framework (SRF))

Prepared by:

State of Connecticut

Department of Energy and Environmental Protection

Katie Dykes, Commissioner

2019

Disclaimer:

This Disaster Debris Management Plan is intended as a guidance document. It does not constitute a complete reference to state, federal or local laws. In the event of inconsistency between this document and the regulatory language, the language in Connecticut's General Statutes and the solid waste management regulations. It is your responsibility to comply with all applicable laws. Relying on the information in this disaster debris management plan will not protect you legally and may not be relied upon to create a right or benefit substantive or procedural, enforceable at law or in equity by any person. Final determination of the proper handling and disposal of waste is the sole responsibility of the generator.

ADA and Title VI Publication Statement:

The Connecticut Department of Energy and Environmental Protection is an Affirmative Action/Equal Opportunity Employer that is committed to complying with the requirements of the Americans with Disabilities Act. Please contact us at (860) 418-5910 or deep.accommodations@ct.gov if you: have a disability and need a communication aid or service; have limited proficiency in English and may need information in another language; or if you wish to file an ADA or Title VI discrimination complaint.

State of Connecticut
Disaster Debris Management Plan
ESF 3- State Response Framework

TABLE OF CONTENTS

This page intentionally left blank.

State of Connecticut
Disaster Debris Management Plan
ESF 3 - State Response Framework

EXECUTIVE SUMMARY

Introduction

The State of Connecticut Department of Energy and Environmental Protection (DEEP) has revised the *State of Connecticut's Disaster Debris Management Plan,* (the Plan) pursuant to the authorities of the Commissioner. The Plan is included as Emergency Support Function (ESF) 3 of the State Response Framework (SRF). DEEP coordinates with the State of Connecticut's Department of Emergency Services and Public Protection's Division of Emergency Management and Homeland Security (DESPP/ DEMHS) and other State and Federal agencies, the United States Environmental Protection Agency (USEPA), United States Army Corps of Engineers (USACE), the Federal Emergency Management Agency (FEMA), and Connecticut's municipalities to prepare the State in protecting the health and welfare of Connecticut's citizens in the event of a major natural disaster. The State's *Disaster Debris Management Plan* establishes the framework for State agencies and municipalities to facilitate the proper management of debris generated by a natural disaster; i.e., hurricane, tornado, flood, ice storm. Implementation of the *State's Disaster Debris Management Plan* will be coordinated through the State's Emergency Operations Center and DESPP/DEMHS, utilizing the Multi-Agency Coordination (MAC) System under the *SRF.*

DESPP/DEMHS considers a Category 3 hurricane as the most probable, worst-case disaster scenario facing the State. The 1938 hurricane and the flooding of 1955 that resulted from heavy rainfall associated with the remnants of two hurricanes are recorded as the worst natural disasters to strike Connecticut. Though not as strong as the 1938 hurricane, hurricanes Gloria (1985) and Bob (1991) are two of the more potent hurricanes impacting the State during the past twenty-five-year period. In 2011, the State was greatly impacted by the January Snowstorm, Tropical Storm Irene and the October Snowstorm, an unusually early nor'easter. The latter two storms damaged a large number of trees, and as a result, approximately 800,000 homes were left without power, some for longer than a week. In 2012, the State was impacted by Hurricane Sandy, which caused severe coastal flooding, tree damage and massive power outages. Most recently, in February 2013, a massive blizzard hit the Northeast bringing more than 3 feet of snow to some areas, which left thousands of people without power and/or a means to travel.

Using the USACE debris modeling formula, DEEP has estimated that approximately 43 million cubic yards (CY) of debris would be generated by a Category 3 hurricane. The types of debris resulting from such natural disasters include: green waste/vegetative debris; putrescent municipal solid waste; household hazardous waste; hazardous waste; construction and demolition debris (C&D) from structures; aggregate (fill materials); scrap metal; white goods; electronic waste; contaminated soil, silt, and sediment; animal mortalities; vehicles and boats; waste tires; and utility related debris.

Objectives of the State's Disaster Debris Management Plan

The objectives of the Plan are to:

- Serve as a resource for the State under ESF 3 of the SRF, and assist other State agencies and municipalities in their disaster debris management planning efforts.

- Facilitate the implementation of emergency waste management practices so as to ensure that any measures that are undertaken are consistent with protecting Connecticut's natural resources to the greatest extent possible, as well as being consistent with the *State of Connecticut's Solid Waste Management Plan, amended December 2006.*

Connecticut's Approach to Debris Management

Connecticut's *Disaster Debris Management Plan* functions within the framework of the *State's Solid Waste Management Plan*, in that the approach used in managing disaster debris is as follows:

- Divert as much material from disposal as possible through recycling, composting and other legitimate diversion options;
- Utilize volume reduction techniques to improve debris management efficiencies and minimize impacts on landfill capacities;
- Use Connecticut's in-state disposal capacity for disposal of disaster debris as efficiently as possible, recognizing that most C&D waste is transferred out-of-state for disposal. Also, allow for temporary tonnage increases at permitted in-state solid waste facilities on an emergency basis;
- Rely on permitted Transfer Stations to transfer waste that cannot be diverted from disposal (recycling, composting, other) to waste handling facilities out-of-state for disposal;
- Rely on permitted Volume Reduction Facilities to reduce and transfer waste that cannot be diverted from disposal to waste handling facilities out-of-state for disposal;
- Consider alternative technologies for managing portions of the debris waste stream, in-state or out-of-state (i.e., biomass facilities); and
- Use approved temporary Debris Management Sites (DMS) for processing debris for recycling and/or final disposal.

Roles and Responsibilities

Federal: There are a number of federal agencies invested with varying authorities for debris management activities. These agencies include the US Department of Homeland Security, FEMA, USACE, USEPA, United States Coast Guard (USCG), Federal Highway Administration (FHWA), and Departments of Agriculture, Commerce, and Transportation. The Robert T. Stafford Emergency Relief and Disaster Assistance Act (PL 93-288, as amended, and referred to as *the Stafford Act*) is the federal legislation that created a national program for disaster preparedness, response, recovery, and mitigation. This Act constitutes the statutory authority for most federal disaster response activities, especially as they pertain to FEMA and FEMA programs.

FEMA is the lead federal agency that responds to disasters and emergencies to help save lives and protect the public health, safety, and property. FEMA operates under specific regulations, which are found in

Title 44 of Code of Federal Regulations (CFR). The Stafford Act and the CFR use the term "debris removal" in a broad sense to encompass the entire process of removing, handling, recycling, and disposing of debris. This regulation declares debris removal to be in the public interest, not only to protect life, public health, and safety, but also to ensure economic recovery of the affected community.

FEMA's most visible role in disaster recovery and debris management is in the administration of the Public Assistance (PA) Grant Program. The Program provides supplemental federal disaster grant assistance to eligible applicants which include states, local governments, and certain non-profit organizations for debris removal and disposal. The Program is administered through a coordinated effort among FEMA, the affected state, and the applicants. Communication and coordination among all of these agencies is important. After an emergency event, the State assumes the role of "grantee" and is responsible for administering the federal grant. Eligible applicants may receive PA funds for debris clearance, removal, and disposal operations.

State: There are a number of primary and supporting State Agencies that are responsible for some aspect of disaster debris management. The primary State Agencies make up the Interagency Debris Management Task Force (IDMTF) which participates in all preparedness activities and serves as operational representatives when debris management and monitoring activities are undertaken and assigns work for the State debris management and monitoring contractors by developing task orders.

The primary agencies that have lead responsibilities with regard to disaster debris management are presented below:

- **Emergency Services and Public Protection's Division of Emergency Management and Homeland Security, Department of (DESPP/DEMHS):** Assigning staff to serve on the IDMTF. Administering the state contracts for debris management and removal services. Requesting teams and equipment from the State debris contractors. DESPP/DEMHS, Department of Transportation, Department of Motor Vehicles, and Connecticut State Police will coordinate on waiver and permitting issues for contracting equipment. Coordinating the establishment and maintenance of communications with affected and/or threatened areas. Coordinating the delivery of assistance to local governments and state agencies as requested and available. Receiving and evaluating situation reports from local governments, state agencies, utility companies, and private non-profit relief organizations. Determining the need for, requesting and coordinating a Preliminary Damage Assessment (PDA) of the disaster-affected areas in conjunction with FEMA. Drafting, for the Governor's signature, formal requests for Presidential disaster and emergency declarations under the Stafford Act and U.S. Small Business Administration disaster declarations. Coordinating the Federal/State Agreement and meeting subsequent to a Presidential declaration. Expediting establishment of special accounts for disaster assistance funds and taking other actions necessary to expedite the availability of disaster assistance funds to local governments and individual disaster victims.

- **Energy and Environmental Protection, Department of (DEEP):** Assigning staff to serve on the IDMTF. Administering the state contract for Disaster Debris Monitoring Services. Requesting teams and equipment from the State debris contractors. Providing technical assistance to state agencies and local authorities regarding the management of disaster debris including the provision of a municipal guidance document for the management of disaster debris and providing public information announcements. Identifying properties suitable for DMS. Approving and issuing emergency authorizations for DMS and monitoring the DMS. Per State contract,

confirming that final destination sites are acceptable for the reuse, recycling or disposal of disaster debris. Providing emergency response to hazardous materials spills. Providing technical assistance on timber salvage, emergency debris management, and open burning. Assessing the State's critical infrastructure (related to DEEP's oversight), including but not limited to, public and private utilities (nuclear, gas, electric, telecommunications), dams, water supply plants, waste water treatment plants and pumping stations, resource recovery facilities and marine terminals). Assessing safety conditions and continuity of operations at DEEP's facilities. Providing qualified personnel as requested by DESPP/DEMHS to serve on joint Federal/State Preliminary Damage Assessment Teams to assess municipal property damage and damage to DEEP lands and facilities.

- **Transportation, Department of (ConnDOT):** Assigning staff to serve on the IDMTF. Notifying the State EOC of disruptions or impending disruptions to the transportation system (e.g., road closures, bridge outages, damage to railways, etc.) and rectification of such disruptions. Assessing the impact of a disaster or emergency upon state transportation facilities, and providing DESPP/DEMHS and/or the State EOC with such written reports as it may require. Requesting teams and equipment from the State debris contractors. Coordinating with public utilities for road clearance activities. Clearing debris from state-maintained roads and bridges. Providing support for search and rescue operations. Providing support to the U.S. Coast Guard Sector of Long Island Sound and DEEP in relation to the closing and subsequent reopening of ports and waterways during or after the occurrence of major natural disasters. Providing public information, via the State EOC and in coordination with the Governor's Office, relative to road conditions and closures, flight service, train schedules, and ferry operations. Releasing sandbags, other material, and equipment as appropriate from ConnDOT garages as requested by DESPP/DEMHS and/or the State EOC. Providing assistance to municipalities for the purposes of debris clearance, inspection, repair and/or condemnation of transportation facilities, once departmental priorities have been met. Providing damage assessors as requested by DESPP/DEMHS to serve on joint federal/state Preliminary Damage Assessment Teams to assess municipal property damages in selected towns. Coordinate with the U.S. Department of Transportation to initiate the State's request for Federal-Aid Highway Emergency Relief program assistance as required. ConnDOT will coordinate on permit procedures for oversized/overweight vehicles (contracting equipment).

Local governments: Each municipality, as a first responder in a disaster situation, is required to make provisions for the safe and sanitary disposal of all solid wastes generated within its boundaries (Connecticut General Statutes (CGS) Section 22a-220) and to make provisions for the separation, collection, processing, and marketing of designated recyclables generated within its boundaries (CGS Section 22a-220(f)). Key elements include: planning, mobilizing, organizing, and controlling a large-scale debris clearance, removal and disposal/recycling operation. Each municipality should prepare a Disaster Debris Management Plan, as an annex to their existing Local Emergency Operations Plan (LEOP) that includes identification of potentially suitable DMS, availability of labor and heavy equipment, and a command structure for debris removal operations. It may also include pre-positioned contracts for both debris removal and monitoring of debris removal operations.

Pre-event Preparation, Planning and Operations

All activities associated with massive debris clearance, removal, and disposal activities depend upon pre-event preparation and planning, and efficient operations. Important components include: separate contracts in-place for debris removal and the monitoring of debris removal contractors' day-to-day operations; the identification of DMS; and debris management operations. Summaries on contracts and phases of clean up are provided below:

Contracts:

State contracts: The State has established pre-need and pre-event contracts through the State Procurement Services/Contract Award process to assist the State in Disaster Debris Management Preparedness. A State contract is in place with both primary and secondary contractors identified for *debris removal operations.* A State contract is in place with only one contractor identified for *debris monitoring*. The Governor may choose to activate the contracts as a result of a Governor-declared Civil Preparedness Emergency. These contracts assure the immediate availability of coordinated debris removal support following a debris-producing incident.

Municipal contracts: City and town governments are responsible for all peoples and property within their boundaries and jurisdictions to the limits of their resources. Each municipality is required to make provisions for the safe and sanitary disposal of all solid wastes generated within its boundaries (CGS Section 22a-220) and to make provisions for the separation, collection, processing, and marketing of designated recyclables generated within its boundaries (CGS Section 22a-220(f)). The State strongly recommends that local governments prepare their own Disaster Debris Management Plan, as an annex to the LEOP, following FEMA and USEPA guidance so as to be better prepared to manage disaster debris within their jurisdictions. FEMA also recommends having pre-positioned contracts for both debris removal as well as monitoring. These contracts must exhibit full and open competition where an adequate and realistic specification or purchase description is publicly solicited and multiple responsible bidders are allowed to compete effectively for the business. Municipalities may also opt to utilize the State Contracts for debris removal and mangement and monitoirng. It is recommended that municipalities consult the FEMA Recovery Fact Sheet 9580.212 Public Assistance Grant Contracting FAQ for contract guidance.

Debris Management Sites (DMS):

It is important to have DMS pre-identified and ready for use in the event of a disaster event. Debris management guidance from the USACE and FEMA **strongly recommends that both State and local governments be responsible for pre-identifying DMS.** It can be expected that Connecticut's solid waste management infrastructure will be quickly overwhelmed during a catastrophic natural disaster, such as a Category 3 hurricane. Therefore, DMS serve as the additional space needed to accommodate the debris generated. In addition, these sites provide a place to segregate and process the waste subject to the State's solid waste management hierarchy that mandates recycling as the preferred approach to managing the waste stream. Upon request, DEEP will issue an Emergency Authorization for site activities related to the management of debris. It is required that municipalities notify DEEP of the site location, and DEEP in turn will act upon their request for an Emergency Authorization.

- **State:** Critical to the State's debris management operations, is the establishment of DMS to be used for debris originating from state highways and roads as well as other state properties. DMS are those sites that have been pre-identified by the State with the assistance of their debris management contractors, and which have been evaluated and approved by DEEP for the purposes of collection, volume reduction, and transfer to final permitted disposal and recycling facilities. The State recognizes that the capacity of the pre-identified DMS cannot accommodate the amount of debris generated by a Category 3 hurricane. Therefore, the pre-identified State sites are reserved for State debris management activities.

DEEP is responsible for the permitting of these sites (by issuance of an Emergency Authorization), as well as ensuring that they are properly closed out. The goal will be to maximize potential processing and recycling options consistent with the State Solid Waste Management Plan.

The State's debris management contractor is responsible for the set-up, operations, and closeout of the DMS sites, consistent with the requirements of the contract documents and relevant state and federal laws. For any future disaster, sites will be chosen based on past storm experiences so that previously used sites may be used again or new sites may be chosen depending on impact areas, amount of debris, and availability of public and private sites, within minimal transportation distance of the damaged areas. Based on the projections of the amount of debris that could be generated and area impacted, sites will be selected by the State's contractors, in consultation with the IDMTF. Other agencies that may be involved in site selection include OPM, DAS/Bureau of Properties & Facilities Management, and Connecticut Economic Resource Center, Inc. (CERC).

- **Municipalities:** Municipalities must identify their own DMS locations either on municipally-owned land or through an agreement on non-municipally owned land. DEEP is responsible for the permitting of these sites by issuance of an Emergency Authorization.

State of Connecticut's Concept of Operations Plan (ConOps) for Disaster Debris Management, Activation and Use of the State Debris Removal and Monitoring Contracts:
This Plan details the steps that will be taken by the State, its contractors, and other parties so as to facilitate the removal, management, collection and disposal of all debris generated from a catastrophic natural disaster, such as a Category 3 hurricane. This ConOps is tied to the activation and use of the State contracts for disaster debris removal and monitoring.

The debris management strategy for the State is divided into four major operational time periods: pre-landfall phase; phase 1; phase 2; and post-recovery. Phase 1 and Phase 2 are major focus areas. Phase 1 is the initial response, typically occurring during the first 24 to 70 hours following an event, and consists primarily of "pushing" the debris that hinders immediate life saving actions and that poses an immediate threat to public health and safety out-of-the right of way along major roadways. Phase 2, which can last up to a year or longer, consists of removing, segregating, and disposing of the debris that hinders the orderly recovery of the community and poses less immediate threats to health and safety. The State contracts may be initiated as early as Phase 1 if it is determined that the storm event may overwhelm State and local emergency response resources.

Federal - Financial, Direct and Technical Assistance

When the response and recovery efforts are beyond the capacity of both the municipalities and the State, the Governor may request federal assistance, in the form of a Presidential Disaster Declaration. FEMA evaluates the request and recommends to the President the type of federal assistance that is warranted. Assistance is usually provided in the form of financial reimbursement of a portion of the disaster related costs (for example, a 75 percent Federal/ 25 percent State cost share). FEMA can also provide direct and technical assistance. It is prudent to be familiar with FEMA eligibility and reasonable costs guidelines during the planning stage in order to appropriately plan for critical issues such as contracting, monitoring and preparing appropriate documentation to support requests for funding. FEMA and the Public

Assistance Program are governed by the Stafford Act (Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended, 42 U.S.C. 5121 et seq.) and regulations. These laws and regulations provide the criteria for determining eligibility of debris activities for reimbursements. This includes: Stafford Act, Sections 403, 407, 502; 44 CFR, Sections 206.224, 206.225; and FEMA Policies.

Summary

By preparing the *State's Disaster Debris Management Plan as ESF 3 of the SRF,* establishing State's Interagency Debris Management Task Force, establishing State contracts for debris removal operations and monitoring of the debris, and the development of the ConOps Plan, Connecticut has positioned itself to be responsive to meet the emergency needs of the State. At the same time, the Plan and the contracts will expedite enhanced federal assistance to the State in the event of a disaster.

This page intentionally left blank.

CHAPTER 1
INTRODUCTION

1.1 Purpose of the Disaster Debris Management Plan (the Plan)

The State of Connecticut's Department of Energy and Environmental Protection (DEEP) has revised the *Disaster Debris Management Plan* dated August 29, 2019. This revised Plan has been prepared pursuant to the authorities of the Commissioner and as an annex to ESF 3 of the SRF . This *Disaster Debris Management Plan* establishes a framework for State agencies and municipalities to facilitate the proper management of debris generated by a natural disaster. The goal is to facilitate prompt and efficient recovery through emergency waste management practices that are both reasonable and cost-effective and, at the same time, are protective of human health and the environment. Implementation of the *Disaster Debris Management Plan* will be coordinated through the State's Emergency Operations Center (EOC) and the State of Connecticut's Concept of Operations Plan for Disaster Debris Management (ConOps).

Types of Natural Disasters: This Plan addresses natural disasters such as: hurricanes, tornadoes, floods, forest fires, earthquakes, ice storms, catastrophic animal mortalities, and catastrophic vegetative waste. Natural disasters precipitate a variety of debris that includes, but is not limited to, trees, stumps, construction and demolition materials, vehicles and other personal property, putrescent food waste, and soil, silt and sediment. Department of Emergency Services and Public Protection's Division of Emergency Management and Homeland Security (DESPP/DEMHS) considers a Category 3 hurricane as the most probable worst-case disaster scenario facing the State. Depending on the type and magnitude of the disaster, the debris field can extend for miles over a large area and be extremely difficult to manage because of the variety and intermingling of the various debris types. While the Plan is written to address natural disaster events, it may also serve as guidance to managing debris resulting from man-made disasters. However, such management may be superseded by other jurisdictions due to the presumption of criminal activity.

Objectives: The objectives of the State's *Disaster Debris Management Plan* are to:

- Serve as a resource for the State and as an annex to ESF 3 of the SRF as well as to assist other State agencies and municipalities in their disaster debris management planning efforts.
- Facilitate the implementation of emergency waste management practices so as to ensure that any measures that are undertaken are consistent with protecting Connecticut's natural resources to the greatest extent possible, as well as being consistent with the *State of Connecticut's Solid Waste Management Plan, amended December 2006*. For the purposes of the *State's Disaster Debris Management Plan*, emergency waste management practices can be defined as occurring before, during and/or after a disaster event to alleviate as expeditiously as possible serious conditions which present continued threats to the health or welfare of Connecticut residents.

***Outline of State's Disaster Debris Management Plan*:** The Plan is based on guidance provided by the Federal Emergency Management Agency (FEMA) (www.fema.gov), United States Environmental Protection Agency (USEPA) (www.epa.gov), United States Army Corps of Engineers (USACE) (www.usace.army.mil/), lessons learned from the destructive hurricanes in the gulf coast states in 2004 and 2005, and the State's storm events in 2011 experiences with the January Snowstorm, Tropical Storm Irene and the October Snowstorm, and in 2012 with Hurricane Sandy. The Plan outlines DEEP's

processes to consider, approve or disapprove requests for authorizations, variances, and waivers as needed for rapid and environmentally sound waste management, specifically with regard to managing the natural-disaster debris waste stream. In addition, this Plan outlines debris monitoring roles and responsibilities, and presents an overview of eligible federal reimbursable costs resulting from debris clean up and monitoring. State government agencies and municipalities will be the primary users of this Plan. Municipalities in particular, can make use of the information for planning pre-positioned contracts with waste haulers, as well as identifying disaster Debris Management Sites (DMS) that may be called into use during disaster recovery operations. Much of the information will also be useful to the waste management industry as they develop their own in-house plans for participating in a potential disaster recovery scenario.

Two Phases of Clean Up (large scale debris clearance; removal and disposal management): There are two phases to debris clearance, removal and disposal activities:

- Phase 1 typically occurs during and immediately after the event and is commonly referred to as the first 70 hours. Phase 1 consists of clearing the debris that hinders immediate life saving actions and that poses an immediate threat to public health and safety.
- Phase 2 will be implemented within seven days of the event and consists of removing and disposing of the debris that hinders the orderly recovery of the community and poses less immediate threats to health and safety, activating pre-positioned contracts and notifying citizens of debris removal procedures. For Connecticut's planning purposes, Phase 2 covers debris removal and recovery, and includes moving through the recovery timeline to include post recovery activities such as public assistance, close-out of the DMS, and quality assurance. This Plan outlines the interaction of State government with federal and local governments under these two phases of operations. State and local governments have principal responsibility for coordinating and managing debris removal operations. If State and/or local governments lack the capability to initiate coordinate and manage debris removal operations following a major natural disaster, then the State can request federal assistance.

Pre-event Preparation and Planning - Contracts: State and local governments must plan for and expect to manage debris removal operations following a major natural disaster. Federal assistance is designed only to address situations where the level of debris is catastrophic in scale, or where the capabilities of the State and/or local government to effectively manage such operations are overwhelmed. State and local governments are expected to establish pre-event contracts and/or arrangements with local or regional debris removal contractors, to assure the immediate availability of coordinated debris removal support following a debris-producing event. Emergency recovery operations will be carried out principally by local forces (that may be supported by intrastate mutual aid); then State forces (that may be supported by interstate mutual aid); and, then if needed and requested through FEMA, federal forces.

When a natural disaster event occurs that produces large amounts of debris, effective coordination is required between the Public Assistance (PA) applicant (in this case the State) and FEMA to ensure that debris removal operations are efficient, effective, and eligible for FEMA PA grant funding. PA applicants, whether the State or a municipality, must monitor debris removal operations and document eligible quantities and reasonable expenses to ensure that the work is eligible for PA grant funding. Failure to do so properly may jeopardize this funding.

The types of pre-event contracts that should be in place by the State and municipalities include: (1) debris removal operations, and (2) monitoring of debris cleanup activities as undertaken by the State Contractors retained under the debris removal operations contract.

State Contracts: The State of Connecticut has in place both debris removal and monitoring contracts. These contracts are available for use by State agencies and municipalities. These contracts were prepared pursuant to Connecticut General Statutes (CGS) Title 4a, Chapter 58 - Purchases and Printing. These State contracts are:

Removal: Disaster Debris Management Services for the State of Connecticut. Contract No. 14PSX0060AA. State Contractors – AshBritt, Inc.; Contract Period – July 8, 2014, through June 30, 2021.

Monitoring: Disaster Debris Monitoring Services for the State of Connecticut; Contract No. 14PSX0059AA. Contractor – Tetra Tech, Inc. Contract Period – June 13,, 2014 through May 31, 2021.

These contracts can be accessed through the CTDAS State Contracting Portal at:
https://biznet.ct.gov/SCP_Search/ContractResults.aspx or through DEEP's website at:
http://www.ct.gov/dep/cwp/view.asp?a=2718&Q=410492&depNav_GID=1646

Municipal Contracts: City and town governments are responsible for all peoples and property within their boundaries and jurisdictions to the limits of their resources. Each municipality is required to make provisions for the safe and sanitary disposal of all solid wastes generated within its boundaries (CGS Section 22a-220) and to make provisions for the separation, collection, processing, and marketing of designated recyclables generated within its boundaries (CGS Section 22a-220(f)). The State strongly recommends that local governments prepare their own Disaster Debris Management Plan following FEMA and USEPA guidance so as to be better prepared to manage disaster debris within their jurisdictions. FEMA also recommends having pre-positioned contracts for both debris removal as well as monitoring. These contracts must exhibit full and open competition where an adequate and realistic specification or purchase description is publicly solicited and multiple responsible bidders are allowed to compete effectively for the business. It is recommended that municipalities consult the FEMA Recovery Fact Sheet 9580.212 Public Assistance Grant Contracting FAQ for contract guidance.

State of Connecticut's Concept of Operations Plan for Disaster Debris Management, Activation and Use of the State Debris Removal and Monitoring Contracts: This Plan details the steps that will be taken by the State, its contractors, and other parties so as to facilitate the removal, management, collection and disposal of all debris generated from a catastrophic natural disaster. This ConOps is tied to the activation and use of the State contracts for disaster debris removal and monitoring.

1.2 Authorities

1.2.1 Federal Authorities

There are a number of federal agencies invested with varying authorities for debris management activities. These agencies include the United States Department of Homeland Security, FEMA, USACE, the Federal Highway Administration (FHWA), USEPA, United States Coast Guard (USCG), and Department of Agriculture which includes the Natural Resource Conservation Service (NRCS), Department of Commerce, and Department of Transportation. The Robert T. Stafford Emergency Relief and Disaster Assistance Act (PL 93-288, as amended, is commonly referred to as the *Stafford Act*) is the federal legislation that creates a national program for disaster preparedness, response, recovery, and mitigation. This Act constitutes the statutory authority for most federal disaster response and its programs.

Financial, direct and technical assistance: When the response and recovery effort appears to be beyond the capacity of both the State and municipalities, the Governor may request federal assistance, in the form

of a Presidential Disaster Declaration. FEMA evaluates the request and recommends to the President the type of federal assistance that is warranted. Public Assistance (PA) is usually provided in the form of financial reimbursement of a portion of the disaster related costs (usually a 75 percent Federal/ 25 percent State cost share). FEMA can also provide direct and technical assistance. It is prudent to be familiar with FEMA eligibility and reasonable costs guidelines during the planning stage in order to appropriately plan for critical issues such as contracting, monitoring and preparing appropriate documentation to support requests for funding. FEMA and the PA Program are governed by the law defined in the Stafford Act and regulations provided in Title 44 of Code of Federal Regulations (44 CFR). These laws and regulations provide the criteria for determining eligibility of debris activities. This includes: Stafford Act, Sections 403, 407, 502; Title 44 CFR, Sections 206.224, 206.225; and FEMA Policies.

Compliance with the National Incident Management Systems (NIMS)*:* NIMS provides a consistent nationwide approach for federal, state, local government, private sector and non-governmental organizations to work together to prepare for, respond to, and recover from domestic incidents, regardless of cause, size, or complexity. Connecticut's *Disaster Debris Management Plan* is NIMS compliant because it takes into account three key organizational systems: the Incident Command System (the State is run using ICMs), the multi-agency coordination system, and the public informational system. The Plan will be implemented to comply with the NIMS approach in cooperation with other State and federal agencies, as well as the municipalities.

1.2.2. State Authorities

CGS Title 28, Chapter 517 provides the authority for the State and its political subdivisions to prepare for and respond to natural disasters and other emergencies. Connecticut's emergency management program, developed under the authority of CGS Title 28, complies with the federal program established by the Federal Stafford Act. In addition, CGS Title 28, Chapter 518 Section 28-23a entitled *Emergency Management Assistance Compact* provides for mutual assistance between the states entering into this compact in managing any emergency or disaster that is duly declared by the Governor of the affected State.

With regard to debris management, the following legal citations from CGS Title 28 that are most relevant include:

- Section 28-7(f): "In the event of a serious disaster or sudden emergency, when such action is deemed necessary for the protection of the health and safety of the people, and upon the request of the local chief executive authority, the Governor or the Commissioner [of the Department of Emergency Services and Public Protection] may authorize the temporary use of such civil preparedness forces as he deems necessary. Personnel of such civil preparedness forces shall be so employed only with their consent."
- Section 28-8a (a): "The chief executive officer of the municipality in which a major disaster or emergency occurs, or his designee, may take such action as he deems necessary to mitigate the major disaster or emergency, and to secure and preserve any documents and evidence pertinent to and necessary for a future investigation."
- Section 28-9: In the event of, among other things, a serious disaster, the Governor may declare that a state of civil preparedness emergency exists. Once this declaration is made, the Governor has a number of significant powers, including the following:
    - Section 28-9(a)—the Governor may "modify or suspend in whole or in part, by order . . . any statute, regulation, requirement or part thereof whenever in his opinion it is in conflict with the efficient and expeditious execution of civil preparedness functions."

  - Section 28-9(b)—the Governor may "order into action all or any part of the department or local or joint organizations for civil preparedness mobile support units or any other civil preparedness forces."
  - Section 28-9(d)—the Governor may "designate such vehicles and persons as shall be permitted to move and the routes they shall follow."
  - Section 28-9(g)—the Governor may "take such other steps as are reasonably necessary in the light of the emergency to protect the health, safety and welfare of the people of the state, to prevent or minimize loss or destruction of property, and to minimize the effects of hostile action."

- Section 28-9c (a): Removal of debris or wreckage. Governor's Powers.
  Whenever the Governor has declared a disaster emergency, or the President, at the request of the Governor, has declared a major disaster or emergency to exist in Connecticut, the Governor is authorized (1) "Notwithstanding any other provision of law, through the use of state departments or agencies, or the use of any of the state's instrumentalities, to clear or remove from publicly or privately owned land or water, debris and wreckage which may threaten public health or safety, or public or private property; (2) to accept funds from the federal government and utilize such funds to make grants to any political subdivision for the purpose of removing debris or wreckage from publicly or privately owned land or water."
  BUT— Section 28-9c (b) (1): "Authority under this section shall not be exercised unless the affected political subdivision, corporation or individual owning such property shall first present an unconditional authorization for removal of such debris or wreckage from public and private property and, in the case of removal of debris or wreckage from private property, shall first agree to indemnify the state against any claim arising from such removal; (2) whenever the Governor provides for clearance of debris or wreckage pursuant to subsection (a), employees of the designated state agencies or individuals appointed by the state are authorized to enter upon private land or waters and perform any tasks necessary to the removal or clearance operation."
- Section 28-11: During the existence of a civil preparedness or public health emergency, the Governor may, in the event of shortage or disaster making such action necessary for the protection of the public, take possession of, among other things, "any land or buildings." This statute provides very specific guidance on the process of taking real property, and the terms of just compensation for such a taking.

With regard to State Agency roles and responsibilities associated with disaster debris management, the following narrative has been taken from the State of Connecticut's Concept of Operations Plan for Disaster Debris Management.

1.2.2.1 Department of Emergency Services and Public Protection, Division of Emergency Management and Homeland Security (DESPP/DEMHS)

Statutory authorities for DESPP/DEMHS are set forth in CGS Title 28, Chapter 517 Civil Preparedness, Sections 28-1 through 28-22. CGS Section 28-1a establishes DESPP/DEMHS and its mission is to direct and coordinate all available resources to protect the life and property of the citizens of Connecticut in the event of a disaster or crisis, through a collaborative program of prevention, planning, preparedness, response, recovery, and public education. DESPP/DEMHS has primary responsibility for development and implementation of the State's emergency management program. DESPP/DEMHS, on behalf of the Governor and in coordination with DEEP, Connecticut's Department of Transportation (ConnDOT), and

its umbrella, DESPP, will prioritize the impacted areas and resource needs. DESPP/DEMHS has divided the State into five emergency management regions. DESPP/DEMHS Regional Offices are responsible for providing administrative support and planning assistance to local governments in their jurisdictions. Please note: the DEMHS regional designations do not follow county lines. Therefore, it is necessary for the regional offices to keep this distinction in mind when providing assistance or information to FEMA for calculating threshold expenses for reimbursement. During emergencies, the Regional Offices serve as mutual aid coordinators and communications links between towns and the EOC. Map 1-1 illustrates the eight counties overlaid by the five DESPP/DEMHS Emergency Management Regions. Table 1-1 provides a listing of the municipalities located in each of the Emergency Management Regions.

During emergencies, the State EOC is staffed with representatives of key state agencies and private companies. The State EOC maintains communications with State departmental EOCs, federal agencies and facilities, private agency EOCs, and the municipalities through their DESPP/DEMHS Regional Offices. The Media Center in the State EOC is used as a Joint Information Center (JIC) by federal and State agencies, and private companies involved in responding to natural disaster. The State EOC operates when an emergency event occurs or is imminent and stays in operation until emergency operations are no longer needed. On-going cleanup operations related to the disaster event may continue after the State EOC is demobilized.

State of Connecticut's State Response Framework (SRF): In accordance with CGS Section28-5(b), the SRF was prepared by DESPP/DEMHS. The purpose of the State Response Framework (the Framework or the SRF) is to describe the interaction of state government with local, federal and tribal governments, nongovernmental response organizations and other private sector partners, the media, and the public in implementing emergency response and recovery functions in times of crisis. In general, the Framework describes how the State of Connecticut and its partners will work together to support local governments and their residents in responding to disasters and emergencies. State Response Framework Concepts describes the general emergency operations concepts that normally apply in all disasters and emergencies requiring a state level response are described. The SRF outlines the general responsibilities of the various emergency management partners at the local, state, and federal government level, as well as the private sector.

Debris Management is addressed in both ESF 3 and ESF 7, which includes an overview of the Interagency Debris Managment Task Force. Primary and Secondary Agencies include Department of Administrative Services (DAS), DEEP, DESPP/DEMHS, DOT, Connecticut Military Department, Department of Labor and U.S. Army Corps of Engineers.

Map 1-1: Counties and DESPP/DEMHS Emergency Management Regions

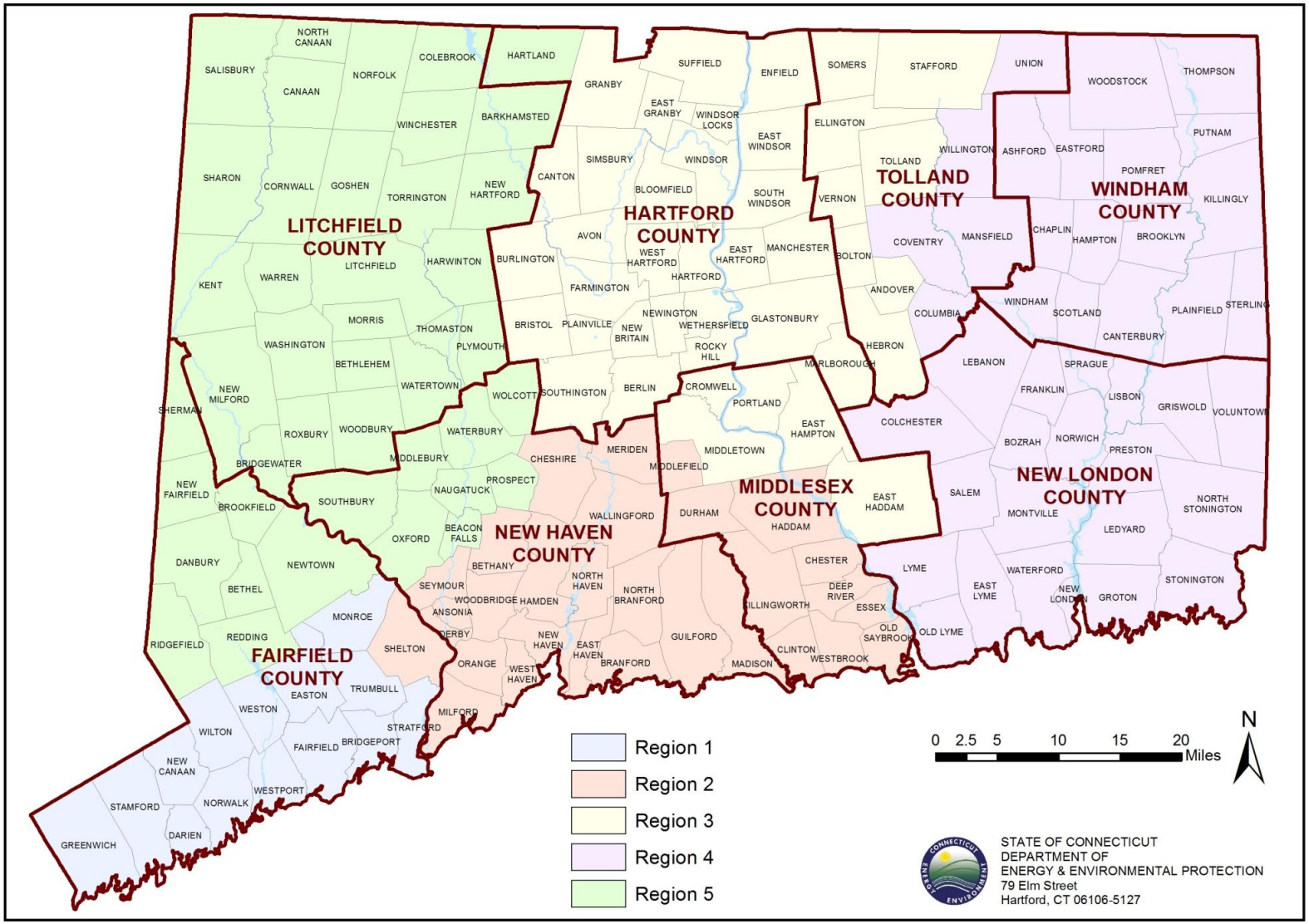


Table 1-1: Emergency Management Regions and Municipalities assigned per Region, DESPP/DEMHS

Region 1	**Region 2**	**Region 3**	**Region 4**	**Region 5**
Towns in Region (14)	*Towns in Region* (30)	*Towns in Region* (41)	*Towns in Region* (44)	*Towns in Region* (43)
Bridgeport	Ansonia	Andover	Ashford	Barkhamsted
Darien	Bethany	Avon	Bozrah	Beacon Falls
Easton	Branford	Berlin	Brooklyn	Bethel
Fairfield	Cheshire	Bloomfield	Canterbury	Bethlehem
Greenwich	Chester	Bolton	Chaplin	Bridgewater
Monroe	Clinton	Bristol	Colchester	Brookfield
New Canaan	Deep River	Burlington	Columbia	Canaan
Norwalk	Derby	Canton	Coventry	Colebrook
Stamford	Durham	Cromwell	East Lyme	Cornwall
Stratford	East Haven	East Granby	Eastford	Danbury
Trumbull	Essex	East Haddam	Franklin	Goshen
Weston	Guilford	East Hampton	Griswold	Hartland
Westport	Haddam	East Hartford	Groton City	Harwinton
Wilton	Hamden	East Windsor	Groton Town	Kent
	Killingworth	Ellington	Hampton	Litchfield
	Madison	Enfield	Killingly	Middlebury
	Meriden	Farmington	Lebanon	Morris
	Middlefield	Glastonbury	Ledyard	Naugatuck
	Milford	Granby	Lisbon	New Fairfield
	New Haven	Hartford	Lyme	New Hartford
	North Branford	Hebron	Mansfield	New Milford
	North Haven	Manchester	Montville	Newtown
	Old Saybrook	Marlborough	New London	Norfolk
	Orange	Middletown	North Stonington	North Canaan
	Seymour	New Britain	Norwich	Oxford
	Shelton	Newington	Old Lyme	Plymouth
	Wallingford	Plainville	Plainfield	Prospect
	West Haven	Portland	Pomfret	Redding
	Westbrook	Rocky Hill	Preston	Ridgefield
	Woodbridge	Simsbury	Putnam	Roxbury
		Somers	Salem	Salisbury
		South Windsor	Scotland	Sharon
		Southington	Sprague	Sherman
		Stafford	Sterling	Southbury
		Suffield	Stonington	Thomaston
		Tolland	Thompson	Torrington
		Vernon	Union	Warren
		West Hartford	Voluntown	Washington
		Wethersfield	Waterford	Waterbury
		Windsor	Willington	Watertown
		Windsor Locks	Windham	Winchester
			Woodstock	Wolcott
			Mashantucket Pequot	Woodbury
			Mohegan Tribal Nation	

1.2.2.2 Department of Energy and Environmental Protection (DEEP)

DEEP is charged with conserving, improving and protecting the natural resources and the environment of the state of Connecticut as well as making cheaper, cleaner and more reliable energy available for the people and businesses of the state. DEEP was established on July 1, 2011 with the consolidation of the Department of Environmental Protection, the Department of Public Utility Control, and energy policy staff from other areas of state government.

DEEP achieves its mission through regulation, monitoring, inspection, and enforcement and licensing procedures that help control air, land, and water pollution in order to protect public health, safety, welfare and natural resources. CGS Section 22a-5 defines the duties and powers of the Commissioner and authorizes the Commissioner to carry out the environmental policies of the State and grants all powers necessary and convenient to faithfully discharge this duty. DEEP has prepared the *Disaster Debris Management Plan* under this authority. Waste disposal operations in the State are regulated by statutes listed under Title 22a of the CGS, Chapter 439 Environmental Protection Department and State Policy and Chapter 446d Solid Waste Management. Emergency authorities for disaster debris cleanup include: CGS Section 22a-6k Emergency authorization for regulated activity; and CGS Section 22a-174(f) Powers of the Commissioner

Consistency with State of Connecticut's Solid Waste Management Plan, amended December 2006 (SWMP): The SWMP serves as the basis for Connecticut's solid waste management planning and decision making for the period 2005 through 2024. The SWMP Plan addresses a wide range of solid wastes, focusing primarily on municipal solid waste and debris resulting from construction and demolition activities. As per CGS Section 22a-229, "(a)…any action taken by a person, municipality or regional authority that is governed by this chapter shall be consistent with such plan." The SWMP identifies DEEP with the task to develop a Disaster Debris Management Plan that is consistent with the SWMP's disaster debris management strategy. The strategy states that disaster debris management that is implemented by State agencies and municipalities will be based on recycling and material separation at the point of generation and at staging/processing locations and that the goal will be to maximize potential processing and recycling options. This strategy will be of highest priority, and public education together with municipal, State, and federal cooperation will be imperative to effectively carry out this mission.

Consistency with Connecticut's Natural Hazard Mitigation Plan: Connecticut adopted a Natural Hazard Mitigation Plan (NHMP) to meet FEMA guidelines set forth in the Disaster Mitigation Act of 2000. This Plan represents the State of Connecticut's efforts to approach mitigating the effects of natural disasters on a multi-hazard basis, and shifts from a disaster-response driven system to one based on effective hazard mitigation planning. The related strategies and activities outlined in this Plan provide a guide to assist Connecticut in working towards achieving these goals that will be implemented or initiated during the time period encompassing this Natural Hazards Mitigation Plan update. The State of Connecticut believes in the importance of natural hazards mitigation planning and strategies will need to be developed. The adoption of this Plan allows Connecticut to be eligible for Federal funding equal to 15% of the total disaster damages from a presidentially declared disaster under the FEMA Hazard Mitigation Grant Program (HMGP). The current NHMP can be found at https://portal.ct.gov/DEMHS/Emergency-Management/Resources-For-Officials/Hazard-Mitigation

1.2.2.3 Department of Labor - Division of Occupational Safety and Health (DOL)

The Connecticut Department of Labor's Division of Occupational Safety and Health is referred to as CONN-OSHA. CGS Chapter 571 Occupational Safety and Health Act, Sections 31-367 through 31-385 establishes this Division and outlines its authorities and responsibilities. CONN-OSHA administers Connecticut's Public Employer Only State Plan and enforces occupational safety and health standards as they apply to all municipal and State employees. As a State Plan, CONN-OSHA adopts and enforces standards that are at least as effective as the federal requirements. CONN-OSHA does not enforce

occupational safety and health standards in private businesses in Connecticut. In those businesses, OSHA standards are enforced by the U.S. Department of Labor, OSHA. In addition to having enforcement responsibilities in the public sector, CONN-OSHA provides on-site consultations to both public and private sector employers. The mission of the Connecticut Consultation Program is to provide timely, courteous and professional service for Connecticut employers to help them recognize and control workplace hazards and prevent work-related injuries, illnesses, and fatalities. The consultants also provide assistance in developing and implementing effective safety and health programs. These consultations are provided at the request of the employer and are free of charge. CONN-OSHA offers comprehensive training and education programs covering all aspects of occupational safety and health. Provided at no charge, these programs are to be used in conjunction with both consultation and enforcement activities. The state-funded Occupational Health Clinics Program is also administered by CONN-OSHA. This program provides grants-in-aid to occupational health clinics and auxiliary occupational health clinics located in Connecticut. The Occupational Safety and Health Statistics Unit publishes information on workplace injuries, illnesses, and fatalities that occur in Connecticut. This unit also collects data for USDOL-OSHA targeting and program evaluation purposes. For more information, access CONN-OSHA website at: http://www.ctdol.state.ct.us/osha/aboutosh.htm

1.2.2.4 Governor's Task Force – Interagency Debris Management Task Force (IDMTF)

Pursuant to Connecticut General Statutes, Section 28-9, the Governor will declare that a state of Civil Preparedness Emergency exits as a result of a catastrophic event. In the event of such a declared disaster, the Governor will activate the state contracts and will authorize the IDMTF members to participate in all preparedness activities, to serve as operational representatives when debris management and monitoring activities are undertaken, and to assign work for the State Debris Management and Monitoring Contractors by developing task orders. The core membership of the IDMTF includes: DESPP/DEMHS, DEEP, DAS, and ConnDOT, and the State debris contractors. CTNG, Northeast Utilities and United Illuminating will provide continuing participation throughout the event. Other agencies/organizations may be requested to participate on the Task Force as necessary (DAS/BPFM, DOL, DESPP/Connecticut State Police (CSP), Department of Motor Vehicles (DMV), Department of Public Health (DPH), FEMA and others).

1.2.3 Local Governments

Though not mandated, it is recommended by both federal and State emergency response programs that local governments develop a comprehensive Disaster Debris Management Plan as an addendum to their Emergency Management Plan. Additionally, municipalities should have pre-positioned contracts for debris removal and monitoring to be better prepared to manage disaster debris. The Plan should include identification of suitable DMS, availability of equipment, and projection of debris quantities that could be generated.

1.3 Plan Maintenance

The Plan shall be reviewed annually by DEEP, and in conjunction with DESPP/DEMHS. Required updates identified during the annual review or due to significant development in governmental protocol or lessons learned from a recent major storm event should be directed to DEEP's Bureau of Materials Management and Compliance Assurance, Bureau Chief's Office, 79 Elm Street, Hartford, CT 06106. Changes to the Plan will be the responsibility of DEEP and the revised Plan will be made available on the DEEP's and DESPP's websites.

CHAPTER 2
DISASTER TYPES and DEBRIS MODELING PROJECTIONS

2.1 Overview

This Chapter summarizes the types of natural disasters that could potentially occur in the State and the types of waste materials that could be generated from such events and provides debris modeling waste generation projections. While this Plan is applicable to both natural disasters and man-made disasters, the focus of this Plan is debris management resulting from natural disasters.

2.2 Natural Disasters

2.2.1 Hurricanes and Tropical Storms

Per the National Weather Service (NWS), New England hurricanes typically accelerate northward up the coast, reaching an average speed of 33 mph forward motion by the time they pass our latitude. As a result, the storm structure becomes skewed in such a way that the following occurs:

- Outer rain bands with tropical storm force gusts can occur way out ahead of the storm center (sometimes 14 hours in advance of the storm), which can cause coastal flooding and shut down coastal roadways.
- Flooding rains typically become focused along and west of the track of the storm, with the east side of the storm typically having only a few showers and perhaps even some sunshine.
- The strongest winds occur to the east of the track of the storm. Consequently, the storm surge (driven mostly by the strong winds) is highest also to the east of the track of the storm.
- There can be a backlash of gusty winds after the storm center passes, but typically all of the rain occurs on the front end of the storm. It is dry after the storm center passes.

Historical Perspective on Tropical Storms and Hurricanes that have Impacted Connecticut: The damaging forces of hurricanes and tropical storms include high velocity winds (up to 150 miles per hour or higher in gusts), storm surge, and wave action. DESPP/DEMHS considers a Category 3 hurricane as the most probable, worst-case disaster scenario facing Connecticut. Although Connecticut has not had a major hurricane in more recent years, DESPP/DEMHS and federal agencies such as FEMA are concerned that the danger of a major hurricane impacting the northeast is likely to occur. The 1938 hurricane and the flooding of 1955 that resulted from heavy rainfall associated with the remnants of two hurricanes are recorded as the worst natural disasters to strike Connecticut. Though not as strong as the 1938 hurricane, the hurricanes named Gloria (1985) and Bob (1991) are two of the more potent hurricanes to strike in the last twenty-five years. Hurricane Bob is noted for having caused significant tree damage in Connecticut.

In 2011, the State was impacted by Tropical Storm Irene. This storm was originally forecasted to be a major event and the expected landfall in New England was to be a strong Category 1 or a weak Category 2 hurricane. Through downgraded to a tropical storm, tree damage was extensive throughout the State and there was enough structural damage along the coastline so that all eight

counties received a Presidential disaster declaration. In 2012, the State was impacted by Hurricane Sandy. Seven of the eight counties received a Presidential disaster declaration.

Storm surge results from low pressure in the center of the storm that allows water levels of the ocean to rise and lift, then fall gently. Wave action from wind on top of the surge or lifting is what causes flooding as waves and surge approach the land. The most severe damage frequently occurs in coastal areas. There has been an overall increase in the coastal population of approximately 33 percent between 1950 and 2000 putting more people and structures at risk to a natural disaster. This is especially true for east coastal New Haven County and all of coastal Middlesex County. These are highly developed vulnerable areas subject to a direct strike from hurricanes However, a significant amount of tree and structural debris may be encountered far inland. The amount of debris generated by such an event would depend on the path, intensity and timing of the storm. The State and municipalities must be ready to effectively deal with a massive debris cleanup effort following a hurricane. The 1938 hurricane produced a storm surge that was 12 to 16 feet above mean sea level and winds clocked at 120 mph. Debris resulting from the storm was estimated at 20 million tons, 15 million tons (equivalent to approximately 45 million cubic yards) of it being woody vegetation, the rest being mostly brick, treated wood, concrete and metal.

Tropical Storm Irene, with a storm surge coinciding with spring high tide caused considerable flooding and structural damage in several coastal towns, most notably, East Haven. Moderate to major coastal flooding was seen with storm surges of 4 to 5 feet in western Long Island Sound during high tide. Additionally, very heavy rainfall continued across most of the state with rainfall totals in western Connecticut exceeding 8 inches in many locations. As a result, river flooding from Irene was moderate to major in western Connecticut and moderate in eastern Connecticut. The Housatonic River was especially vulnerable to major flooding.

During Hurricane Sandy, the reported storm surge at Bridgeport and New London was 10 and 5.5 feet above normal, respectively. Tides were running 10 feet above normal with strong East winds continuing to push more water into Western Long Island Sound.

2.2.2 Tornadoes

Damage from tornadoes is caused by high velocity rotating winds. Many parts of Connecticut have experienced tornadoes, but the most severe tornadoes in recent years struck the Litchfield Hills and parts of Naugatuck River Valley in July of 1989, the Windsor Locks area in the 1990's, and the City of Bridgeport in 2010. The severity of the damage depends on the size of the tornado funnel and the length of time the funnel strikes the ground. Damage is generally confined to a narrow path extending up to half a mile wide and from a hundred yards to several miles long. Tornado debris includes damaged and destroyed structures, vegetative debris, and personal property.

2.2.3 Floods

The damage resulting from flood events is caused by structural inundation of flood waters and high velocity waters. Structural damage is usually limited to the floodway and the floodplain area immediately adjacent to a river. Heavy structural damage may result from high velocity waters in areas of steep slopes or failure of a flood control project, such as a dam or levee. Flood debris consists of sediment deposited on public and private property, personal belongings discarded from damaged homes, and construction materials. Landslides are often associated with flooding and result in debris consisting of soil, gravel, rock, and some construction material.

In March 2010 there were three major rain events that in combination resulted in severe flooding throughout Connecticut. As a result, the three coastal counties of Fairfield, Middlesex, and New London received a Presidential disaster declaration.

2.2.4 Forest Fires

Debris from forest fires consists of burned out structures, cars and other metal objects, ash, and charred wood waste. Large-scale loss of ground cover may lead to mud slides, resulting in clogged drainage structures and possible damage to homes and bridges.

2.2.5 Earthquakes

While the least likely of the natural disasters to occur in Connecticut, the State experienced a minor earthquake in 2011. Earthquakes are caused by shock waves and earth movements along fault lines. Secondary damages, such as fires and explosions, may result from the disruption of utility systems. Debris consists of building materials, personal property, and sediment caused by landslides.

2.2.6 Ice and Snowstorms

Ice storms can generate significant amounts of woody debris from broken tree limbs and branches, utility lines, wires, poles/towers, and building debris from damaged roofs and structures. Damage is more likely to occur when ice accumulation on trees and limbs reaches half of an inch in thickness. Ice storms are actually more difficult to deal with in terms of power restoration because the post-event weather and temperature dictates how fast ice will melt off trees and wires affecting the ability to restore power.

The January and October 2011 Snowstorms caused extensive damage throughout Connecticut. The January snowstorm delivered snowfall totals of 20 to 30 inches. Heavy snow caused the roofs of many building to collapse, forcing the evacuation of residents and employees. The storm forced state troopers to close a 50-mile stretch of Interstate 95 in southwest Connecticut due to numerous trucks becoming stuck on the highway in the snow. Six of the eight counties received a Presidential disaster declaration.

The October Snowstorm, though not an ice storm, was an autumn snow storm, that deposited heavy wet snow on wires and trees, still with foliage. This storm took down another 1% to 2% of the State's trees and impacted approximately 800,000 homes without power for over a week. All eight counties received the Presidential declaration for a disaster area. Until a major catastrophic storm event takes down a significant number of trees (>30%), Connecticut's significant tree overgrowth will make it highly vulnerable to ice storms. All eight counties received a Presidential disaster declaration.

Most recently, in February 2013, a massive blizzard hit the Northeast bringing more than 3.0 feet of snow to some areas and leaving thousands of people without power and/or a means to travel. Snow removal, especially in the larger cities, required extra man-power and specialized equipment like airport grade snow blowers, loading equipment and large-scale hauling trucks. Equipment and manpower was secured through both interstate mutual aid and the Connecticut National Guard.

2.2.7 Catastrophic Animal Mortalities

Catastrophic animal mortalities can result from a natural disaster such as flooding caused by a hurricane or heavy rains, or may be the direct result of disease. A catastrophic storm may cause a farmer to not have access to the animals that can cause additional deaths. Also, flooding can cause animals to wash onto public and private properties. Disposal of animals presents both an environmental and health issue.

2.2.8 Catastrophic Vegetative Waste (from Disease)

Connecticut has experienced periodic occurrences of major tree diseases leading to widespread tree death. These outbreaks are usually due to a non-native insect or disease arriving in Connecticut and spreading rapidly, and often fatally, throughout the existing tree population. Examples include the chestnut blight, Dutch elm disease, gypsy moth, and the hemlock woolly adelgid. A problem organism is the emerald ash borer for which a ban exists on the movement of clean wood, both freshly cut and older waste wood, into and out of the county. See DEEP's website regarding additional guidance or

http://www.ct.gov/dep/cwp/view.asp?a=2697&q=464598&depNav_GID=1631 for more information. Potential problem organisms include the Asian longhorn beetle and ramorum blight (sometimes called sudden oak death). Tree decline and death from such insect or disease outbreaks tend to occur over a period of months to years in any one locality – the impact of the outbreak does not require the immediate response of a forest fire or a major storm. However, problems resulting from such damage may call for the attention of tree wardens and other public officials to promptly remove dead and hazardous trees that may be a danger to the public.

2.3 Debris Modeling Projections

For planning purposes, the State has estimated the storm debris generated as the result of a hurricane categories 1, 2, and 3. The assumption used to calculate these estimates is the projected storm path and expected wind speeds per county. Pre-disaster modeling and projections provide volume estimates for preparation of debris management sites and pre-positioning of resources. For each approaching hurricane or other storm event, these projections will be reviewed, analyzed and refined using available modeling formulas and known data. The USACE Hurricane Debris Estimating Model was used to estimate possible debris volumes. The following picture and figure were applied when making assumptions in addressing factors needed in the model's formula. The table illustrates the estimated debris generated per county.

Picture 2.1 shows a historic averaged path of a hurricane along the eastern coast. Wind and precipitation present a critical part in the formula. As the picture illustrates, most of Connecticut should anticipate receiving a "wet" storm. "Wet" storms tend to generate more vegetative debris due to the uprooting of complete trees.

Figure 2.1 shows a map of the State with the projected potential for a category 3 hurricane path based on the historic averaged path of a hurricane along the eastern coast. The map also shows the different wind speeds for a storm of this magnitude: red in category 3 wind speeds, orange indicates category 2 wind speeds, and yellow indicates category 1 wind speeds based on the swath of the storm. This storm path illustration was prepared by the State of Connecticut's debris monitoring contractor, Science Applications International Corporation.

Table 2.1 indicates the total estimated debris generated, per county, for a category 3, category 2, and category 1 hurricane based on the historic averaged path of a hurricane along the eastern coast and wind speeds as shown in Figure 2.1. As the hurricane category decreases, the hurricane category impact decreases by 1 magnitude.

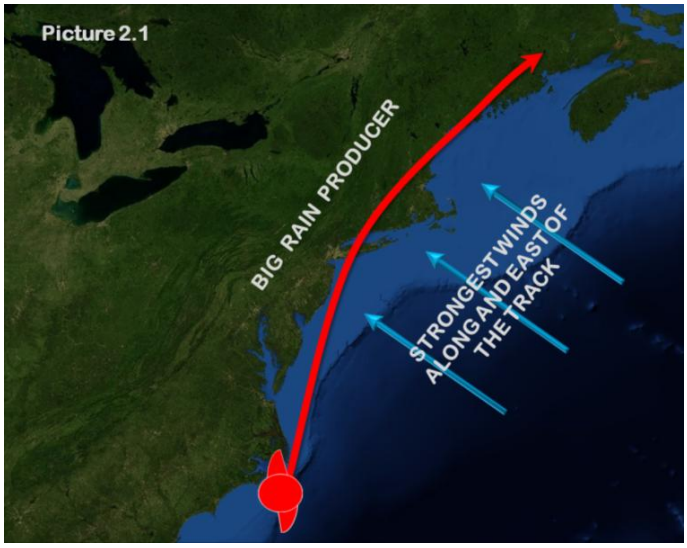


Figure 2.1: Wind Speeds by County

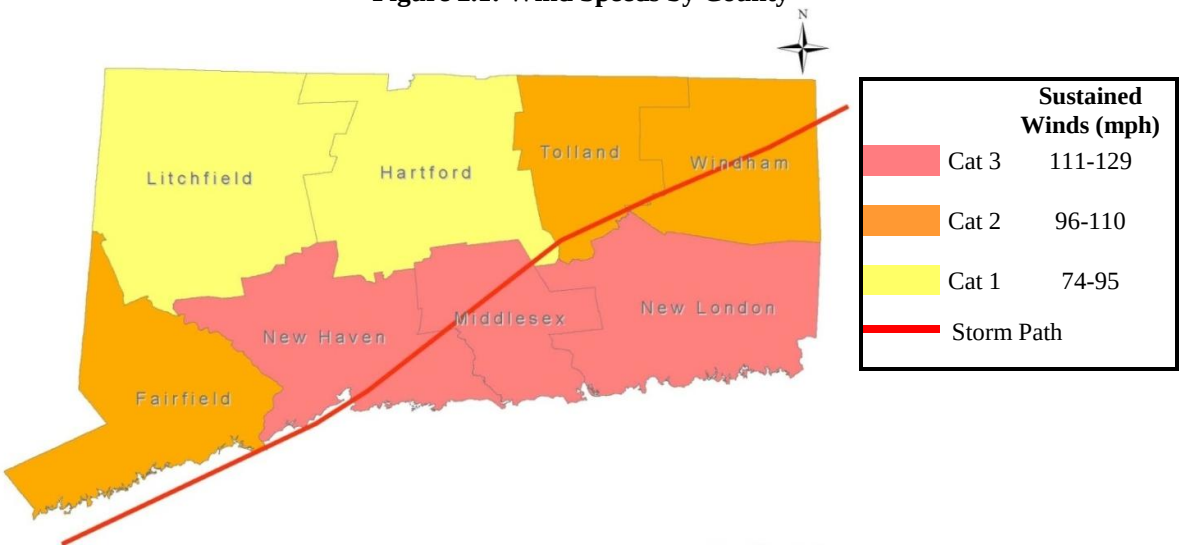


Table 2.1: Estimated Debris Generation Rate per County showing Households using 2010 Census Data and Under Categories 1, 2, and 3 Hurricane Winds

		Category 3 Hurricane		Category 2 Hurricane		Category 1 Hurricane	
County	**Households**	**Hurricane Category Impacts**	**Debris Cu. Yds.**	**Hurricane Category Impacts**	**Debris Cu. Yds.**	**Hurricane Category Impacts**	**Debris Cu. Yds.**
Fairfield	327,670	3	14,619,325	2	4,498,254	1	1,124,563
Hartford	341,717	2	4,691,091	1	1,172,773	Tropical Storm	586,386
Litchfield	74,767	1	252,712	1	252,712	Tropical Storm	126,356
Middlesex	67,078	3	2,947,407	2	906,895	1	226,724
New Haven	322,963	3	14,409,317	2	4,433,636	1	1,108,409
New London	105,052	3	4,687,000	2	1,442,154	1	360,538
Tolland	54,641	2	738,746	1	184,687	Tropical Storm	92,343
Windham	43,870	2	593,122	1	148,281	Tropical Storm	74,140
TOTAL AMOUNT OF DEBRIS:			**42,938,721**		**13,039,391**		**3,699,461**

The USACE guidelines indicate that hurricane-generated debris would consist of the following: 30% clean, woody debris and 70% mixed construction and demolition debris. Further compositional breakdown of the mixed construction and demolition debris indicates the following: 42% burnable after sorting; 5% soil; 15% metals; and 38% appropriate for disposal at landfills.

This page intentionally left blank.

CHAPTER 3
ROLES OF GOVERNMENT and the PRIVATE SECTOR

3.1 Overview

In most cases, debris clearance, removal and disposal actions can be accomplished quickly using State and municipal resources augmented by assistance from neighboring municipalities, State agencies and contractor resources. In other cases however, the damage and resulting debris in a municipality is so extensive that it can only be successfully managed through adequate pre-planning and the coordinated efforts of the federal and State government, and local communities. Disaster debris on State property will be the cleanup responsibility of the State. The roles of government and the private sector in managing natural disaster debris are discussed below.

3.2 The State Role

3.2.1 State Mission Statement

The shared mission of Connecticut's emergency management community in times of natural disaster is to:

- Maximize the preservation of life and property;
- Correct or alleviate, as expeditiously as possible, serious disaster or emergency-related conditions which present continued threats to the health or welfare of the residents of the State; and
- Facilitate a return to normalcy by all practical means.

In a catastrophic disaster, Connecticut State agencies will be tasked to locate staff, equipment, and funds to devote to emergency debris removal tasks that, in a worst-case scenario, could last many months. Such activities will be reliant upon: debris removal and disposal policies and strategies outlined by this Plan; technical assistance provided by DEEP and implemented under DEEP statutory authorities; and the Governor's emergency powers as necessary. As per the SRF, the State EOC Unified Command will coordinate all emergency response during a major natural disaster. If in the event that the State could not effectively manage the debris removal or was overwhelmed by the magnitude of the disaster event, the State could request direct federal assistance through FEMA.

As described in the SRF, the following is an outline of operations in the event of a natural disaster:

- DEMHS/DESPP is in a state of constant monitoring and is always operating under the SRF.
- Based on the scale of an emergency or event, the Governor may activate the State EOC and request representation in the State EOC by appropriate state, federal and private response agencies.
- The State EOC Unified Command will monitor disaster response activities statewide and will coordinate the provision of assistance to State and local authorities as necessary and appropriate.
- The State EOC Unified Command will maintain communication with the FEMA Coordination Center.
- Communication with local authorities will be maintained through the five DESPP/DEMHS Regional Offices.

- If necessary, the Governor may declare a State of Emergency under CGS Section 28-9 and invoke extensive emergency powers which allow the Governor to take any action reasonably necessary in light of the emergency. The Governor's emergency powers include (but are not limited to) taking operational control of all civil preparedness forces and functions in the State, modifying or suspending statutes and regulations, ordering evacuations, removing debris from public and private land or waters, and seizing property.

The State of Connecticut has in-place both interstate and intrastate mutual aid assistance procedures to manage emergencies and disasters. These authorities and capabilities are described below:

- *Interstate – Emergency Management Assistance Compact*: CGS Chapter 518 Emergency Management Assistance Compact Section 28-23a commits Connecticut to the terms of the Emergency Management Compact (EMAC) which requires member states (called parties) to provide mutual aid assistance to manage emergencies and disasters declared by the Governor of any of the party states. The compact provides a legal framework for requesting and providing assistance. This compact also provides for mutual cooperation in emergency-related exercises, testing or other training activities using equipment and personnel simulating performance of any aspect of the giving and receiving of aid by party states or subdivisions of party states during emergencies. The Commissioner of DESPP/DEMHS is Connecticut's compact representative and is responsible for formulating appropriate interstate mutual aid plans and procedures necessary to implement it.
- *Intrastate – Mutual Aid System*: Public Act 07-56 *An Act Creating an Intrastate Mutual Aid System* commits the State's participating political subdivisions (towns) to the terms of the Intrastate Mutual Aid Compact. The compact provides a legal framework for towns to request and provide mutual aid when any member town declares a local civil preparedness emergency. Any town may withdraw from the compact by enacting a resolution to that effect and submitting a copy of the resolution, within ten days after adopting it, to the Commissioner of DESPP/DEMHS The Public Act outlines responsibilities of local civil preparedness organizations, procedures for activating the compact, permit and license reciprocity, and reimbursement and liability issues.

The SRF, ESF 15, includes procedures regarding dissemination of information to the general public. Direction and control of media liaison activities and public information shall be the responsibility of the Governor's Press Secretary or his designee. To the greatest extent possible, all State agencies will coordinate disaster public information activities with the Governor's Press Secretary to avoid contradictory, confusing, incomplete or erroneous information being given to the public. In addition, DEEP will be preparing public announcements to serve as guidance for the public in their cleanup activities and will be amending a Guidance Document for municipalities regarding debris management pre-event planning. The Guidance Document will be forwarded to each municipality and it will be placed on DEEP's website.

By preparing the *State's Disaster Debris Management Plan* as an annex to the SRF, establishing State contracts for debris removal operations and monitoring of the debris, and the development of the ConOps Plan, Connecticut has positioned itself to be responsive to meet the emergency needs of the State. At the same time, the Plan and the contracts will expedite enhanced federal assistance to the State in the event of a disaster.

3.2.2 Department of Energy and Environmental Protection (DEEP)

Management of disaster debris falls under the existing solid waste management statutes. Implementing recycling and material segregation practices under these statutes, together with statutes related to the management of debris during an emergency situation, is the framework for debris cleanup measures during a disaster event. The relevant CGS includes:

- *CGS* Section *22a-208, Powers and duties of the Commissioner* – gives the Commissioner broad powers to plan for and regulate existing or proposed solid waste facilities so that they are operated and closed in such a way as to minimize impacts to the environment and public health, safety and welfare.
- *CGS* Section *22a-*208a, *Permit for construction, alteration or operation of solid waste facility* – gives the Commissioner authority to issue permits for the construction, alteration, and operation of solid waste facilities, including a general permit.
- *CGS* Section *22a-6k, Emergency authorization for regulated activity. Temporary authorization for regulated* activity *and CGS Section 22a-174(f), Powers of the Commissioner. Regulations. Exemptions* – gives the Commissioner authority to authorize actions to address disaster debris management in the event of a disaster declaration or emergency situation.

A summary discussion of emergency authorizations follows:

- *Emergency Authorization:* Under CGS Section 22a-6k (a), the Commissioner may issue an emergency authorization for any regulated activity provided that such activity is necessary to prevent, abate, or mitigate an imminent threat to human health or the environment and that it is not inconsistent with the federal Water Pollution Control Act, the federal Rivers and Harbors Act, the federal Clean Air Act or the federal Resource Conservation and Recovery Act. Such emergency authorization shall be limited to any conditions the Commissioner deems necessary to adequately protect human health and the environment.
  - Upon request, DEEP will issue Emergency Authorizations for certain activities related to the management of debris. Emergency authorizations, which will be active for a defined period of time, will be issued to municipalities as well as private entities as needed depending on debris streams and quantities.
  - As an example, DEEP has developed a template emergency authorization for solid waste management resulting from a natural disaster event. The template emergency authorization includes conditions that cover the use and management of temporary storage, transfer or processing sites/facilities during and after the emergency; and environmental testing and monitoring protocols.

During and after a catastrophic natural disaster, DEEP will offer information and technical assistance to the municipalities and regional resources recovery authorities in several topical areas including, but not limited to, the following:

- Permitting authorizations covering the collection, processing, recycling, and disposal of debris resulting from the natural disaster incident;
- Contact information for final debris management sites; and
- Contact information for volume reduction, resources recovery, and recycling facilities.

3.3 The Municipal Role

Municipalities will always be the first responders in a disaster situation. Therefore, it is highly advantageous to have a coordinated debris management plan developed in advance of a debris-generating event to expedite the response and recovery process. FEMA encourages and expects local municipalities to do this pre-event preparation and planning. This includes:

- Pre-identifying DMS preferably on municipal property, but contracting to use private property if ideally suited;
- Preparing pre-existing contracts with haulers and demolition contractors for the collection and removal of debris; and
- Pre-planning communication with impacted residents and businesses about cleanup and waste stream segregation and methods of information dissemination.

The criteria for DMS can be found in Chapter 5 of this plan. DEEP will authorize the operation of the DMS under the State solid waste management statutes and regulations to ensure that they are managed in accordance with this *Disaster Debris Management Plan* and in such a way as to protect human health and safety and the environment. Proper management of the sites ensures efficient waste handling and segregation, safety, and accountability to ensure that debris disposal operations are eligible for federal reimbursement.

Municipalities are responsible for the oversight of disaster-related work performed by private contractors working for the municipality. It is strongly recommended that municipalities pre-positioned contracts for debris removal and monitoring. Contracts must exhibit "fair and open competition" where a complete, adequate and realistic specification or purchase description is publicly solicited and multiple responsible bidders are allowed to compete effectively for the business. FEMA requires three qualified bidders. Time and Materials Contracts are discouraged, but may be used when no other contract type is suitable. This contract type must include a ceiling amount and must be limited to work that is necessary during the first 70 hours immediately after a disaster. It can then be followed by a competitively bid unit based contract for cleanup during the remainder of the recovery period. Two types of prohibited contracts include noncompetitive contracts and cost-plus percentage of cost contracts.

Local officials may be required by FEMA or the State Public Assistance Officer (PAO) to explain local procedures for validating contractor invoices for work done. Inadequate monitoring of contractors by local officials could result in loss or reduction of federal and state disaster assistance funds in cases where FEMA or the State PAO determines that contractor invoices are excessively high and that local monitoring of contractors was inadequate to guard against inappropriate billings. Owner/operators of the DMS must contact DEEP prior to closing a site to discuss and coordinate what will be required for closure, including environmental sampling, if needed.

3.4 The Federal Role

There are a number of Federal Agencies that have a role in supporting disaster debris recovery and response and recovery efforts following a Presidential Emergency or Major Disaster Declaration. Among the agencies most directly involved are FEMA, USACOE, NRCS, the USCG, USEPA, and OSHA. See FEMA Fact sheet 9580.202 outlining the federal agencies and their roles and responsibilities.

FEMA is among the most critical federal agency that the State will coordinate emergency response and recovery efforts within a catastrophic event.

FEMA

When the response and recovery efforts appear to be beyond the capacity of both the municipalities and the State, Connecticut may request federal assistance through FEMA in the form of a Presidential Disaster Declaration. A major disaster declaration in response to a Governor's request specifies, among other things, the type of incident covered, the time periods covered for specific activities, the types of disaster assistance available, and the declared counties.

Following a Presidential disaster declaration, public assistance funds are available to eligible applicants for debris clearance, removal, and disposal operations. Eligible applicants typically include State and local governments, federally recognized Indian Tribes, and certain private nonprofit organizations. Debris located on public property and rights-of-way is eligible.

In order to be eligible for FEMA funding, the debris removal work must:

- be a direct result of a Presidentially declared disaster;
- occur within the designated disaster area; and
- be the responsibility of the applicant at the time of the disaster.

In addition, debris removal work must be necessary to:

- eliminate an immediate threat to lives, public health and safety;
- eliminate immediate threats of significant damage to improved public or private property; or
- ensure the economic recovery of the affected community to the benefit of the community-at-large.

Examples of eligible debris removal activities include:

- debris removal from a public right-of-way to allow the safe passage of emergency vehicles; and
- debris removal from public property to eliminate health and safety hazards.

Examples of ineligible debris removal activities include:

- removal of debris, such as tree limbs and trunks, from an applicant's unimproved property or undeveloped land;
- removal of pre-disaster sediment from engineered channels;
- removal of debris from a natural channel unless the debris poses an immediate threat of flooding to improved property;
- removal of debris from federal lands or facilities that are the authority of another federal agency of department, such as federal-aid roads, USACE navigable waterways, and Natural Resources Conservation Service (NRCS) canals.

Debris removal from private property is generally not eligible for Public Assistance (PA) funding because it is the responsibility of the individual property owner. If property owners move the disaster –related debris to a public right-of-way, the local government may be reimbursed for curbside pickup and disposal for a limited period of time. If the debris on private business and residential property is so widespread that public health, safety, or the economic recovery of the community is threatened, FEMA may fund debris removal from private property, but it must be approved in advance by FEMA. For instance under normal conditions, removal of debris in waterways falls under a number of federal, state and municipal jurisdictions, as well as private property owners.

Under CGS Section 7-146, a municipality can exert its authority to cause the removal from any waterway or tidal water within its jurisdiction of debris wreckage or other similar materials for which a private person or firm or corporation is responsible and which prevents or may tend to prevent the free discharge

of flood waters. However, under CGS Section 28-9c, the governor can authorize state departments or agencies or the use of any of the state's instrumentalities to clear or remove debris from land or water.

The Robert T. Stafford Disaster Relief and Emergency Assistance Act broadly authorizes the President to direct federal agencies to provide *essential assistance* as needed, including cleanup and disposal of waste and debris. FEMA evaluates the request and recommends to the President the type of federal assistance that is warranted. FEMA then implements the National Response Plan (NRP) and issues mission assignments in the form of Emergency Support Functions (ESF). FEMA also opens a Joint Operations Center (JOC) and a Disaster Field Office(s) in the affected area(s) to coordinate efforts with local and State authorities.

FEMA's Debris Mission is as follows: *When directed, remove debris in support of affected States to eliminate threats to lives, public health and safety; eliminate immediate threats of significant damage to improved public or private property; or ensure economic recovery of affected communities to the benefit of the community-at-large*.

ESFs identify critical areas of federal assistance needed to augment state and local response efforts. There are a number of major ESFs that help to facilitate coordinated federal response to a disaster under the National Response Plan. The Public Works and Engineering Emergency Support Function includes debris management and the issuance of debris removal and disposal contracts. The USACE is tasked with managing, monitoring, and providing technical assistance in the clearance, removal, and disposal of debris and the clearing of roads and waterways in the affected areas. The vast majority of debris removal will be conducted by private contractors who are normally responsible for all of the transportation and logistical support required for their operations.

If an emergency or major disaster declaration is made under the authority of the Stafford Act, assistance is usually provided in the form of financial reimbursement of a portion of the disaster-related costs. Debris removal costs incurred by municipalities and Connecticut would be evaluated and if determined eligible would be reimbursed on a cost-sharing basis (normally 75% federal, 25% nonfederal).

In catastrophic disasters, FEMA can also provide direct federal assistance to support the State in performing some of the activities related to debris removal, recycling and disposal. The response capabilities of both the municipalities and Connecticut must be clearly exceeded before this level of assistance can be provided. Since Connecticut municipalities have a solid waste and recycling ordinance by law and the State has mandated recycling (CGS Section 22a-241b), FEMA may also fund recycling of disaster debris especially if the local government can demonstrate that recycling is a cost-effective debris management option.

FEMA may also direct other federal agencies to provide debris removal technical assistance to municipalities and State agencies. Technical assistance may be provided in contract preparation, bid solicitation, contract management, and debris disposal activities. Municipalities and the State agencies remain responsible for all debris removal activities and are reimbursed for their eligible costs. Cost share for federal technical assistance is 100 percent federal.

For more information about Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288) as amended, access the FEMA website at: http://www.fema.gov/about/stafact.shtm.

3.5 The Private Sector Role

The private sector will have direct and indirect roles in managing debris resulting from a catastrophic natural disaster. For example, private contractors and waste disposal companies will play a significant role in the debris removal, collection, volume reduction and disposal process for both municipalities and State agencies. In addition, contracting with private commercial entities may be necessary to establish DMS where needed throughout the state. While re-establishment of commercial entities is a private responsibility, access to the facilities of many large retailers may affect overall response and recovery efforts and will be considered when setting priorities for catastrophic response.

This page intentionally left blank.

CHAPTER 4
CONNECTICUT'S SOLID WASTE MANAGEMENT FRAMEWORK and DEBRIS MANAGEMENT

4.1 Overview

Connecticut is a small, densely populated state that has become reforested during the past seventy-five years. Much of the State's population resides in the corridor along the Route I-95 from the New York border to the New Haven border, and then north along Route I-91 to the Massachusetts border. Much of this area is low-lying with extensive wetlands and many developed areas are prone to flooding. The I-95 corridor, which straddles the coastline, would be hardest hit from the damaging forces of a hurricane. Natural disasters precipitate a variety of debris. Disaster debris is a very visible reminder of the scope of a disaster that can account for as much as 40% of all disaster-related costs according to FEMA. The quantity and type of debris generated from any particular disaster is a function of the location and kind of event experienced as well as its magnitude, duration and intensity. The debris, its location, and the size of the area over which it is dispersed, directly impacts the type of collection, recycling, and disposal methods used to address the debris problem, associated costs incurred, and the speed with which the problem can be addressed. This Chapter outlines Connecticut's solid waste management framework and the management and disposal of various types of natural disaster debris and integrates the State's strategy handling debris through the debris removal and monitoring contracts.

4.2 Connecticut's Solid Waste Management Framework

4.2.1 State Solid Waste Management Plan, amended December 2006

Legislatively, Connecticut has formally adopted an integrated waste management hierarchy as a guiding framework for solid waste management efforts. Connecticut's system adheres to this hierarchy by emphasizing source reduction, recycling, composting, and energy recovery from solid waste, while relying on landfill disposal as a last resort. Connecticut's *Solid Waste Management Plan* (SWMP) is based on this hierarchy. The SWMP has as two of its three goals:

- Goal 1: Significantly reduce the amount of Connecticut generated solid waste requiring disposal through increased source reduction, reuse, recycling and composting.
- Goal 2: Manage the solid waste that ultimately must be disposed in an efficient, equitable, and environmentally protective manner, consistent with the statutory solid waste hierarchy.

4.2.2 Connecticut's Solid Waste Management Infrastructure

Connecticut has a comprehensive and highly effective integrated solid waste management system, including widespread municipal solid waste recycling services, regional resources recycling facilities and, for bulky waste, a system of volume reduction facilities and limited capacity for bulky waste landfills

In 2010, approximately 3.1 million tons of municipal solid waste (MSW) was generated. Of the total, an estimated 24.2 percent was recycled, approximately 68 percent was managed in the State's six resources recovery facilities; 0.67 percent was disposed at in-state landfills; and the remaining 7.5 percent was exported for disposal in other states.

In 2006, approximately 1.4 million tons of Connecticut C&D waste/oversized MSW was reported processed, transferred through or disposed at Connecticut waste facilities. Connecticut's management of C&D debris and oversized MSW relies greatly on out-of-state disposal. This reliance on out of state disposal will challenge Connecticut in managing a significant amount of structural debris resulting from a catastrophic natural disaster. Approximately 86 percent of this C&D total was processed by Volume Reduction Facilities and Transfer Stations and sent to out-of-state disposal sites; 9 percent was disposed at in-state landfills; a very small percent (between 5 and 7 percent) of the material was reported recycled. Analysis of 2010 data seems to indicate a significant drop in tonnage of Connecticut C&D/oversized MSW processed, transferred, or disposed through Connecticut waste facilities (about 60 percent of the amount estimated for 2006). The drop is likely due to the economic downturn and perhaps data reporting and analysis issues. Generation of C&D waste can be affected by a variety of external factors, including economic conditions and the frequency and severity of natural disasters. The C&D figures above do not include the asphalt, brick, and concrete processed by facilities which only process clean fill since these facilities are not permitted by the State, and therefore do not submit tonnage and stumps generated by land clearing activities unless that material was included in the "mixed C&D waste" reported received by Connecticut solid waste facilities. Table 4-1 presents the permitted and registered solid waste facilities in Connecticut.

Table 4-1. Type and number of permitted/registered solid waste facilities in Connecticut, January 2013

Type of Solid Waste Facility	**Number of Facilities**
Transfer Stations (TS)	180
Volume Reduction Plants (VRP)	38
Landfills (Active)	29
o Municipal Solid Waste (MSW) Landfill	1
o Bulky Waste Landfill	20
o Special Waste Landfill	6
o Bulky Waste Landfill / Special Waste Landfill	1
o RRF Ash Residue Landfill	1
Resources Recovery Facility (RRF) for MSW	6
RRF for Waste Tires	1
Intermediate Processing Centers	6
Household Hazardous Waste Permanent Facilities	4
Treatment Storage	8
Leaf Compost Facilities	100

Components of Connecticut's solid waste management infrastructure include:

- *Transfer Stations:* There are 180 transfer stations, the majority of which are municipally operated. The transfer stations at the municipal level receive both municipal solid waste (MSW) and oversized MSW (commonly referred to as bulky waste) that can include construction and demolition debris. These facilities then transfer this waste to either in-state or out-of-state landfills or volume reduction facilities. Most transfer stations only aggregate waste and have limited storage capacity.
- *Volume Reduction Plants (VRP):* There are 38 VRPs permitted to process construction and demolition debris and other types of solid waste suitable for sorting/recycling (including clean wood) of which at least 15 are permitted to receive more than 500 tons per day. VRPs are sorting and recycling a portion (10% -20%) of the received waste and subsequently, the remaining solid waste undergoes some form of processing for volume reduction and further disposal at in-state and/or out-of-state permitted landfills.

- *Landfills - MSW Landfills, Bulky Waste/Special Waste Landfills:* There are 29 active landfills, and consist of the following subsets:
  - MSW - There is only 1 municipal solid waste landfill remaining in the State. The Windsor-Bloomfield Landfill is permitted to take both municipal solid waste and construction and demolition debris. The Manchester Landfill is permitted to take only construction and demolition debris.
  - Bulky Waste (BW) - There is 20 active landfills in Connecticut that accept C&D debris/oversized MSW or C&D waste only; only one of these is privately owned and operated. Most of these landfills serve only their communities.
  - Special Waste (SPC) - There are 6 special waste landfills which may receive such wastes as paper sludge, ash sludge, and aluminum residuals.
  - There is 1 landfill that accepts both bulky waste and special waste
  - RRF Ash Residue - There is 1 landfill permitted to receive ash residue. Putnam Landfill, with an expected closure in the year 2017, is permitted to only accept the ash residue generated from MSW RRFs.
- *Resources Recovery Facilities (RRFs) for MSW:* Connecticut is highly dependent on RRFs for municipal solid waste disposal. The State has 6 MSW RRFs, having a combined maximum permitted design capacity of approximately 2.6 million tons per year and currently all are operating at full capacity.
- *Resources Recovery Facilities for Waste Tires*. There is 1 RRF facility in Connecticut (ReEnergy Sterling Resource Recovery Facility) that handles waste tires.
- *Intermediate Processing Centers*: There are 6 Intermediate Processing Centers that can recycle an item(s), then market and deliver for reuse the end product(s). Such facilities are owned by public or private entities or combinations thereof and may offer service on a State, regional, municipal or sub-municipal level.
- *Household Hazardous Waste Permanent Facilities:* There are 4 permanent regional household hazardous waste facilities in New Haven, Manchester, Essex and Willington. The Metropolitan District Commission operates a mobile facility in the Hartford region.
- *Treatment Storage:* There are 8 sites that are permitted for treatment and storage of hazardous waste materials.
- *Leaf Compost Facilities:* There are 100 sites registered with the State that can process leaves on-site.

Other waste handling operations include the following:

- *Aggregate Recycling Facilities*: These facilities operate clean fill, concrete, rubble, and asphalt recycling facilities.
- *Scrap Metal Processors*: The State has several large scrap metal processors that can process metal segregated from construction and demolition.
- *Hazardous waste*: The private sector handles this material and it is shipped out-of-state for recycling or disposal.
- *Biomedical Waste Transporters*: DEEP permits biomedical waste transporters.
- *Asbestos waste*: Asbestos containing material is handled by Connecticut licensed asbestos contractors for removal and disposal.
- *Lead waste*: Lead containing material is handled by Connecticut licensed lead abatement contractors for removal and disposal.

Connecticut's existing solid waste management policies, programs and infrastructure constrain disaster debris management planning in a number of very significant ways:

- *Open Burning:* CGS Section 22a-174 (f) provides the framework under which open burning can be conducted in the State. This statute enumerates certain activities and conditions where open burning may be authorized.
- *Out-of-State Disposal:* Some of the construction and demolition debris (i.e., clean wood, not treated wood) generated by a disaster may, as a last resort in conjunction with open burning, be able to be incinerated in RRFs based on available capacity at these facilities. The bulk of disaster related debris, especially C&D, will ultimately need to be temporarily stockpiled and then disposed out-of-state because of the limited in-state disposal capacity at VRPs.
- *In-state Land filling.* Because remaining landfill capacity is so scarce in Connecticut, land filling must be reserved for MSW that cannot be incinerated in RRFs and for the disposal of asbestos contaminated debris. Any reopening and use of closed and *capped landfills for* these purposes or for disposal of demolition debris will be subject to a critical review, in consultation with USEPA.
- *Segregation Requirements:* In order to minimize expensive out-of-state shipment of materials that could be handled in-state, proper segregation of debris type at the site of generation and at DMS is essential.
- *Debris Management Site (DMS) Demobilization Priority:* If it is necessary to utilize DMS in coastal locations, which in turn may be subject to repeated storm impacts, these sites will need to be de-mobilized as soon as possible in order to prevent environmental damage from future storms.

4.3 Connecticut's Approach to Debris Management

Connecticut's *Disaster Debris Management Plan* functions within the framework of the *State's Solid Waste Management Plan*. Connecticut will approach managing disaster debris management and capacity as follows:

- Divert as much material from disposal as possible through recycling, composting and other legitimate diversion options. The types of materials that could be diverted from disposal could include: vegetative waste (clean wood from brush and trees); building materials (asphalt, brick and concrete); recyclable metals (i.e., abandoned vehicles, white goods; scrap metals); and household hazardous wastes.
- Utilize volume reduction techniques to improve debris management efficiencies and minimize impacts on landfill capacities;
- Use Connecticut's in-state disposal capacity for disposal of disaster debris as efficiently as possible, recognizing that most construction and demolition debris is transferred out-of-state for disposal; also allow for temporary tonnage increases at permitted in-state solid waste facilities on an emergency basis.
- Rely on permitted Transfer Stations to transfer waste that cannot be diverted from disposal (recycling, composting, other) to waste handling facilities out-of-state for disposal.
- Rely on permitted Volume Reduction Facilities to reduce and transfer waste that cannot be diverted from disposal (i.e., recycling, composting, other) to waste handling facilities out-of-state for disposal.
- Consider alternative technologies for managing portions of the debris waste stream, in-state or out-of-state, such as biomass facilities.
- Use approved DMS for processing debris for recycling and disposal.

4.4 Disaster Debris Management Strategies

The *Disaster Debris Management Plan* implemented by Connecticut State agencies and municipalities will be based on recycling and material separation at the point of generation to the extent possible with additional segregation occurring at DMS in order to minimize disposal and reduce potential threats to human health and safety. DMS will be those sites that have been identified by local and State government, and which have been evaluated and approved by DEEP for the purposes of collection, volume reduction, and transfer to final permitted disposal and recycling facilities. DEEP is responsible for the permitting of these sites and will do so through an Emergency Authorization. The goal will be to maximize potential processing and recycling options consistent with the *State Solid Waste Management Plan*. This strategy will be of highest priority and public education together with municipal, State, and federal cooperation will be imperative to effectively carry out this mission. If there is advance warning of the pending event, as there is likely to be with a hurricane, DEEP will participate with DESPP/DEMHS so as to prepare municipal officials and the general public for their roles in debris management. The debris segregation requirements, hazardous waste management procedures, and DMS plans will be reviewed. Access to the selected DMS will be secured. State and municipal equipment that will be needed in the clean-up will be moved to safe locations. Public announcements will be made regarding the potential hazards of moving storm debris, the rationale for and importance of debris segregation requirements, and the location of household hazardous waste aggregation facilities.

4.4.1 Management and Disposal of Various Debris Types

The types of materials generated from disasters and requiring management can include:

- clean wood from brush and trees;
- putrescent municipal solid waste;
- construction and demolition debris from damaged structures;
- white goods;
- household hazardous waste from damaged residences;
- hazardous wastes;
- aggregate (asphalt, brick, concrete);
- scrap metal;
- electronic waste;
- soil, silt, and sediment (uncontaminated; contaminated);
- animal mortalities;
- waste tires;
- abandoned vehicles and abandoned boats; and
- utility-related debris.

Volume reduction methods that will be implemented for cleanup operations will include primarily grinding and chipping, and in the most dire situations burning or incineration. Open burning must be authorized by DEEP. Additionally, the techniques for open burning must use FEMA recommended air curtain pit incineration methods or a mobile air curtain burner, or other alternate methods as approved by FEMA and the State. This is the least preferred option, and will only be considered if no other debris management options are available. Recycling will be considered early in the debris clearance, removal and disposal operation because it presents the best opportunity to reduce the overall costs of cleanup. Metals, green waste, aggregate and sediment/soils are prime candidates for recycling. The cost of chipping and grinding green waste is basically equal to that of incineration. However, there are significant differences in volume reduction. Incineration, for example, reduces the volume approximately 95%, leaving only an ash residue for disposal. Depending on the waste stream, chipping and grinding can typically reduce the volume on a 4-to-1 ratio (4 cubic yards is reduced to 1 cubic yard) or by 75%. For the October Snowstorm, the ratio AshBritt was able to achieve fluctuated between 5:1 and 6:1. The

ratio was achieved because of the nature of the woody debris – almost all tree limbs and branches which could easily be chipped, thereby achieving a greater reduction ratio.

For chipping and grinding to be feasible, the 25% of volume remaining in a 4:1 reduction ratio, must have some benefit or use. The ability to use the recycled wood chips as mulch for agricultural or erosion control purposes, or in the landscape industry and even for a fuel for industrial heating or in a cogeneration plant will negate the need to incinerate clean wood, provided separation of clean versus treated wood has been accomplished. Clean wood, namely green waste, should be managed within each municipality and can be done without creating significant environmental hazards. However, for massive amounts of green waste, it may be necessary to transport it out of the municipality to a regional DMS. This was not the case for the October Snowstorm or Tropical Storm Irene, but a larger storm event (i.e., a Category 3 Hurricane) would no doubt require larger, more expansive sites that could accommodate both state and municipal debris.

Asbestos contaminated material (ACM) must be collected, properly contained, and disposed of as quickly as possible and other hazardous wastes must be handled separately from other debris in order to ensure public and worker safety and in order to prevent portions of the waste stream which can be recycled or disposed as solid waste from being contaminated with hazardous wastes.

Management Recommendations for Major Types of Debris: For the purposes of this Plan, debris categories are named for the most likely items requiring management after a disaster event and shall be managed as follows:

1. Green Waste/Vegetative Debris

For the purposes of this Plan, green waste is that portion of the clean wood waste stream consisting of vegetative debris including all portions of a damaged or downed tree to include the stump, limbs and other brush.

The management of green waste/vegetative waste on State and municipal property and right-of-ways will be both a State and municipal responsibility. The management of trees damaged during a natural disaster event is based on a number of factors and includes determining whether a tree is hazardous or non-hazardous based on the following:

- Dangerous hanging limbs having a diameter of 2" or greater above the right-of-way;
- Fallen and leaning trees within the ROW, including trees extending onto the right-of-way from private property; and
- Dangerous and exposed stumps.

Green waste will be separated from other debris, cut to manageable size, and transported to State DMS or municipal debris staging sites in the towns where generated. In a worst-case scenario, regional wood waste sites will be designated. The brush should be chipped while the wood is still green and the limbs and trunks processed into firewood or wood chips. Many municipalities have chippers and some have tub grinders; there are also commercial services available. The resultant processed wood material can be provided to residents or sold to commercial landscapers. It can also be used as a carbon source in composting animal carcasses and municipal solid waste during a debris management crisis. If the amount of stored wood exceeds the needs of the municipalities and landscape industry, then the wood may be sent to a final destination site, either municipally owned or in private ownership. If the final destination site is not permitted, state agencies and municipalities may contact DEEP to request an Emergency Authorization for the storage of processed wood, typically first grind wood chips. The scope of authorization will be 1) to store and manage wood chips resulting from processing of green waste generated by the storm event and 2) Designate a location for the management of wood chips resulting from the processing of green waste generated by the storm event. While incineration is an option, it does

not follow the preferred SWMP hierarchy. All green waste generated in a county under the Emerald Ash Borer ban must be managed accordingly.

2. Putrescent Municipal Solid Waste (MSW)

For the purposes of this Plan, the putrescent portion of the MSW is considered as primarily food spoilage and contaminated or damaged recyclables such as wet or mildewed newspaper, cardboard, etc. which requires immediate disposal.

The preferred management approach for MSW is for this waste to be processed at a resources recovery facility (RRF). There is the expectation that normal operations will resume for weekly garbage collection. If at all possible, this waste should be containerized at the curb for collection to be brought to one of the in-state MSW RRFs. However, the amount of MSW requiring disposal may increase significantly in times of an emergency as businesses, residents, and institutions are forced to dispose of damaged consumer goods. Therefore, some portion of one or more DMS may have to be dedicated to the collection and storage of putrescent MSW. DEEP will coordinate with the DPH and DESPP/DEMHS on a notification procedure to the public regarding food spoilage and special emergency procedures for the collection and/or drop off for this waste type. To the extent that there are facilities available for the processing of food waste, efforts will be made to direct appropriate materials to these facilities. If the State's MSW RRFs' burn capacity proves to be insufficient because of the amount of disaster-related MSW, or if one or more of the facilities cannot operate due to storm damage, MSW will have to be disposed of at in-state landfills or transported to out-of-state facilities. The in-state Resources Recovery Authorities, in consultation with the owners and operators of the active in-state landfills, will be required to organize the allocation of MSW among the facilities and make arrangements, as necessary, for the transport of excess MSW out-of-state.

3. Construction and Demolition Debris (C&D)

For the purposes of this Plan, C&D consists of debris resulting from structural damage to buildings as well as buildings that will require demolition as a result of the disaster event, and will include items such as aggregate (concrete, brick, block), wood (both clean and treated), roofing and siding materials, wallboard, metals, carpeting and flooring, insulation, glass, tile, window coverings, plastic pipe, heating and ventilating, and air conditioning systems and their components, light fixtures, furnishings and fixtures.

Debris from structural damage to buildings, bridges, roads, etc. will constitute the State's largest debris management problem. Prior to moving such debris, municipal fire officials must consult Superfund Amendments and Reauthorization Act (SARA) Title III: The Emergency Planning and Community Right-to-Know Act (EPCRA) information to determine whether hazardous materials or waste is likely to be encountered. Such information is available through Local Emergency Planning Committees and the Regional Local Emergency Planning Committees. DEEP will assist with this task. They must also screen for large quantities of asbestos (siding, roofing, pipe wrap, etc.) and leaking oil tanks. For asbestos, USEPA's December 2009 publication entitled Guidance for Catastrophic Emergency Situations Involving Asbestos, EPA 340/1-92-010, serves as effective guidance in managing this material. The guidance has been updated since its previous 1992 publication and discusses specific events that occurred since that time contributing to the updated guidance.

Methods for handling these wastes are described below. Any scrap metal or clean rubble must be kept separate. The balance of the material will be loaded and trucked to a storage and processing site.

Non-Asbestos containing waste: C&D that is free of asbestos will have to be reduced in volume and sent to a permitted in-state volume reduction facility that handles C&D. Most of the C&D that is processed at Connecticut volume reduction facilities for C&D is then sent to out- of-state landfills for disposal. It is

anticipated that in a catastrophic natural disaster, such as a Category 3 hurricane or higher, there will be far more C&D requiring disposal management than can be handled by the existing in-state volume reduction facilities and landfills. Hence, the need for DMS. The importance of pre-positioned contracts, previously arranged by the State, regional trash authorities, or the municipalities will ease the burden by providing for processing and transport from the DMS to the out-of-state landfills. Processing to reduce the volume of C&D should include, if possible, the removal of metals and aggregate such as brick, block, and concrete. DEEP has prepared an environmental program fact sheet on renovation and demolition activities that cover much of the same type of waste material that could result from a disaster incident. The fact sheet outlines environmental, health and safety requirements concerning: asbestos; lead-based paint; fugitive dust and air emissions; C&D waste; treated wood; land-clearing debris; chemical products; mercury; PCBs; used electronics and batteries; contaminated equipment/structures/soil; air conditioners and refrigeration equipment; underground storage tanks; site cleanup issues; spills; and drinking water supplies. For more information, access DEEP website at:
http://www.ct.gov/deep/cwp/view.asp?a=2718&q=325410&depNav_GID=1646

Asbestos containing waste: Suspect asbestos-containing materials (ACM) shall be either treated as ACM, or sampled and analyzed for asbestos content. The identification of ACM shall be made by an asbestos consultant licensed by the Department of Public Health (DPH), with certification as an Inspector or Management Planner, or by individuals identified by the DPH as appropriately qualified. Materials that are sampled for asbestos content must be analyzed at an environmental laboratory certified by the DPH. Whenever feasible, asbestos-containing debris shall be segregated from non-asbestos containing debris. In the event that the asbestos-containing debris cannot be segregated from other construction debris, all debris must be disposed of as asbestos-containing waste. Asbestos-containing debris must be adequately wetted during the process of collection and processing, and must remain adequately wet while packaged and placed in a waste container for disposal. Asbestos-containing waste shall be appropriately labeled and shall be disposed of at a waste disposal facility authorized for disposal by DEEP, or if disposed of out-of-state, at an authorized waste facility within that jurisdiction. Asbestos destined for a Connecticut disposal facility typically must first be authorized by DEEP through a special waste authorization letter. Asbestos abatement shall be conducted in accordance with applicable federal, state, and municipal requirements. These shall include, but not necessarily be limited to, the asbestos National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61, Subpart M), the DPH regulations (*Standards for Asbestos Abatement, Licensing and Training Requirements for Persons Engaged in Asbestos Abatement and Asbestos Consultation Services, and the Asbestos-Containing Materials in Schools regulations)*, and Department of Labor regulations.

4. White Goods

For the purposes of this Plan, white goods are a category of scrap metal and include appliances such as stoves, refrigerators, freezers, dishwashers, washers, dryers, microwaves, air conditioners, other similar types of appliances.

White goods should be segregated curbside to the extent it is necessary to then stage white goods at an authorized DMS or permitted solid waste facility. White goods must be stored in an area separate from other solid waste, preferably on an impervious surface, and must be stored in a manner that prevents vector and odor problems. White goods shall be removed from a site within 90 days to the extent practicable. PCB capacitors and Freon may be contained in old appliances. Until white goods arrive at their final destination, they should be handled in a manner that will prevent a release of refrigerants. Freon shall be required to be removed from any white goods at a DMS or final recycling/disposal facility.

Scrap metal dealers will be required by Emergency Authorization to remove any capacitors and capture any Freon prior to processing the appliances. Typically, municipalities are responsible for removing the Freon and capacitors, but the emergency may prevent them from spending time to do this. FEMA project

record keeping requires written verification that Freon has been removed from each unit. In addition to the removal of PCBs and Freon from white goods, putrescent MSW will also have to be removed and disposed of properly.

5. Household Hazardous Waste (HHW)

For the purposes of this Plan, HHW is considered to include, but not be limited to, items such as automobile fluids, batteries, paints and stains, cleansers, photo chemicals, lawn-care chemicals, and pesticides.

Prior to a disaster, DEEP encourages residents to take advantage of local household hazardous collection programs to clear out hazardous products before a disaster strikes, thereby limiting the amount of hazardous products that will need to be managed once an incident occurs. If storm damage is such that HHW can be containerized by residents at the point of generation, instructions will be communicated to residents as to the best management practices for curbside containerizing of HHW or for containerizing and transporting to a temporary debris staging site. Curbside containerized HHW will then be transported to a pre-identified local or regional temporary aggregation site which might include a public works garage, transfer station or some other temporary location where the waste materials can be stored until an authorized HHW contractor can be brought in to deal with the material. Private contractors will be directed to separate any HHW that may be mixed with other waste at the curb and to take the HHW only to a pre-identified temporary HHW aggregation site. Some municipalities may have access to qualified contractors from conducting HHW cleanup days. There are four regional HHW facilities in the state. They are located in Essex, New Haven, Manchester, and Willington. All four facilities are permitted by DEEP, and are operated by Clean Harbors. During an emergency cleanup operation, the Commissioner, through an emergency authorization, may waive or adjust permit requirements like scheduling where calling ahead to drop off waste items is usually required. The municipality may also choose to have a trained person (40 hour HAZWOPER) supervise the receiving of waste items after normal operating hours, or the HHW contractor(s) may provide additional staff as necessary to operate the facilities beyond normal operating hours.

6. Hazardous Waste

Hazardous waste will include materials like petroleum-contaminated media, chlorofluorocarbons (CFCs), and all other substances as defined in 40 CFR (Code of Federal Regulations) 261.3.

Hazardous waste, once identified by private owners or State and local officials, must be segregated from other disaster-generated waste, stored separately, and ultimately disposed of at a permitted commercial hazardous waste disposal facility out-of-state. The Toxicity Characteristic Leaching Procedure ("TCLP") is generally required to determine if a waste is toxic (Section 22a-449(c)-101(a)(1) of the Regulations of Connecticut State Agencies, incorporating 40 CFR 261.24). However, generators may use knowledge of the material to manage as hazardous waste without conducting analyses. These materials must be handled by Connecticut licensed Hazardous Waste Transporters and licensed Spill Response Contractors. If hazardous or unknown materials such as lead, PCBs solvents, pesticides, herbicides, pool chemicals, industrial grade cleaning solutions, and other similar types of materials are discovered during a demolition or cleanup, the materials should be staged separately and with secondary containment to collect leaks and prevent further mixing with other hazardous waste or incompatible chemicals. If possible, the material should be segregated from the rest of the demolition and cleanup. During a debris management crisis, owners would be responsible for notifying DEEP's Emergency Response and Spill Prevention Division at 860-424-3338 of spill releases that pose a potential threat to safety, health, and the environment. For more information related to managing PCB containing disaster debris, see the USEPA document entitled "Planning for Polychlorinated Biphenyl (PCB) Containing Disaster Debris, June 2011 (http://www.epa.gov/wastes/homeland/docs/pcb-disposal.pdf.). This document supplements the USEPA's

"Planning for National Disaster Debris Guidance" (Document ID Number EPA530-K-08-001) located at http://www.regulations.gov/#!documentDetail;D=EPA-HQ-RCRA-2008-0329-0186.

7. Aggregate (Fill Materials)

For the purposes of this Plan, aggregate is defined as clean, uncontaminated brick, block, concrete and asphalt.

Clean, uncontaminated asphalt, brick and concrete can be reused. Concrete that has been contaminated by a petroleum product or chemical spill as a result of a natural disaster event should be prepared for disposal with other construction and demolition materials. Clean materials can be transported to aggregate recycling facilities within the State. Aggregate materials should be placed in a separate pile curbside for collection.

8. Scrap Metal

For the purposes of this Plan, scrap metal refers to ferrous metals such as structural steel and steel framing members and non-ferrous metals such as wiring/conduit, plumbing (pipes and fixtures) and HVAC materials (ductwork, motors). White goods are considered as scrap metal, but are described separately.

Scrap metal, to the extent possible, should be segregated at the curb for collection and brought to a DMS or directly to a scrap metal processor located in the State. Handling scrap metal from stray and abandoned vehicles is covered under the section dealing with *Stray and Abandoned Vehicles and Vessel.*

9. Electronic Waste

For the purposes of this Plan, electronic waste (e-waste) includes items such as stereos, televisions, VCRs, DVD players and computers and peripheral accessories, telephones, and other devices.

E-waste should be segregated to the extent possible at the curb. Most e-waste contains hazardous materials like lead and a host of other toxic substances that should be kept out of the landfills. DMS should allocate a discrete area for the collection and storage of e-waste. E-waste that is transported to a DMS shall be managed in accordance with Connecticut's Universal Waste Rule as found in Section 22a-449 of the Regulations of Connecticut State Agencies. For more information on Universal Waste Rule, access DEEP's website at: http://www.ct.gov/dep/cwp/view.asp?a=2718&q32542#top

10. Soil, Silt and Sediment (Uncontaminated; Contaminated)

For the purposes of the Plan, contaminated soil, silt and sediment can be defined as residuals deposited by receding flood waters which may include historical sediment from nearby water bodies, soil from yards, road and construction debris, and other material.

Uncontaminated: This is material that has not been subjected to spills, floodwaters or has been determined by analytical testing to be not contaminated. This material could be transported to a staging area until final disposal or reuse has been determined.

Contaminated: The sediment left behind after receding flood waters and washouts often contains a wide variety of pollutants including fuel oils, gasoline, human and animal waste, metals, and other materials. As a result of certain conditions, some soils may exhibit visible or known traces of petroleum or chemical spills. These soils should be excavated and placed in weather-tight containers, such as a covered and lined roll-off or inter-modal container. If these containers must be stored temporarily, they should be placed on an impervious surface, such as a concrete or asphalt parking lot for no more than 90 days. This material could be transported to a staging area until final disposal and reuse has been determined. If necessary, analytical testing should be performed to determine if the material can be reused or must be

disposed. If it is evident that the spill is the result of an empty or leaking piece of equipment (e.g., electrical equipment or similar source) which has not been tested, some testing of the soil may be necessary to identify if PCBs are present. PCB containing materials must be sent to a Toxics Substance Control Act (TSCA) or hazardous waste landfill outside of Connecticut. There are no PCB disposal facilities in Connecticut. Testing must be by USEPA-approved method 8082. If material is contaminated by a piece of PCB equipment, the equipment must be addressed by containerizing the entire item, if small enough or by draining the remaining fluid into drums and disposing of both the fluid and empty machine carcass at TSCA disposal facilities out-of-state. Empty equipment that has contained fluid with less than 50 ppm, once drained, can be managed as scrap metal provided it contains no free flowing liquid.

Used sandbags should be considered contaminated and should be collected, transported, and disposed of as directed by the State.

11. Animal Mortalities

For the purposes of this Plan, animal mortalities are defined as a significant loss of livestock, pets, and/or natural wildlife.

Catastrophic animal mortalities, if they occur, would more likely be seen along the shoreline and along major river flood zones. These could include fish hatcheries, livestock, and horses. Incidental occurrences of small companion pets, such as dogs, cats, rabbits, etc. may be buried on-site or containerized and disposed curbside as MSW. Historically, massive animal disposal from disease outbreaks or barn fires has taken place at landfills and resources recovery facilities. While both of those disposal options still exist for management of disaster-related animal mortalities, capacity is limited at both. Composting is a method that other states have adopted in their emergency plans for dealing with catastrophic farm animal mortalities, and could be employed in Connecticut. In 2006, DEEP provided input into the State's Draft Pandemic Response Plan, Department of Agriculture and DESPP/DEMHS with regard to the disposal of poultry, products and contaminated articles. In 2007, the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) released a guidance document entitled *Catastrophic Mortality, Large Animal Disposal, Pit Methods-State of Connecticut (http://www.ct.nrcs.usda.gov/Soil_Pages/trench_summary.html.)*. This guidance outlines a method of disposing of large volumes of dead animals by placing the carcasses in successive layers in an excavated pit. In the event of an unexpected disaster, the federal NRCS maintains a listing of suitability for Catastrophic Mortality, Large Animal Disposal by soil component. Decisions about the disposal of large amounts of animal carcasses must be made on site specific information, including whether the animals are infectious; the location, number and type of carcasses; and the site characteristics that may limit on-site management. In the event of a catastrophic event, State and federal health and agricultural agencies should be consulted regarding the appropriate disposal method. Decisions on the disposal will be made in conjunction with DEEP, DPH, and Connecticut's Department of Agriculture; further consultations may be made with the appropriate federal agencies.

12. Waste Tires

For the purposes of this Plan, waste tires are defined as all tires that have been separated from the vehicle to which they belonged.

Tires that are collected curbside or collected from other properties as a result of cleanup efforts will be kept separate and stored and disposed of as a special waste. When stored at a DMS, they shall be kept dry and preferably containerized. To the extent possible, tires will be transported to: a tire recycling facility in Connecticut; the tire resources recovery facility in-state; or as a last resort, an out-of-state facility for recycling or disposal.

13. Utility Related Debris

For the purposes of this Plan, utility related debris is defined as power transformers, utility poles, cable, and other utility company material.

The public utilities, such as electric utilities, are responsible to remove and dispose of all their respective utility related debris, in accordance with their normal protocol. Additionally, municipal utilities (Bozrah, Groton, Norwalk, Norwich, and Wallingford) are responsible for removal and disposal of all their respective utility related debris. Non-utility private entities, such as private companies like manufacturers or facilities such as schools, shopping centers, etc., are responsible for removal and disposal of all their respective utility related debris. There is an exception where a situation exists on private property that necessitates that the State or its designated agent needs to correct or alleviate, as expeditiously as possible, serious disaster or emergency-related conditions which present continued threats to the health or welfare of the residents of the State. In all cases, management of this type of waste must be managed in accordance with applicable federal, state and local regulations.

During Tropical Storm Irene in August of 2011, there were approximately 295 transformer releases with 5% of those involving PCBs greater than 55ppm, with another approximately 10% containing lower levels of PCBs. During Hurricane Sandy, there were approximately 469 transformer releases with 2.5% of those involving PCBs greater than 55ppm. The clean-up contractor for this specific waste stream was dispatched in real-time with staff manning the utility storm center. The utilities provided DEEP with updated spill information several times per day. All PCBs were manifested for disposal to a permitted facility outside of Connecticut as there are no PCB disposal facilities in the state.

14. Stray and Abandoned Vehicles and Vessels

For the purposes of this Plan, abandoned vehicles are defined as cars, trucks, motorcycles, or recreational vehicles. The definition of abandoned vessel as expressed in CGS Section 15-140c is a vessel left unattended for more than 24 hours on the waters of the state not moored, anchored, or made fast to the shore; or a vessel left on the property of another for more than 24 hours without the consent of the property owner. For abandoned vehicles and boat recovery in waterways, the following document will also serve as guidance: FEMA Recovery Policy RP9523.5, Debris Removal from Waterways; issued October 30, 2012.

Stray and abandoned vehicles (trucks, cars, and motorcycles) and vessels can impede response efforts by blocking access to roadways and waterways and can impact private property. In the event of a disaster emergency or civil preparedness emergency, CGS Sections 28-9c and 28-11 would authorize the taking of property and provide a means for the owner to obtain just compensation, consistent with basic constitutional requirements. In order for removal of vehicles and vessels to be eligible under FEMA reimbursements, the applicant must demonstrate the following:

- The vehicle or vessel is presenting a hazard or immediate threat (i.e., blocking ingress/egress, located in a public use area);
- The vehicle or vessel is abandoned (i.e., vehicle or vessel is not on the owner's property and the ownership is undetermined);
- Applicant must follow the local ordinances and state law by: securing ownership, verifying chain of custody, transport, and disposal of the vehicle or vessel; and
- All supporting documentation relating to removal of abandoned vehicles or vessels must be submitted to FEMA for reimbursement.

For the recovery and removal of stray and abandoned vehicles and vessels, the work will most likely be performed by the State's debris management and monitoring contractors. The contractors will be responsible for providing vessels, experienced personnel, standard equipment and accessories, fuel, and use of the most cost-effective technology for this type of work.

The State's Contractors will work with the State to secure sites where vehicles and vessels can be stored until demobilization. Sites should be level, clean, dry and have a firm surface and be accessible by recovery and remediation vehicles and equipment. Each site will require an evaluation and be prepared with regard to issues of ingress and egress, highway access, neighborhood concerns and soil conditions. The Contractor will be responsible for mobilization, build-out of site, operations at the site, and demobilization.

Stray and Abandoned Vehicles: The removal and recovery of stray and abandoned vehicles within the public right-of-way needs to be a cooperative effort between, local governments, and the State debris removal contractor. Those state and local officials that will be critical to the operations are the State Department of Motor Vehicles (DMV) and state and local law enforcement officials. The basic procedure will be to use licensed towers/wreckers to transport collected vehicles to an authorized secured aggregation site. Once at the aggregation site, these vehicles will be inventoried for such information such as vehicle make, model, VIN number, plate number, extent and type of damage, and other related information. Vehicles will be stored in a manner to permit inspection by State authorities as required, or for reclamation by owners. Vehicles shall be discharged to appropriate entities for disposal, recycling, or other appropriation as determined by the State, after clearance through applicable State and/or local protocols and after documentation. Protocols for the removal of vehicles that may end up on private properties will need to be established by the State.

In addition to any information which the DMV may require, the State's contractor will be required to provide the following additional information:

- The date and time the vehicle was towed;
- The location from which the vehicle was towed;
- Documentary proof of the results of the National Crime Information Center check for every vehicle in its possession;
- Complete documentation of any sale or disposition of each vehicle, including documentation of all efforts to determine the identity and address of the owner and lien holder (if any), as well as copies of all notices sent to the owners and any lien holder; and
- If the vehicle was claimed by the owner, lien holder, or authorized agent, the date, time, and name of the person the vehicle was released to, as well as a complete listing of all charges and fees assessed.

The State's contractor will need to collect all applicable fees, including the cost of recovery, transport and storage prior to releasing the vehicle to the owner, lien holder, or authorized agent and net the amounts from the bill to the State.

Stray and Abandoned Vessels: Unless such authority is suspended or superseded by the Governor during an emergency or preempted by federal law, it is important to defer to the authority established in state law regarding the removal and processing of displaced or abandoned vessels. The authority will vary depending on where and how the displaced vessel has come to rest. Under current law, DEEP's Boating Division administers the abandoned boat law (CGS Section 15-140c) in cooperation with the DMV; the ConnDOT administers Harbormaster law (CGS Section 15-1 et seq.). Both will be important in a mass displacement event.

For those vessels, floating or not, that are moored to tackle that have been displaced and come to rest within the waters of the state, the harbormaster (where extant) with jurisdiction over the area where the vessel has come to rest has authority. The law provides a harbormaster with the authority to station and re-station vessels, to declare vessels derelict, and with associated cost recovery tools that are not available

elsewhere (CGS Section 15-1 et seq.). A harbormaster may also secure a free floating or grounded and unattended vessel and bring it under his or her authority. Harbormasters are agents of ConnDOT.

For those vessels that are found free floating and that are unattended for more than 24 hours, and for those that have come to rest on a property without the consent of the property owner (having been at rest for more than 24 hours), the person who collects the vessel from the water, or the person on whose property the vessel comes to rest, has the authority to initiate the abandoned boat process under CGS Section 15-140c. It should be noted that vessel ownership information is kept in qualified confidentiality by the DMV, and that certain procedures are in place that allow an aggrieved landowner to obtain vessel ownership information. It is also important to note that the DMV and DEEP have developed an abandoned boat process that, if followed, provides for notification of the last owner of record and, if unsuccessful in causing the removal of the vessel by the owner, allows the aggrieved landowner to gain control of the vessel after the completion of a sixty-day process. Unless preempted by superseding emergency-related law, this is the procedure under which most abandoned vessels will be processed.

Maritime Law and Salvage Operations: It is likely that in the aftermath of a mass displacement event salvagers may attempt to recover sunken vessels and/or vessel in peril as a business venture. This is an ancient practice with a long international body of law supporting it, and it is important to allow it to proceed if someone has undertaken a salvage operation (unless avoidable environmental harm is being caused). Note, in order for an operation to be considered salvage, a vessel must be in peril and the owner must be unreachable or must give acquiescence. A salvager may remove the vessel from peril (un-ground it, re-float it, etc.) and may make a claim against the owner of the vessel for a substantial percentage of the value of the vessel and any cargo. That having been said, private owners may independently hire salvagers to recover their vessels. While not technically a "salvage" operation, there is no reason to interfere with such operations unless they are causing harm to the environment.

Agency Cooperation: The removal and recovery of displaced and abandoned vessels within the public right-of-way may need to be a cooperative effort among State and local governments as well as the State's debris removal contractor. Additionally, coordination with federal agencies, such as the USCG, FEMA, and USACE may also be necessary. As stated above, removal of vessels meeting the conditions identified below may be eligible for FEMA reimbursements:

- The vessel is presenting a hazard or immediate threat (i.e., blocking ingress/egress, located in a public use area); and,
- The vessel is abandoned (i.e., vehicle or vessel is not on the owner's property and the ownership is undetermined).

In order to be eligible for reimbursement, the applicant must be able to demonstrate the following:

- The applicant must follow the local ordinances and state law by: securing ownership, verifying chain of custody, transport, and disposition of the vessel; and
- All supporting documentation relating to removal of vessels must be submitted to FEMA for reimbursement.

Recovery of vessels will begin with the State's debris removal contractor identifying the vessel using GPS coordinates. The debris removal contractor will first inspect the vessel and make a record of the vessel location, description, registration number, hull identification number, size and the type and extent of damage. Prior to loading, the State's contractor will mitigate for any fluid leaks before transporting the vessel to the aggregation site. Vessels will then be processed at the aggregation site. During storage, vessels will be checked for leaks of fuels or other hazardous liquids. If leaks are found, they will be mitigated by the contractor to include the removal of bilge fluids and damaged batteries. For safety purposes, battery cables will be disconnected from undamaged batteries.

Displaced Vessel Aggregation: The basic procedure will be to recover and tow displaced and abandoned vessels to an authorized secured aggregation site, whether this aggregation site is on water or on land. The condition of the vessel should be documented as soon it is safe to do so. Once at the aggregation site, the vessels will be inventoried using their existing registration number, or if not present, hull identification number. If neither number is present, a unique tracking number should be assigned. Such numbers will be used to monitor the vessel through each step.

The State debris removal contractor will secure the aggregation site and provide access to owners, lien holders, and their authorized agents or legal representatives at set times for the purpose of identifying and/or representing vessels in which they have a legal interest.

It is important that vessels aggregated on the water be left on the water if possible, and at a location under the authority of a cooperative harbormaster. This will allow the harbormaster to invoke existing law with respect to vessel stationing and full cost recovery, as well as vessel disposal for derelict vessels. Boat owners will be asked to assume vessel removal costs regardless of the condition of the boat, but current law makes this difficult to enforce except in the case where a vessel can be removed under harbormaster law.

15. Disaster Debris in the Marine Environment – Waterway Debris

In a catastrophic storm event, the categories of debris previously described are not only dispersed on land, but also in streams, rivers, coastal marshes and wetlands, and offshore areas of Long Island Sound, either originating from Connecticut or Long Island. Waterway debris can be invisible, making it difficult to locate, avoid, and remove. It can damage fishing boats and fishing gear, cripple fishing operations and prevent commercial and recreational activities in affected areas.

Removal of waterway debris in shipping channels is usually addressed by the USACE in order to open these vital transportation and commercial routes quickly. However, there currently exists no established mechanism to plan for, survey, and remove waterway debris in areas outside of major shipping and navigation channels in affected waterways of Connecticut, and no existing guidelines to facilitate such a process. At some point, much of the debris is likely to wash up on shore and once deposited above the mean high water line becomes the property owner's responsibility. Even while below the mean high water line, the littoral property owner may have some responsibility (see CGS Section 22a-363e below), though this is not likely to be a very popular option.

> **CGS Sec. 22a-363e. Failure to comply with order. Littoral owner as responsible party.** When, notwithstanding any request for a hearing or a pending appeal, any person fails to comply, within a reasonable time as established by order of the commissioner, with any requirement to discontinue, remove or otherwise abate or alleviate any condition found by the commissioner to constitute an imminent and substantial hazard to public safety or navigation or likely to cause imminent and substantial damage to the environment, the commissioner shall have authority to remove, abate or alleviate any such condition. The commissioner may assess reasonable costs and expenses incurred in such removal, abatement or alleviation against the person responsible. The Attorney General shall, at the request of the commissioner, institute proceedings to collect any such assessment. For the purposes of this section, in the event that the person responsible for causing, retaining or maintaining such condition cannot be determined, the littoral owner shall be deemed to be the responsible person except in the case of vessels abandoned on the property of such owner. Nothing in this section shall be construed to preclude the commissioner from exercising any other enforcement authority.

Acknowledging the experience that New Jersey undertook as a result of Hurricane Sandy, the State's contractors may be activated to accommodate large scale removal operations of waterway debris. The State's contractor, as directed, will identify submerged debris in waterways, removing debris from State-owned waterways, disposing or recycling of debris, and dredging and redistributing sand as necessary. The State and its contractors will ensure that all work performed is eligible for FEMA Public Assistance grant funding and is performed in accordance with FEMA regulations, policies, and guidance.

Based on field observations and aerial reconnaissance, the impacted coastal and river waterways will be divided into zones for waterway debris removal and they will be ranked for complexity of debris removal operations, anticipated volume of debris, and other factors. This task will be done by the Contractor with the assistance of the DEEP Office of Long Island Sound, Coastal Planning Division and the USACE. As in the case of Hurricane Sandy, zones will extend inland to the farthest extent of a storm-related tidal surge as defined by FEMA.

The State's contractor will take the lead in submitting to the IDMTF a detailed debris removal and management "Zone Work Plan" (ZWP) for each zone impacted by the storm. Each work zone can further be divided into smaller more manageable work zones or sub-zones. The ZWP will include a defined Concept of Operations and Work Strategy, work flow, Organizational/Management Structure, zone Safety Plan, off load points, dock facilities and any other project specific items as identified by the IDMTF. Each ZWP will be submitted for approval prior to beginning any work.

The State contract's specifications will detail the operation for waterway debris removal. In general, the following are some of the contract specifications:

- The contractor will be responsible for performing a pre-removal assessment, using the most cost-effective technology, to document waterway debris prior to commencing debris removal. The Contractor must present a plan to the IDMTF for approval indicating the areas in which it seeks to perform a pre-removal assessment. The plan must include specific areas to be scanned and supporting reasons for a scan of that area including, but not limited to, an explanation of tidal forces moving debris to particular areas.
- Debris removed from the waterway sorted prior to or at the time it is removed from the Contractor's boats/barges and placed on shore for final disposal.
- Dredging of sand will not begin until all eligible debris overlying the sand is removed.
- Freon will be removed for recycling from white goods prior to hauling to an approved landfill.
- Care will be taken by the contractor to minimize impacts to coastal marshes and wetlands and aquatic vegetation as well as destruction to shellfish beds when conducting waterway debris removal operations. The Contractor will be required to have a Connecticut approved plan for avoiding or minimizing physical injury to natural resources while removing debris, avoiding or minimizing releases of hazardous substances or oil while removing debris; characterizing and responding to releases of hazardous substances or oil occurring during debris removal; remediating the release of a hazardous substance or oil, if it occurs; characterizing injuries to natural resources and public use of those resources in the event of a hazardous substance or oil release; identifying potential projects/measures to restore or compensate the public for demonstrated natural resource injuries; and rehabilitate oiled or injured wildlife.
- Before reporting that all work has been completed in a zone, the Contractor will utilize side-scan sonar, LIDAR or other cost-effective and appropriate technology to

ascertain that all eligible debris has been removed from the waterway and provide written verification of such.

4.5 Managing for the Potential of Human Remains

If suspected human remains (defined as dead bodies, tissue and/or teeth and bones) are found during the debris removal process, the State's debris removal contractor will immediately stop all operations in the area where the remains were found and take measures to secure the area from further disturbance. The State's debris management contractor's project manager will notify the state and local law enforcement officials, as well as the IDMTF of the situation. Strong coordination efforts are needed in response to this sensitive issue. The law enforcement officials, with support of the State's medical examiner, if necessary, will properly document the situation and collect the remains and other items deemed appropriate. Operations may resume once the law enforcement officials notify the Interagency Debris Management Task Force that the site has been released.

This page intentionally left blank.

CHAPTER 5
PLANNING and OPERATIONS: Debris Management Sites and Concept of Operations Plan

5.1 Overview of Chapter

All activities associated with massive debris clearance, removal, and disposal activities depend upon the availability of suitable sites for managing debris. In major disasters, there may be insufficient landfills to handle the debris in a timely fashion. State agencies and communities may use temporary DMS to store, segregate, or reduce the volume of debris. To appropriately plan for and incorporate social, economic, and environmental considerations, it is important that DMS planning be conducted prior to a disaster event. Further, the effective execution of the *Disaster Debris Management Plan* relies on careful timing and a progression of various tasks and decisions. This is particularly important with regard to the sequence of operations to be followed under the two phases of cleanup.

This Chapter discusses the planning components to be considered with regard to establishing DMS and also discusses the State's Concept of Operations Plan.

5.2 Debris Management Sites[1]

5.2.1 Overview

The importance of having potentially suitable DMS pre-identified and ready for use at all times in the event of a disaster event cannot be stressed enough. The advanced identification and securing/acquisition of DMS is the responsibility of the State and local governments. Debris management guidance from the USACE and FEMA strongly recommends that both State and local governments be responsible for pre-identifying DMS, preferably on public property, though private property should not be ruled out, especially when public property is not available or not as suitable or accommodating. Pre-identification of suitable DMS will allow post-disaster cleanup efforts to begin early and in an efficient manner.

DMS must be approved by DEEP to protect public health and the environment, as well as to ensure that the owner/operator of the DMS be qualified to receive Public Assistance funds from FEMA.

DEEP has pre-identified suitable DMS that may be activated for use through an Emergency Authorization. In developing this Plan, the projections made with regard to the amount of debris resulting from a Category 3 hurricane indicated a range of approximately 18 million tons to 20 million tons (approximately 43 million cubic yards) from a wet hurricane event. To put this amount into context, the State typically processes and manages approximately 5 million tons of solid waste (municipal solid waste; C&D) per year.

[1] Excerpted from the following three documents: FEMA "Public Assistance Debris Management Guide, Publication #325, April 1999, Chapter 2 – Pre-Disaster Planning; www.fema.gov/pdf/government/grant/pa/demagde.pdf; Participant Manual, Debris Management Course, FEMA, National Emergency Training Center, Unit 8 – Selecting and Operating Temporary Storage Sites; Florida DEP Guidance for Establishment, Operation and Closure of Staging Areas for Hurricane-generated Debris, Nov. 19, 2004 (updated Sept. 22, 2005)

DEEP undertook a planning exercise for the purpose of identifying potentially suitable locations for DMS. DEEP reviewed state-owned lands based on a number of environmental criteria, used its GIS capabilities, and conducted site analyses. Most state properties that were investigated were deemed not suitable for debris management. Others were deemed potentially suitable for designation as DMS, but would need prep work before being put into use. Based on the most recent storm events, private properties that were used as DMS remain on the list of future potential sites. The search for additional properties will be ongoing, and will be both public and private sites, depending on opportunities presented.

5.2.2 Environmental Considerations

After a major natural disaster occurs, the emphasis is on rapid debris clearance from the public right-of-ways. The result is that DMS receive debris faster than can be reduced and ultimately disposed of. Consequently, these areas must be properly sited because of the potential of adversely impacting the land, water, and air of the State. These negative impacts could include: surface and ground water contamination, soil contamination, impacts to vegetation, odor, and dust. Therefore, the siting of DMS using the recommended criteria described in the following sections can greatly minimize potential impacts to the environment.

5.2.3 Site Selection Guidelines for Debris Management Sites

DMS are temporary locations that can be used for the duration under a DEEP Emergency Authorization. Consistent with FEMA guidance, State policy and programs, and experience with Tropical Storm Irene and the October Snowstorm, DEEP has assembled the following guidelines for the selection of DMS:

- Pre-designated sites should preferably be on public property and generally consist of an area that, based on the State contractor's opinion, will serve the stockpiling of a particular waste stream, i.e. white goods may need a smaller area, then say, green waste. Therefore, smaller sites may be appropriate based on the type of waste being managed and space constraints. Use public lands first to avoid costly leases. Use private land only if public sites are unavailable or if a particular parcel proves to be user-ready and ideal for debris staging needs. If private lands are utilized for municipal debris management operations, they must have government (or its designated contractor) oversight and management.
- The required size of the site will depend on the expected type and volume of debris to be collected and planned volume reduction methods. As a general rule, larger sites mean fewer sites and, hence, easier site closeout. However, larger sites may create logistical problems.
- Large open sites are needed for any type of debris staging activity. Paved sites are best. Semi-paved or large parking lots paved in stone dust or gravel is the next best option. Meadows are least desirable because they may be inaccessible because of saturated soils after extended and heavy precipitation
- If possible, per FEMA guidance, the soil, groundwater and/or surface water at and near a proposed staging area should be tested prior to receipt of disaster generated debris to establish pre-existing baseline conditions. For storm events, where green waste is the pre-dominate waste stream, it may only be necessary to document pre-existing conditions with either video and/or photographs.
- DMS for debris other than green waste should not be allowed in public source water protection areas including aquifer protection areas, public drinking water supply watersheds, and public well source areas.
- In no case should any DMS be located in or within 100 feet of a wetland area or watercourse.
- DMS for debris other than green waste shall not be located within 200 feet of a watercourse, waterbody, or wetland, unless otherwise approved by DEEP.

- Impacts from noise, dust, and traffic that are tolerated by the public early in a disaster recovery may have to be curtailed later. Avoid locating the DMS near residential areas, schools, and hospitals.
- Sites should not have critical habitat or rare ecosystems, threatened and/or endangered species, historic and/or archaeological sites.
- Sites should have good ingress/egress, preferably with an existing curb cut, to accommodate heavy truck traffic and have a site configuration that will allow for an efficient layout.

5.2.4 Site Operation of a Debris Management Site

DEEP has assembled the following guidance for operating a DMS based on FEMA guidance. DMS should have:

- Visible, demarcated buffer areas at the 200-foot or 100-foot wetland setback line.
- Storm water controls, such as silt fences, to prevent discharge of contaminated runoff into water bodies where such discharge may cause violations of State regulations.
- Some method to control the off-site migration of dust, wood chips, or other debris residuals from vehicular traffic and from the handling of debris and ash.
- An adequate supply of water to ensure that the debris is adequately wet during the segregation, processing and/or packaging of the waste to prevent risk of fire and/or dust migration.
- Some type of access control to prevent unauthorized dumping and scavenging.
- Monitors to correctly identify and segregate waste types, especially hazardous waste from non-hazardous waste, for appropriate management.
- Oversight management for the site.
- Secondary containment for portable fuel tanks, drums, and other fluids for operating equipment and vehicles.
- When staging debris other than green waste, if possible:
  - install wells and perform groundwater sampling;
  - conduct spot soil sampling at "hot" areas such as household hazardous waste (HHW), ash, other waste types;
  - provide specific fuel storage areas;
  - take videos, photos of the site before operations begin;
  - periodically sketch/map layout including "hot" areas; and
  - prepare quality assurance reports, spill reports, etc. as part of the overall project.

5.2.5 Site Remediation/Closure Checklist for Temporary Debris Storage and Reduction Sites

The testing and closure of DMS will be undertaken in accordance with all requirements of Connecticut statutes and regulations and federal laws. The following broad guidelines apply to the closure of DMS:

- Owner/operators of the DMS will be responsible for closure of the site in accordance with DEEP requirements, including environmental sampling, if needed.
- All disaster related debris must be removed by the expiration of the Emergency Authorization and/or General Permit, unless otherwise authorized by DEEP.
- Mulch and wood chips produced from processing uncontaminated green waste may be left on-site if prior approval is obtained from DEEP. DEEP will consider these requests on a case-by-case basis.

Areas that were only used to stage uncontaminated green waste, or ash from authorized burning of solely vegetative debris, will not require any environmental sampling after the debris or ash is removed unless

there is reason to believe that the area may have become contaminated (e.g., significant visible staining or known contaminant releases in the area).

- Areas that were used to stage mixed debris, or ash from burning mixed debris, will normally require environmental sampling after the debris or ash is removed, unless there is reason to believe that no contamination in the area occurred (e.g., the area is paved with asphalt or concrete and there is no visible evidence of staining or known contaminant releases).
- Areas that were used to stage household hazardous waste and hazardous waste will require environmental sampling after all material has been removed from the site. These sites may require possible remediation to meet the goals of the State's Remediation Standard Regulations, Sections 22a-133k-1 through 22a-133k-3 of the Regulations of Connecticut State Agencies (RCSA).
- When sampling of soils and groundwater is needed, it should typically include at least four soil samples and one groundwater sample collected from a monitoring well or direct sampling method in areas showing significant visible staining or areas believed to be impacted by the staged waste or ash. Unless otherwise approved by DEEP, these samples should normally be analyzed for total RCRA metals, volatile organic compounds and semi-volatile organic compounds using approved USEPA methods and DEEP protocols. DEEP may also require other approaches to conducting environmental sampling at staging areas on a case-by-case basis, such as requiring that the site meet the criteria of the Sections 22a-133k-1 through 22a-133k-3 of the RCSA.

5.2.6 Additional Testing Criteria

The following is additional testing criteria that may be required, at the discretion of the Commissioner, under certain debris staging situations:

5.2.6.1 Ash Testing

- All ash piles in mixed debris staging sites should be tested using the Toxicity Characteristic Leaching Procedure. One composite sample from each separate ash pile should be analyzed. A minimum of ten samples taken from different strata within the pile is appropriate to develop the composite sample, and if unacceptable contamination is not found, ash may be transported out-of-state to a permitted landfill or placed in a permitted Connecticut ash landfill.
- If unacceptable levels of contamination are detected, the material should be further evaluated and placed in a permitted ash landfill (if contamination is within permit limits) or a hazardous waste landfill, as appropriate.

5.2.6.2 Soil Testing

- Soils should be tested for the presence of volatile hydrocarbon contamination. Samples should be taken immediately below the surface. This testing should be done if it is suspected that they were hazardous materials, such as oil or diesel fuel spills, dumped on the site. This phase of the testing should be done after the stockpiles are removed from the site.
- If burning is conducted, the entire burn site should be inspected for any areas of discoloration, odor, or obvious problems. Such areas should be identified and restored, as necessary.

5.2.6.3 Groundwater Testing

- Groundwater should be tested on selected sites to determine the probable effects of rainfall leaching through either the stockpile areas or ash areas if burning is conducted Although every effort must be made to avoid siting DMS in areas important for public water supply (section 5.2.3), it is possible that DMS could of necessity be sited in areas where the groundwater used for drinking water, whether through public or private drinking water supply wells.
- Runoff from stockpiled debris within the storage areas has the potential to contaminate groundwater. Although the probability of contamination is considered low, testing is needed because of the importance of protecting water quality and assessing consistency with Connecticut's Water Quality Standards, particularly in an area served by private drinking water supply wells.
- Groundwater monitoring wells or temporary sampling points should be placed around the perimeter of the stockpiles (especially for stockpiles of things like white goods, electronics, HHW, etc) that have remained for an extended period of time prior to final disposal, and burn piles, to determine if there is any type of contamination.
- Testing should occur at selected sites after all debris is removed. Results of such testing will be compared to the criteria defined in the Remediation Standard Regulations, Sections 22a-133k-1 through 22a-133k-3 of the RCSA for the applicable groundwater classification, as defined in the Connecticut's Quality Standards (authorized by the CGS Section 22a-426) and associated water quality classification maps.
- If applicable, results should also be compared to Drinking Water Action Levels as identified by the Drinking Water Section of the DPH.

5.2.6.4 Generic Checklist for Quality Assurance at Closeout

DEEP presents a generic checklist for Quality Assurance (QA) that should be considered at the close-out of each DMS. The Responsible Party for the site is responsible for closure in accordance with all applicable federal, State and local requirements. The generic checklist includes, but is not limited to, the following:

- Lease special conditions met?
- Debris stockpiles removed and disposed?
- Ash pile tested, removed, disposed?
- *Illegally filled or disturbed wetlands* restored and locations noted on appropriate State and municipal maps?
- Chain of custody records complete for the site?
- Location of storage area stockpiles marked on plans?
- Contractor petroleum and HHW spills remediated?
- Perimeter berms leveled and topsoil restored?
- Existing groundwater monitoring wells identified on map, secured and restored?
- Environmental records submitted (contractor groundwater and air quality monitoring if any, chain of custody records for HHW, other state approvals)?
- Site secured wherever stockpiles (chips, tires, etc.) do remain, to discourage illegal dumping?
- All contractor equipment and temporary structures removed?
- Compare baseline data of the temporary site to conditions after the stockpile is removed and the contractor vacates the site.
- Use Global Positioning system (GPS) coordinates to locate the sites for future reference needs.

5.2.7 Completing Closeout

DEEP should be informed in writing when all closure activities at the DMS area are completed. If environmental sampling was conducted as part of the closure activities, then the closure notice should include the results of this sampling, unless otherwise approved by DEEP.

5.3 State of Connecticut's Concept of Operations Plan (ConOps) for Disaster Debris Management, Activation and Use of the State Debris Removal and Monitoring Contracts

5.3.1 Overview:

The State Response Framework, the State's Disaster Debris Management Plan, and the State's contracts for Debris Management and Removal Services and for Debris Monitoring and Documentation of Debris Removal Operations Services provide an organizational structure and general principles for managing catastrophic disaster debris management operations at the State and local levels.

The State of Connecticut developed the Concept of Operations Plan (ConOps) for Disaster Debris Management, Activation and Use of the State Debris Removal and Monitoring Contracts. The ConOps describes the phases of clean-up and the priorities associated with the clean-up. In addition, the ConOps details the steps that will be taken by the State, its contractors, and other parties so as to facilitate the removal, management, collection and disposal of all debris generated from a catastrophic natural hazard event such as a Category 3 hurricane. This ConOps is tied to the activation and use of the State contracts for disaster debris removal and monitoring. This ConOps is the Playbook by which the IDMF operates.

The scope of the ConOps is to:

- Provide overall coordination for state-wide disaster debris management implementation.
- Provide for the allocation of human, technical and financial resources available for disaster debris management.
- Provide for the coordination of disaster debris management on a state and local level, including push and shove, removal, collection, sorting, recycling, and disposal operations and the safety of personnel and the environment.
- Provides a pre/post event timeline and related activity and/or plan execution action items. It should be noted that this ConOps could also cover other types of natural disasters (i.e., ice storms, tornados, etc.) and that time frames would be modified to reflect the specific event.

5.3.2 Activities Timeline

The ConOps activities timeline is segmented into four major operational time periods:

5.3.2.1 Pre-Landfall Phases: -4 to 0 days (day 0 is landfall)

Notice Event Activation of IDMTF and State Debris removal and monitoring contractors

- Identify potential threats and impacts
- Assess available resources
- Discuss potential resource sharing, including personnel and assets; prepare draft task orders
- Identify pre-placed contracts and confirm availability for stand-by or activation
- Coordinate deployment of personnel and pre-positioning of equipment, as appropriate

5.3.2.2 Phase 1 – Initial Response/Debris Clearance: 0 to +6 days

Phase 1 is the initial response and consists primarily of clearing from the public roads and right-of-ways the disaster debris that hinders immediate life-saving actions and that poses an

immediate threat to public health and safety. The Phase 1 period is normally 70 working hours (i.e., one week) following an event (per FEMA guidance); however, it can be extended if the situation warrants it (through coordination with FEMA). Typically, the State clears State roads and municipalities clear local roads. Priority road systems in Connecticut are the federal interstates, the parallel roads along the federal interstates, and the State Routes. Roadway debris will be moved to the side of the road to provide access into damaged areas. Normally, no attempt is made to remove, segregate or dispose of the debris in this first phase. However, in rare instances it may be beneficial to remove the debris immediately when a significant health and safety risk is present. The initial emergency road clearance will be done based on the following priorities and on field assessments:

1) Support to Search and Rescue and other life-saving resources.
2) Critical life-sustaining facilities (i.e., hospitals, nursing homes, other).
3) Additional life-sustaining facilities (i.e., emergency feeding and sheltering sites, Local Distribution Points, other).
4) Critical community support facilities (i.e., police, fire, EMS, and emergency management sites, other).
5) Critical infrastructure facilities (i.e., Electrical Utilities, Telecommunications Utilities, other).
6) Longer- term sustaining facilities (i.e., water treatment facilities, wastewater treatment facilities, water pumping stations, other).

Priority road systems in Connecticut are the federal interstates (including the entrances/exits), the parallel roads along the federal interstates and the State routes. Table 5-1 shows the major routes that are found within the State's five Emergency Management Regions.

Table 5-1. Connecticut's Emergency Management Regions/Assigned Debris Control Zones and the federal interstates and State roads located within each of the zones.

Emergency Management Regions	Federal Interstates	State Roads
1	I-95	1, 7, 15, 53, 57, 58, 59, 106, 107, 127, 130, 135
2	I-91, I-95, I-691	1, 5, 17, 22, 34, 68, 69, 79, 81, 103, 110, 114, 121,122, 139, 145, 146, 147, 149, 152, 154, 156, 337
3	I-91, I-84, I-384, I-291	2, 3, 6, 10, 19, 30, 44, 71, 71A, 75, 83, 94, 99, 140, 159, 167, 173, 177, 178, 179, 185, 186, 187, 194, 196, 217, 286, 314, 315, 316, 322, 364
4	I-95, I-395, I-84	1, 1A, 2, 2A, 6, 11, 12, 16, 21, 27, 31, 32, 44, 82, 87, 89, 97, 101, 117, 131, 138, 156,163, 165, 169, 171, 184, 193, 195, 198, 203, 215, 244, 287, 289, 320, 354
5	I-84	4, 6, 7, 8, 20, 37, 39, 41, 43, 45, 47, 53, 55, 58, 61, 64, 67, 73, 102, 112, 116, 118, 128, 132, 172, 188, 199, 202, 222, 254, 262, 263, 272, 302, 341, 361

Per the SRF, ConnDOT is responsible for clearing and/or removing wreckage and debris from state owned or maintained transportation facilities and also provides support of local debris management operations when conditions permit. Municipalities are responsible for their local roads. Immediate debris clearing actions on State and local roads and properties should be supervised by local public works or ConnDOT personnel using all available resources. In the event of a natural disaster and based on feedback from field personnel, a determination will be made by each impacted municipality if their in-house capabilities are sufficient to remove the quantity of debris generated by the event. If it is determined that the quantity exceeds the municipality's capabilities, municipalities should activate their contracts.

5.3.2.3 Phase 2 – Recovery /Debris Removal: +7 to +29 days

Phase 2 consists of removing, segregating, and disposing of the debris that hinders the orderly recovery of the community and poses less immediate threats to health and safety. Phase 2 could last up to a year or longer and may involve reassessment of debris quantities, operations of debris staging areas, public education, and debris separation, collection, storage, recycling and disposal activities. *(Normally the debris removal must be completed within 6 months, with a possible 6-month extension. This has frequently been extended when the situation warrants.)* Debris removal may begin during the emergency response phase and will constitute a major part of the recovery phase. Debris removal will be done based on the following priorities and on field assessments:

1) Public roads and bridges to ensure access for emergency and response vehicles to essential facilities, i.e., police, fire and emergency medical centers, hospitals, clinics, emergency operation centers, airports, municipal complexes, essential public utility facilities to include electrical transmission substations, water treatment plants, water supply facilities, sewage treatment plants, and generating stations. Public roads and bridges to ensure access for emergency and response vehicles to schools, libraries, community and educational facilities, and commercial establishments.
2) Public waterways essential to commerce and major flood drainage ways. (In this instance, ConnDOT, USACE, U.S. Department of Agriculture/Natural Resources Conservation Service (NRCS), and/or U. S. Coast Guard (USGC) may need to be involved depending on responsibilities.)
3) State properties.
4) Public recreational facilities.

5.3.2.4 Post Recovery - Public Assistance, DMS Closure, and Quality Assurance: +30 to +180 days

Monitor State and municipal recovery operations and progress, including closeout of temporary debris management sites, and develop after-action reports and revise plans, as appropriate.

5.3.3 Summary

The ConOps Plan was first developed in 2009. Since that time, it has been activated and implemented for a number of federally declared storm events. In each of these cases, the ConOps Plan met the overall goal in achieving the desired outcome of the State's ability to efficiently and effectively manage the debris generated from a natural hazard event. However, this ConOps Plan is a dynamic document which is annually reviewed and revised as necessary by the Interagency Debris Management Task Force.

CHAPTER 6
SUMMARY STATEMENT

6.1 Summary Statement

If a catastrophic storm event, such as a Category 3 hurricane were to strike Connecticut, it is estimated that approximately 18 million tons to 20 million tons of debris (40 million to 45 million cubic yards) would be generated as a result of that event. In Connecticut, approximately 5 million tons of solid waste is processed each year.

Connecticut is better positioned to effectively respond to such a storm event because of the documents in place – this Plan, the Concept of Operations Plan, and the pre-positioned contracts for both debris removal and management and debris monitoring and documentation. For recent catastrophic storm events, Connecticut was able to effectively deal with managing large volumes of woody debris and significantly lesser amounts of construction and demolition debris because of the Plan and the State contracts. However, the Plan and the State contracts have not yet been tested for the level of devastation recently suffered by parts of New York and New Jersey as a result of Hurricane Sandy which was a Category 1 hurricane.

Therefore, Connecticut must continue to plan, train, and be prepared to be able to respond to natural hazard events. The list below identifies areas that need to be considered for a stronger operational approach:

- The State DOES NOT have enough processing and/or final disposal capacity in-state to manage debris generated from a Category 3 hurricane. Processing capacity includes the existing solid waste infrastructure and debris management sites that are established as a result of a natural disaster. While there are opportunities to increase processing capacity at existing infrastructure sites, the volume of debris may be such that the existing infrastructure would be quickly overwhelmed, therefore necessitating the need for both DMS that would also serve as volume reduction plants to facilitate quick and more efficient transport of waste for out of state disposal. With the anticipated volume of construction and demolition debris, out of state disposal is the only option. Various modes of transport other than trucking must be considered such as rail, barge, and container freight.

- The number and location of DMS is critical in any planning. Currently, the state has identified a limited number of state owned sites for State use. However, these site do not have the capacity that would be needed to manage debris generated for a Category 3 hurricane. The State continues to research and evaluate state-owned lands for their potential to serve as a DMS. The State will have to look to privately owned property to accommodate the projected capacity needs. Similarly at the municipal level, municipalities must identify their own DMS locations whether on municipally-owned land or on leased private property. Additionally, it is the municipalities' responsibility to ensure that the DMS has obtained the necessary permit(s)/authorization(s). Finally, both that state and the municipalities should consider regional DMS.

- Challenges still exist in cleaning non-hazardous debris from shallow waters and marshes just offshore that the USACE or the Guard might not handle. The IDMTF is reviewing some of the research coming from the National Oceanic Atmospheric Administration, in particular, their study of similar challenges in the Gulf Coast. This is an issue of debris clean-up that still requires additional investigation.

- In general, current law is barely adequate to deal with existing abandoned boats and is ill prepared to deal with a mass vessel displacement event. It is the aim of DEEP's Boating Division to revamp current abandoned boat law to streamline it and to make it scalable so as to be able to deal with a mass displacement event. Until then, care must be exercised to work within the existing law to prevent claims against the state, and to work with federal agencies to access supporting funding where available. DEEP should be prepared to implement a web-based, publically available, database providing information helpful in determining the ownership of a collected boat. Such database should include, at a minimum, the following information for each boat collected: the body of water from which the vessel was collected, the vessel registration and/or hull identification number, the vessel name (if any), identifying colors, the make and model of the vessel, and aggregation site location. The database should be constructed so as to allow the owner to correspond with DEEP confidentially, to expedite the reunion of vessel owners with their vessels.

- Enhanced coordination and planning with the utility companies will improve response time to begin collection and removal of waste in the right of way thereby getting this waste to a processing facility quicker for disposal and/or recycling.

- Enhanced communication, coordination, and planning with municipalities with regard to managing disaster debris. Provide technical assistance with regard to the proper siting and authorization of DMS.

ABBREVIATIONS

Below are the acronyms and definitions used in this Plan

Acronym	Definition
ABC	Asphalt, Brick, and Concrete Rubble
ACM	Asbestos Containing Material
CFR	United States Code of Federal Regulations
CGS	Connecticut General Statutes
C&D	Construction and Demolition Debris
ConnDOT	Connecticut's Department of Transportation
Conn-OSHA	Connecticut's Department of Labor, Division of Occupational Safety and Health
ConOps	Connecticut's Concept of Operations Plan for Disaster Debris Management
DEEP	Connecticut's Department of Energy and Environmental Protection
DAS	Connecticut's Department of Administrative Services
DAS/BPFM	Connecticut's Department of Administrative Services, Bureau of Property and Facilities Management.
DESPP/CSP	Connecticut's Department of Emergency Services and Public Protection, Connecticut State Police
DESPP/DEMHS	Connecticut's Department of Emergency Services and Public Protection, Division of Emergency Management and Homeland Security
DMS	Debris Management Site
DOL	Connecticut's Department of Labor
DPH	Connecticut's Department of Health
DESPP	Connecticut's Department of Emergency Services and Public Protection
EMAC	Emergency Management Assistance Compact
EOC	Connecticut's State Emergency Operations Center
USEPA	United States Environmental Protection Agency
ESF	Emergency Support Function
FCO	Federal Coordinating Officer
FEMA	Federal Emergency Management Agency
HHW	Household Hazardous Waste

ICM	Incident Command System
IDMTF	Interagency Debris Management Task Force
JIC	Joint Information Center
MSW	Municipal Solid Waste
NHMP	Natural Hazard Mitigation Plan
NESHAPS	National Emissions Standards for Hazardous Air Pollutants
NIMS	National Incident Management Systems
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resource Conservation Service
NWS	National Weather Service
OSHA	U.S. Department of Labor, Occupational Health and Safety
PA	Administration Public Assistance
PAO	Public Assistance Officer
PCB	Polychlorinated Biphenyl
RCSA	Regulations of Connecticut State Agencies
RFP	Request for Proposal
RRF	Resources Recovery Facility
RSR	Connecticut's Remediation Standard Regulations
ROW	Right-of-Way
SCO	State Coordinating Officer
SWMP	State of Connecticut's Solid Waste Management Plan
TCLP	Toxicity Characteristic Leaching Procedure
TSCA	Toxics Substance Control Act
TS	Transfer Station
U.S. or US	United States
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
VRP	VRF Volume Reduction Plant

REFERENCES

State of Connecticut

- State of Connecticut Disaster Debris Management Preparedness web page: www.ct.gov/deep/disasterdebrismanagement

- State of Connecticut Contracts: Disaster Debris Management Services (No. 14PSX0060AA) and Disaster Debris Monitoring Services (No. 08PSX0059AA) have been extended through May 31, 2021 DAS link: http://www.biznet.ct.gov/SCP_Search/Default.aspx?AccLast=1
  - **Debris Management and Removal** provides for clearing, collecting and transporting debris, establishing and operating temporary debris management sites, and ensuring ultimate recycling or disposal of debris.
    - A copy of the contract may be accessed through the Department of Administrative Services (DAS) website: DAS Contract 014PSX0060--Debris Removal or https://biznet.ct.gov/SCP_Search/ContractDetail.aspx?ID=14028

  - **Debris Monitoring (and Documentation)** provides for monitoring of debris removal operations and debris site management. The monitoring contract also provides comprehensive oversight, guidance and documentation services. This monitoring is required to receive potential federal reimbursement for disaster debris management expenditures under Program, as applicable.
    - A copy of the contract may be accessed through the DAS website: DAS Contract 14PSX0059-Debris Monitoring and Documentation or f https://biznet.ct.gov/SCP_Search/ContractDetail.aspx?ID=13930

- State Response Framework (**SRF**), https://portal.ct.gov/-/media/DEMHS/_docs/SRFV41pdf.pdf

- State of Connecticut, Concept of Operations – Disaster Debris Management, Activation and Use of the State Debris Removal and Monitoring Contracts

- *State of Connecticut, **Natural Hazard Mitigation Plan***, https://portal.ct.gov/-/media/DEMHS/_docs/Plans-and-Publications/State-of-Connecticut-Natural-Hazard-Mitigation-Plan---2019.pdf?la=en
- *State of Connecticut, Solid Waste Management Plan, amended 2006,* Connecticut Department of Energy and Environmental Protection, 2006.
  Or, http://www.ct.gov/dep/cwp/view.asp?a=2718&q=325482&depNav_GID=1639

- *State of Connecticut Department of Labor, Division of Occupational Safety and Health, Emergency Operations Plan, January 26, 2007.*

FEMA:

- Public Assistance Policy Digest, ***FEMA 321*** */ January 2008*
  Or, http://www.fema.gov/pdf/government/grant/pa/pdigest08.pdf

- Public Assistance Guide, **FEMA 322** / June 2007
  Or, http://www.fema.gov/pdf/government/grant/pa/paguide07.pdf

- Public Assistance Applicant Handbook, ***FEMA P-323*** */ March 2010*
  Or, http://www.fema.gov/pdf/government/grant/pa/fema323_app_handbk.pdf

- Public Assistance Debris Management Guide, ***FEMA 325*** */ July 2007*
  Or, http://www.fema.gov/pdf/government/grant/pa/demagde.pdf

- Debris Estimating Field Guide, ***FEMA 329*** */ September 2010*
  Or, http://www.fema.gov/pdf/government/grant/pa/fema_329_debris_estimating.pdf

- Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended, and Related Authorities, ***FEMA 592*** */ June 2007*
  Or, http://www.fema.gov/pdf/about/stafford_act.pdf

- Debris Management Plan Workshop, Student Guide, ***FEMA 604****/July 2007*

- FEMA Recovery Division Debris Contracting Guidance **Fact Sheet RP9580.201** / September 2010
  Or, http://www.fema.gov/pdf/government/grant/pa/9580_201.pdf

- Participant Manual, Debris Management Course, FEMA, National Emergency Training Center, Unit 8 – Selecting and Operating Temporary Storage Sites.

USEPA

- Planning for Natural Disaster Debris, United States Environmental Protection Agency, March 2008.
  Or, http://www.epa.gov/osw/conserve/imr/cdm/pubs/pndd.pdf

- Guidance for Catastrophic Emergency Situations Involving **Asbestos**, December 2009; U.S. Environmental Protection Agency, Office of Enforcement and Compliance Assurance, Office of compliance
  Or,http://www.iowadnr.gov/portals/idnr/uploads/air/insidednr/asbestos/asbestos_guidelines.pdf

- Planning for Polychlorinated Biphenyl (**PCB**) Containing Disaster Debris, June 2011, U.S. Environmental Protection Agency
  Or, http://www.epa.gov/wastes/homeland/docs/pcb-disposal.pdf

Other States

- *Guidance for Establishment, Operation and Closure of Staging Areas for Hurricane-Generated Debris*, Florida Department of Environmental Protection, Nov. 19, 2004 (updated Sept. 22, 2005).

Or, http://www.dep.state.fl.us/mainpage/em/files/0922_debris_guidance.pdf

APPENDIX F

State of Connecticut

Concept of Operations Plan – Disaster Debris Management

Activation and Use of the State Debris Removal and Monitoring Contracts

2019

Primary Agencies for Interagency Debris Management Task Force (IDMTF):

Administrative Services, Department of (DAS)
Emergency Services and Public Protection, Department of / Division of Emergency Management and Homeland Security (DESPP/DEMHS)
Energy and Environmental Protection, Department of (DEEP)
Transportation, Department of (ConnDOT)

Supporting State Agencies:

Administrative Services, Department of /Bureau of Properties & Facilities Management (DAS/BP&FM)
Connecticut National Guard (CTNG)
Consumer Protection, Department of (DCP)
Emergency Services and Public Protection, Department of /CT State Police (DESPP/CSP)
Energy and Environmental Protection, Department of /Public Utility Regulatory Authority (DEEP/PURA)
Governor's Office
Labor, Department of / Occupational Safety and Health Administration (ConnOSHA)
Motor Vehicles, Department of (DMV)
Office of Policy and Management (OPM)
Public Health, Department of (DPH)

State Contractors:

AshBritt, Inc. (AshBritt is the sole contractor for Disaster Debris Response and Management Services)
Tetra Tech, Inc. (Tetra Tech is the sole contractor for the monitoring of debris management/removal operations)

Public Utilities

Eversource Energy (Eversource)
United Illuminating Company (UI)

Other Supporting Organizations:

Conference of Connecticut Municipalities (CCM)
Connecticut Economic Resource Center, Inc. (CERC)
Council of Small Towns (COST)
Other Public Utilities (e.g., telecommunications, water and waste water)
University of Connecticut Technology Transfer Center (UCONN TTC)

Supporting Federal Agencies:

U. S. Department of Homeland Security/ Federal Emergency Management Agency (FEMA)
U. S. Department of Agriculture /National Resources Conservation Center (NRCS)
U. S. Coast Guard (USCG)
U. S. Department of Labor/ Occupational Safety and Health Administration (U.S. OSHA)
U. S. Environmental Protection Agency (EPA)
U. S. Army Corps of Engineers (USACE)

TABLE OF CONTENTS

I. Introduction

1. Purpose

a. The State Response Framework (SRF), the State's **Disaster Debris Management Plan**, and the State's Contracts for Disaster Debris Response and Management Services and for Disaster Debris Monitoring and Documentation Services provide an organizational structure and general principles for managing catastrophic disaster debris management operations at the State and local levels. This Concept of Operations Plan details the steps that will be taken by the State, its contractors, and other parties so as to facilitate the removal, management, collection and disposal of all debris generated from a catastrophic natural hazard event such as a Category 3 hurricane and from other major disasters.

b. The State has contracted with AshBritt, Inc. (sole contractor) to provide a comprehensive range of debris management services. The State has contracted with Tetra Tech, Inc. (sole contractor) to monitor the debris removal operations.

c. In the event of a catastrophic disaster or emergency declared by the State of Connecticut, the Governor may activate the State contracts with AshBritt and Tetra Tech. AshBritt and Tetra Tech will primarily support State agencies such as Department of Transportation (ConnDOT) and Department of Energy and Environmental Protection (DEEP). Individual municipalities may also directly contract with the State's contractors. This Concept of Operations is tied to the activation and use of the State contracts for disaster debris removal and monitoring.

2. Scope

a. Provide overall coordination for state-wide disaster debris management implementation.

b. Provide for the allocation of human, technical and financial resources available for disaster debris management.

c. Provide for the coordination of disaster debris management on a state and local level, including push and shove, removal, collection, sorting, recycling, and disposal operations and the safety of personnel and the environment.

d. The Concept of Operations Activities Timeline Table has been written for an anticipated catastrophic hurricane event. It provides a pre/post event timeline and related activity and/or plan execution action items. It should be noted that this Concept of Operations could also cover other types of natural disasters (i.e., ice storms, tornados, etc.) and that time frames would be modified to reflect the specific event.

II. Situation

1. Disaster Conditions

The Department of Emergency Services and Public Protection/ Division of Emergency Management and Homeland Security (DESPP/DEMHS) considers a Category 3 hurricane as the most probable, worst-case disaster scenario facing the State. A significant or catastrophic disaster event is expected to generate sufficient quantities of mixed debris which may initially hamper first responders, impede rescue operations, cripple the State's road and rail transportation networks and harbors, and disrupt utility systems. Using the U.S. Army Corps of Engineers (USACE) model, Connecticut's Interagency Debris Management Task Force (IDMTF) has estimated that a Category 3 hurricane event could generate approximately 18 million tons to 20 million tons of debris. (40 million to 45 million cubic yards).

III. Policies

1. State of Connecticut's Disaster Debris Management Plan.

Implementation of emergency disaster debris management practices that are undertaken shall be consistent, to the greatest extent practicable, with protecting Connecticut's natural resources, as well as being consistent with the State Solid Waste Management Plan, 2006 and the State's Disaster Debris Management Plan, 2013. The State's Disaster Debris Management Plan would be implemented as part of the State Response Framework (SRF) as coordinated through DESPP/DEMHS.

2. Contracts.

The State of Connecticut has executed contracts for debris removal and for debris monitoring. These contracts **expire** May 31, 2021.

Disaster Debris Response and Management Services DAS Contract Award #14PSX0060 "AshBritt" provides for clearing, collecting and transporting debris, establishing and operating temporary debris management sites, and ensuring ultimate recycling or disposal of debris.

- A copy of the contract may be accessed through the Department of Administrative Services (DAS) website: DAS Contract 14PSX0060--Debris Removal or http://www.biznet.ct.gov/SCP_Search/ContractDetail.aspx?ID=14028
- AshBritt's contact information may be found in both the contract and in Section IX Key Contact List of this plan.

Disaster Debris Monitoring (and Documentation) Services DAS Contract Award #14PSX0059 "Tetra Tech" provides for monitoring of debris removal operations and debris site management. The monitoring contract also provides comprehensive oversight, guidance and documentation services. This monitoring is required to receive potential federal reimbursement for disaster debris management

expenditures under Federal Emergency Management Agency (FEMA) Public Assistance Program and the U.S. Federal Highway Administration Emergency Relief Program, as applicable.

- A copy of the contract may be accessed through the DAS website: DAS Contract 14PSX0059-Debris Monitoring and Documentation or http://www.biznet.ct.gov/SCP_Search/ContractDetail.aspx?ID=13930

- Tetra Tech's contact information may be found in both the contract and in Section IX Key Contact List of this plan.

State: In the event of a catastrophic disaster or emergency declared by the State of Connecticut, the Governor may activate the State contracts with AshBritt, Inc. and Tetra Tech. The State contracts were developed to support the State agencies in responding to and recovering from disasters. The Contractors will provide performance bonds in advance of any work and such other documents as required by the State contracts to the Department of Administrative Services which is responsible for this administration and coordination.

Municipalities: Municipalities choosing to use the debris management services from the State's contractors will contract directly with AshBritt for Disaster Debris Response and Management Services and Tetra Tech for Disaster Debris Monitoring (and documentation) Services. The state contracts have been competitively bid and municipalities simply need to enter a mutual agreement with the State contractors. Information for the municipalities pertaining to this option will be available on the DEEP website and will also be communicated to the municipalities via the DESPP/DEMHS Regional Coordinators, Conference of Connecticut Municipalities (CCM), Council of Small Towns (COST) and the UCONN Technology Transfer Center (TTC). Municipalities can use their own labor force for managing, removing, and monitoring debris and should ensure that their activities are in compliance with FEMA Debris Management Guidance documents. Municipalities may also use their existing contractors, provided that the contracting was done competitively. If municipalities do not have prepositioned debris contracts, they must use a competitive process so that their costs will be eligible for FEMA reimbursement.

3. The Two Phases of Cleanup

a. ***Phase 1 – Initial Response/Debris Clearance/Push and Shove***. Phase 1 is the initial response and consists primarily of clearing from the public roads and right-of-ways the disaster debris that hinders immediate life-saving actions and that poses an immediate threat to public health and safety. The Phase 1 period is normally 70 working hours (i.e., one week) following an event (per FEMA guidance); however, it can be extended if the situation warrants it (through coordination with FEMA). Typically, the State clears State roads and municipalities clear local roads. Priority road systems in Connecticut are the federal interstates, the parallel roads along the federal interstates, and the State Routes. Roadway debris will be moved to the side of the road to provide access into damaged areas. Normally, no attempt is made to remove, segregate or dispose of the debris in this first phase. However, in rare instances it may be beneficial to remove the debris immediately when a significant health and safety risk is present. The initial emergency road clearance will be done based on the following priorities and on field assessments:

1) Support to Search and Rescue and other life-saving resources.

2) Critical life-sustaining facilities (i.e., hospitals, nursing homes, other).

3) Additional life-sustaining facilities (i.e., emergency feeding and sheltering sites, Local Distribution Points, other).

4) Critical community support facilities (i.e., police, fire, EMS, and emergency management sites, other).

5) Critical infrastructure facilities (i.e., Electrical Utilities, Telecommunications Utilities, other).

6) Longer- term sustaining facilities (i.e., water treatment facilities, wastewater treatment facilities, water pumping stations, other).

b. ***Phase 2 – Recovery/Debris Removal.*** Phase 2 consists of removing, segregating, and disposing of the debris that hinders the orderly recovery of the community and poses less immediate threats to health and safety. Phase 2 could last up to a year or longer and may involve reassessment of debris quantities, operations of debris staging areas, public education, and debris separation, collection, storage, recycling and disposal activities. *(Normally the debris removal must be completed within 6 months, with a possible 6-month extension, when the situation warrants.)* Debris removal may begin during the emergency response phase and will constitute a major part of the recovery phase. Debris removal will be done based on the following priorities and on field assessments:

1) Public roads and bridges to ensure access for emergency and response vehicles to essential facilities, i.e., police, fire and emergency medical centers, hospitals, clinics, emergency operation centers, airports, municipal complexes, essential public utility facilities to include electrical transmission substations, water treatment plants, water supply facilities, sewage treatment plants, and generating stations.

2) Public roads and bridges to ensure access for emergency and response vehicles to schools, libraries, community and educational facilities, and commercial establishments.

3) Public waterways essential to commerce and major flood drainage ways. (In this instance, DEEP, ConnDOT, USACE, U.S. Department of Agriculture /National Resources Conservation Center (NRCS), and/or U. S. Coast Guard (USGC) may need to be involved depending on responsibilities.)

4) State properties.

5) Public recreational facilities.

4. Interagency Debris Management Task Force (IDMTF).

a. In the event of a disaster, the Governor will activate the state contracts and will authorize the IDMTF members (DESPP/DEMHS, DEEP, DAS, and ConnDOT) to participate in all preparedness activities, to serve as operational representatives when debris management and monitoring activities are undertaken, and to assign work for the State Debris Management and Monitoring Contractors by developing task orders.

b. The State IDMTF will be represented at the State EOC. Operationally, the IDMTF may be located at the State EOC, DEEP in Hartford, and/or Conn DOT in Newington. The core membership of the IDMTF includes: DESPP/DEMHS, DEEP, DAS, and ConnDOT, and the State debris contractors. CTNG, Eversource and United Illuminating will provide continuing participation throughout the event. Other agencies/organizations may be requested to participate on the Task Force as necessary (DAS/BP&FM, DOL, DESPP/CSP, DMV, DPH, OPM, FEMA and others).

c. DESPP/DEMHS, DEEP, and ConnDOT will share leadership responsibilities for the IDMTF.

d. The IDMTF will assign work for the contractors by developing Task Orders. Task Orders will be issued (i.e., approved and executed) by DESPP/DEMHS (to AshBritt) for debris removal and by DEEP (to Tetra Tech for debris monitoring). DEEP and DESPP/DEMHS IDMTF members are authorized by the Governor to execute and sign the task orders. For the purposes of documentation and data management, Tetra Tech documentation will be used.

e. The IDMTF will be under the direction and supervision of the Alternate Governor's Authorized Representative (AGAR) and/or the State Coordinating Officer (SCO). The AGAR, the SCO, or an IDMTF representative will report to the Unified Command, as needed.

f. The IDMTF will disseminate debris management information periodically to the towns through the DESPP/DEMHS Regional Coordinators, CCM, COST, and UCONN TTC. DEEP will provide debris management information on their website: www.ct.gov/deep/disasterdebrismanagement.

g. DESPP/DEMHS, ConnDOT, DMV, and DESPP/CSP will coordinate on waiver and permitting issues for contracting equipment. This can include overweight trucks, wide loads, and extensions on working hours. The IDMTF (DESPP/DEMHS, DEEP, ConnDOT, DMV, and DESPP/CSP) will confer with the Governor's office for coordination with the Governor's civil preparedness declaration, the contemplated termination of the declaration, and the possible need for extension of the Governor's declaration, specifically concerning the contractor equipment waivers.

5. Finance Administration

a. Financial Administration for the State debris contracts is a shared responsibility of OPM, DESPP/DEMHS, DEEP, and ConnDOT. The use of state funds shall be coordinated by OPM, DESPP/DEMHS, DEEP and DOT. These agencies will participate on an ongoing basis in the coordination of relevant actions associated with any debris-generating disasters when the State activates the state debris contracts.

b. A Memorandum of Understanding (MOU) exists and will be updated as necessary among the parties (OPM, DESPP/DEMHS, DEEP, and ConnDOT) for the purpose of delineating responsibilities with respect to implementation of the FEMA Public Assistance Program and any other federal disaster funding as may become relevant. The first MOU was executed in 2012 for the October 2011 Snow Storm, also referred to as Storm Alfred. This MOU was amended for use in Hurricane Sandy in 2012 and for the February 2013 Severe Winter Storm. The MOU contains the following significant provisions:

   i. OPM, the Office of the State Comptroller, and the Office of the Treasurer will establish a State line of credit for FEMA Public Assistance funding and for disaster debris management expenditures for a declared State Civil Preparedness Emergency. The DESPP/DEMHS Fiscal Administration Manager will provide to OPM the appropriate financial information for this line of credit on an on-going basis.

   ii. DESPP/DEMHS is responsible for the overall financial administration and programmatic work for the FEMA Public Assistance Program. DESPP/DEMHS will process purchase orders and payments related to FEMA Public Assistance Program reimbursement requests, as well as process invoices from the state's debris management contractor and debris monitoring contractor, as approved by DESPP/DEMHS and the IDMTF. DESPP/DEMHS will be responsible for originating purchase orders within the State's Financial System. These purchase orders are based on the Task Orders issued by the IDMTF. ConnDOT will be responsible for financial administration for the U.S. Federal Highway Administration Emergency Relief program, including coordination with municipalities.

   iii. DEEP shall coordinate all approvals of state-authorized debris monitoring services.

   iv. OPM shall review with DESPP/DEMHS, DEEP, and ConnDOT any potential budgetary implications related to the MOU.

6. Debris Management Sites (DMS)

State: Critical to the State's debris management operations, is the establishment of DMS to be used for debris originating from state highways and roads as well as other state properties. DMS are those sites that have been pre-identified by the State with the assistance of

their debris management contractors, and which have been evaluated and approved by DEEP for the purposes of collection, volume reduction, and transfer to final permitted disposal and recycling facilities.

The State recognizes that the capacity of the pre-identified DMS cannot accommodate the amount of debris generated by a Category 3 hurricane. Therefore, the pre-identified State sites are reserved for State debris management activities.

DEEP is responsible for the permitting of these sites (by issuance of an Emergency Authorization), as well as ensuring that they are properly closed out. The goal will be to maximize potential processing and recycling options consistent with the State Solid Waste Management Plan.

The State's debris management contractor is responsible for the set-up, operations, and closeout of the DMS sites, consistent with the requirements of the contract documents and relevant state and federal laws. For any future disaster, sites will be chosen based on past storm experiences so that previously used sites may be used again or new sites may be chosen depending on impact areas, amount of debris, and availability of public and private sites, within minimal transportation distance of the damaged areas. Based on the projections of the amount of debris that could be generated and area impacted, sites will be selected by the State's contractors, in consultation with the IDMTF. Other agencies that may be involved in site selection include OPM, DAS/Bureau of Properties & Facilities Management, and Connecticut Economic Resource Center, Inc. (CERC).

Municipalities: Municipalities must identify their own DMS locations either on municipally-owned land or through an agreement on non-municipally owned land. See Roles and Responsibilities associated with Disaster Debris Management in section IV.5.

IV. Roles and Responsibilities associated with Disaster Debris Management

The following narrative captures selected roles and responsibilities of State Agencies as reflected in the **State** Response Framework, as well debris management tasks identified through actual storm experiences.

1. Primary Agencies:

Emergency Services and Public Protection, Department of / Division of Emergency Management and Homeland Security (DESPP/DEMHS): Assigning staff to serve on the IDMTF. Administering the state contract for Disaster Debris Response and Management Services. Requesting teams and equipment from the State debris contractors. DESPP/DEMHS, ConnDOT, DMV, and CSP will coordinate on waiver and permitting issues for contracting equipment. Coordinating the establishment and maintenance of communications with affected and/or threatened areas. Coordinating the delivery of assistance to local governments and state agencies as requested and as available. Receiving and evaluating situation reports from local governments, state agencies, utility companies, and private non-profit relief organizations. Determining the need for, requesting and coordinating a Preliminary Damage Assessment (PDA) of the disaster-affected areas in conjunction with FEMA. Drafting,

for the Governor's signature, formal requests for Presidential disaster and emergency declarations under the Stafford Act and U.S. Small Business Administration disaster declarations. Coordinating the Federal/State Agreement and meeting subsequent to a Presidential declaration. Expediting establishment of special accounts for disaster assistance funds and taking other actions necessary to expedite the availability of disaster assistance funds to local governments and individual disaster victims.

Energy and Environmental Protection, Department of (DEEP): Assigning staff to serve on the IDMTF. Administering the state contract for Disaster Debris Monitoring Services. Requesting teams and equipment from the State debris contractors. Providing technical assistance to state agencies and local authorities regarding the management of disaster debris including the provision of a municipal guidance document for the management of disaster debris and providing public information announcements. Identifying properties suitable for DMS. Approving and issuing emergency authorizations for DMS and monitoring the DMS. Per State contract, confirming that final destination sites are acceptable for the reuse, recycling or disposal of disaster debris. Providing emergency response to hazardous materials spills. Providing technical assistance on timber salvage, emergency debris management, and open burning. Assessing the State's critical infrastructure (related to DEEP's oversight), including but not limited to, public and private utilities (nuclear, gas, electric, telecommunications), dams, water supply plants, waste water treatment plants and pumping stations, resource recovery facilities and marine terminals). Assessing safety conditions and continuity of operations at DEEP's facilities. Providing qualified personnel as requested by DESPP/DEMHS to serve on joint Federal/State Preliminary Damage Assessment Teams to assess municipal property damage and damage to DEEP lands and facilities.

Transportation, Department of (ConnDOT): Assigning staff to serve on the IDMTF. Notifying the State EOC of disruptions or impending disruptions to the transportation system (e.g., road closures, bridge outages, damage to railways, etc.) and rectification of such disruptions. Assessing the impact of a disaster or emergency upon state transportation facilities, and providing DESPP/DEMHS and/or the State EOC with such written reports as it may require. Requesting teams and equipment from the State debris contractors. Coordinating with public utilities for road clearance activities. Clearing debris from state-maintained roads and bridges. Providing support for search and rescue operations. Providing support to the U.S. Coast Guard Sector of Long Island Sound and DEEP in relation to the closing and subsequent reopening of ports and waterways during or after the occurrence of major natural disasters. Providing public information, via the State EOC and in coordination with the Governor's Office, relative to road conditions and closures, flight service, train schedules, and ferry operations. Releasing sandbags, other material, and equipment as appropriate from ConnDOT garages as requested by DESPP/DEMHS and/or the State EOC. Providing assistance to municipalities for the purposes of debris clearance, inspection, repair and/or condemnation of transportation facilities, once departmental priorities have been met. Providing damage assessors as requested by DESPP/DEMHS to serve on joint federal/state Preliminary Damage Assessment Teams to assess municipal property damages in selected towns. Coordinate with the U.S. Department of Transportation to initiate the State's request for Federal-Aid Highway Emergency Relief program assistance as required. ConnDOT will coordinate on permit procedures for oversized/overweight vehicles (contracting equipment).

2. Supporting Agencies:

Administrative Services, Department of (DAS): Assigning staff to serve on the IDMTF.

Contract: Issuing state contracts for relief supplies, equipment, debris management, and other services as needed. Activating the State Contracts for Disaster Debris Response and Management, and for Monitoring of Debris Operations. Securing performance bonds. Maintaining Disaster Debris Response and Management Services and Debris Monitoring Services contract files. Acting as repository for all state instruments (bonds, certificate of insurance, U.S. DOT licensing and other required documents) necessary to perform the disaster debris removal and monitoring work for the state agencies.

Bureau of Properties & Facilities Management (DAS/BP&FM): Assessing the impact of a disaster upon state buildings and developing and submitting to DESPP/DEMHS written damage assessment reports as requested. Providing damage assessors as requested by DESPP/DEMHS to serve on joint Federal/State Preliminary Damage Assessment Teams to assess municipal property damage in selected communities. Providing assistance to the IDMTF and DEEP in identifying properties suitable for DMS.

Connecticut National Guard (CTNG): As directed by the Governor, provide support on debris clearance and removal operations.

Consumer Protection, Department of (DCP): Assisting the Governor's Office with public information, especially during the recovery phase, to advise disaster victims about dealings with others, including retailers and contractors, and good consumer practices. Ensuring that the portable scales (if utilized) used at DMS by the State's debris removal contractors have been pre-registered and NTEP-approved.

Emergency Services and Public Protection, Department of /Connecticut State Police (CSP): Monitoring dams, particularly state dams, as requested by DEEP for high water levels and visible signs of loss of structural integrity. Conducting aerial assessments. Providing security and traffic control. Assisting the Governor's Office with public information. CSP will coordinate on the relief from regulations, in accordance with Title 49 of the Code of Federal Regulations Section 390.23. The IDMTF (DESPP/DEMHS, DEEP, ConnDOT, DMV, and CSP) will confer with the Governor's office for coordination with the Governor's civil preparedness declaration, the contemplated termination of the declaration, and the possible need for extension of the Governor's declaration, specifically concerning contracting equipment waivers.

Governor's Office: Declaring a Civil Preparedness Emergency. Ordering the activation of the State EOC. Ordering the implementation of the State emergency operations plans, including the State Response Framework and the Disaster Debris Management Plan. Activating the State Disaster Debris Response and Management Services contract and the State Disaster Debris Monitoring Services contract. Authorizing the IDMTF members (DESPP/DEMHS, DEEP, DAS, and ConnDOT) to participate in all preparedness activities, to serve as operational representatives when debris management and monitoring activities are undertaken, and to assign work for the State Debris Management and Monitoring Contractors by developing task orders. The IDMTF (DESPP/DEMHS, DEEP, ConnDOT, DMV, and CSP) will confer with the

Governor's office for coordination with the Governor's civil preparedness declaration, the contemplated termination of the declaration, and the possible need for extension of the Governor's declaration, specifically concerning contracting equipment waivers.

Labor, Department of / Occupational Safety and Health Administration (ConnOSHA): Inspect State DMS. Provide training and outreach. Provide technical assistance and intervention. Coordinate with Federal OSHA.

Motor Vehicles, Department of (DMV): Assist in the processing of abandoned boats and vehicles. DMV will coordinate on the relief from regulations, in accordance with Title 49 of the Code of Federal Regulations Section 390.23. The IDMTF (DESPP/DEMHS, DEEP, ConnDOT, DMV, and CSP) will confer with the Governor's office for coordination with the Governor's civil preparedness declaration, the contemplated termination of the declaration, and the possible need for extension of the Governor's declaration, specifically regarding contracting equipment waivers.

Public Health, Department of (DPH): Involvement of public health officials in identifying and preventing the spread of disease from disaster-generated debris. Providing technical assistance with regard to the proper management of asbestos containing debris. Assisting the Governor's Office with public information.

Office of Planning and Management (OPM): As directed by the Governor, approves the allocation of financial resources to CORE-CT to support the activation of State debris management and monitoring contracts. OPM serves as a member of the Finance Committee (composed of DESPP/DEMHS, DEEP, DOT and OPM) which has an executed MOA regarding the Disaster Debris Response and Management Services contract and the Debris Monitoring and Documentation Services contract. OPM will provide contact information on state agencies so that they may receive disaster-related information and FEMA Public Assistance Program information. OPM will also provide information on state agencies who own and are responsible for the maintenance of buildings and properties which may be in need of the debris contractors' services. OPM will provide assistance to the IDMTF and DEEP in identifying properties suitable for Debris Management Sites (DMS).

3. Contractors:

AshBritt, Inc.: State Contracted Services (14PSX0060; expiring June 30, 2019) – When activated by the Governor, AshBritt will provided efficient removal of large volumes of disaster-generated debris from areas of the State as necessary, in a timely and cost effective manner and lawfully managing the recycling and disposal of the debris following a natural disaster or destructive event. Providing for emergency and right-of-way debris clearance. Providing the State with the necessary resources to assist in the recovery efforts. AshBritt will assist the State in estimating debris generation amounts at the time of an event.

Tetra Tech: State Contracted Services (14PSX0059; expiring June 30, 2019) – When activated by the Governor, Tetra Tech will provided close monitoring of debris management contract operations to ensure that those operations are eligible for FEMA Public Assistance (PA) Grant funding and for other federal funding as may be available. Tetra Tech will assist the State in estimating debris generation amounts at the time of an event.

4. Public Utilities:

Eversource Energy: Assigning staff to serve on the IDMTF. Coordinating with ConnDOT and IDMTF regarding roadway clearance operations.

United Illuminating Company: Assigning staff to serve on the IDMTF. Coordinating with ConnDOT and IDMTF regarding roadway clearance operations.

5. Other Supporting Organizations:

6. Connecticut Economic Resource Center (CERC): CERC will be requested to provide assistance to the IDMTF and DEEP in identifying properties suitable for DMS, including the use of inventory databases.

7. Municipalities:

Municipalities are always the first responders in a disaster situation. FEMA strongly encourages and expects local municipalities to have a coordinated debris management plan developed in advance of a debris-generating event to expedite the response and recovery process. The type of pre-event preparation and planning that should be undertaken by local municipalities includes:

- Pre-identifying potential DMS preferably on municipal property, but also on private property (under lease agreement) when suitable;
- Preparing pre-event contracts for Disaster Debris Response and Management Services and for the monitoring of the Disaster Debris Response and Management Services contractor(s); and
- Pre-planning communication, with the use of various methods of information dissemination, about debris clean-up to residents and businesses.

DMS and Emergency Authorizations: DEEP has prepared criteria for the proper siting of a DMS in the State's Plan for Disaster Debris Management. In the event of a significant natural disaster, DEEP will issue an *Emergency Authorization for Debris Management*. This allows municipalities to stage storm debris on ***municipal properties*** and allows municipalities to demonstrate to FEMA that such staging is authorized. The storing of debris on municipal properties is covered by the statewide emergency authorization. Municipalities MUST NOTIFY

DEEP of the DMS location. However, if the municipality is using ***leased property***(ies), the leased property needs an *Individual Emergency Authorization*. Again, the municipality must provide DEEP the address of the DMS, and DEEP will promptly issue the individualized emergency authorization to that town. These authorizations are for a 90-day period. It is anticipated that after the initial 90-day period, DEEP will be issuing extensions or other types of Emergency Authorizations for specific activities as requested by the towns.

Contracting: Municipalities must be knowledgeable of FEMA's debris management reimbursement eligibility guidelines. Municipalities are responsible for the oversight of disaster-relief work performed by their own municipal forces or by their private contractors. While municipalities can use their own existing contractors, the contracting must have been done competitively.

Municipalities can also use the State's disaster debris removal and monitoring contracts. The state contracts have been competitively bid, and municipalities simply need to enter into an individual mutual agreement with the state contractors.

Municipalities may utilize Time and Materials contracts for the first 70 contractor working hours of response. After those 70 hours of push and shove activity, FEMA requires that contracts must be competitively bid on a unit price basis to be eligible for FEMA reimbursement. FEMA requires that debris collection, removal and disposal work performed by a contractor must be monitored. Towns may do their own monitoring or hire a contractor to perform the monitoring. The monitors must keep track of tonnage/cubic yards of disaster debris collected, size of trucks, and must ensure that the debris is collected from FEMA-eligible areas (public right of ways on town roads and town properties).

V. References

1. State *of Connecticut's State Response Framework*
2. *State of Connecticut's Disaster Debris Management Plan, 2013.*
3. State of Connecticut, State Contract (#14PSX0059) Disaster Debris Monitoring Services, expiring June 30, 2019.
4. State of Connecticut, State Contract (#14PSX0060) Disaster Debris Management Services, expiring June 30, 2019.
5. Public Assistance Debris Management Guide, FEMA 325/July 2007.

VI. Description of the Concept of Operations Activities Timeline

The Concept of Operations Activities Timeline has been developed and is segmented into four major operational time periods:

- Pre-Landfall Phases: -4 to 0 days (day 0 is landfall)

- Phase I: Initial Response and Debris Clearance: 0 to +6 days, and on-going
- Phase II: Debris Removal and Recovery: +7 to +29 days, and on-going
- Post Recovery: Public Assistance, Close Out DMS, and Quality Assurance: +30 to +180 days, and on-going

For each of these time periods, critical activities and responsible parties have been identified. For some activities, multiple days have been identified. For example, a line item/activity in the pre-landfall phase has been given a time period of -1 to +60 days continuing into the post recovery operational time period. This means that this activity is being conducted over the different operational time periods and is not repeated again as a line item/activity in the table.

VII. Description of the Key Contact List

Identifies those entities/individuals that will be involved in debris management.

VIII. Table of Concept of Operations Activities Timeline, rev. August 2014

Item	Pre/Post Event (Days)	Activity	Responsible Party
Pre-Landfall Phase			
1	-4	1. Initial notification to DESPP/DEMHS Point of Contact by AshBritt re/potential storm event. 2. Initial notification to DEEP Point of Contact by Tetra Tech re/potential storm event.	DESPP/DEMHS, DEEP, AshBritt, Tetra Tech
2	-4	1. Review the DMS file and assess potential needs to prepare/ready sites for use. Assess existing baseline conditions for anticipated DMS use. Prepare and preliminarily approve preliminary site plans illustrating layout, including circulation routes (based on Debris Site Evaluation Worksheets prepared by AshBritt, 2009). 2. Communicate with AshBritt, OPM, DAS/Bureau of Properties & Facilities Management, and CERC on potential need for additional sites. 3. Contact State agencies having jurisdiction over sites as a pre-notification that sites may be activated.	DEEP, in consultation with AshBritt, OPM, DAS/BP&FM, CERC
3	-4	1. Governor directs DESPP/DEMHS to activate the IDMTF. Governor signs ***Authorization of IDMTF Members letter.*** 2. Agency members of the IDMTF assemble at the EOC and/or DEEP headquarters	Governor, DESPP/DEMHS, IDMTF
4	-4	Review Emergency Authorization template for DMS.	DEEP
5	-3	Conduct initial conference calls between DAS, DESPP/DEMHS, DEEP, ConnDOT, AshBritt and Tetra Tech as storm approaches. Discuss plan overview, identify and confirm contact information for the Interagency Debris Management Task Force (IDMTF), establish reporting and coordinating schedule. IDMTF conference calls ongoing.	DAS, DESPP/DEMHS, DEEP, ConnDOT, AshBritt, Tetra Tech
6	-2	Governor orders the implementation of the *State of Connecticut* ***State Response Framework*** and the *State's Disaster Debris Management Plan.*	Governor
7	-2	**Governor approves the activation of the State Emergency Operations Center (EOC) under the State Response Framework**.	Governor
8	-2	Governor declares a civil preparedness emergency under CGS Section 28-9.	Governor, DESPP/DEMHS
9	-2	IDMTF/DEEP establishes their operations center for debris recovery at a location to be determined.	IDMTF
10	-2	DESPP/DEMHS requests FEMA State Liaison to come to the EOC.	DESPP/DEMHS, FEMA
11	-2	Public Information disseminated to media and towns. On-going activity. • Press releases, interviews and outreach to media: o Alert public to anticipated hurricane/storm and steps they should take to secure their property and safety o Provide guidance being suggested by federal/state officials o Announce opening of state EOC o Announce declaration of state civil preparedness emergency • Prominently feature storm "alert" information from state agencies on ct.gov homepage	PIO – Governor's Emergency Communications Team – in consultation with: • IDMTF • Debris Contractors • DESPP/DEMHS Regional Coordinators • Town Officials
12	-2	IDMTF will periodically distribute debris management information to the municipalities through the DESPP/DEMHS Regional Coordinators, CCM, COST and UCONN TTC. On-going activity.	IDMTF
13	-2	Governor requests a Pre-Landfall Emergency Declaration by the President through the FEMA Region 1 Administrator.	Governor, DESPP/DEMHS

Item	Pre/Post Event (Days)	Activity	Responsible Party
Pre-Landfall Phase (continued)			
14	-2	DESPP/DEMHS consults with OPM on establishing a line of credit in CORE-CT.	DESPP/DEMHS, OPM
15	-1	FEMA grants the Pre-Landfall Declaration.	FEMA
16	-1	1. Governor makes decision to "Activate Contracts" and directs DESPP/DEMHS to make this happen. 2. Governor signs ***Activation of Contracts letter***.	Governor, DESPP/DEMHS
17	-1	DESPP/DEMHS consults with OPM, DAS, DEEP, and ConnDOT on the activation of contracts with AshBritt and Tetra Tech.	DESPP/DEMHS, OPM, DAS, DEEP, ConnDOT
18	-1	DAS informs (verbal and written) AshBritt and Tetra Tech that contracts are activated. DAS contacts AshBritt for $5 million performance bond (for deployment and arrival), Certificate of Insurance, and other state-required instruments. DAS contacts Tetra Tech for $1 million performance bond, Certificate of Insurance, and other state-required instruments.	DAS, AshBritt, Tetra Tech
19	-1 to +60	FEMA guidance on debris contracting, DEEP fact sheets and other debris management information disseminated to town officials.	IDMTF, DESPP/DEMHS HQ & Regional Coordinators, CCM, COST, UCONN TTC
20	-1	DESPP initiates purchase orders for the mobilization and deployment of AshBritt and Tetra Tech Advance Teams, respectively, to the State EOC. These two Purchase Orders will also authorize DESPP/DEMHS and DEEP to write Task Orders (1A-AshBritt; 1B-Tetra Tech) "Notice to Proceed" and Task Orders (2A; 2B) "Mobilization/Equipment". Additional purchase orders and task orders will be executed as needed.	DESPP/DEMHS, DEEP
21	-1	**EXECUTE: <u>TASK ORDER NO. 1A – NOTICE TO PROCEED/DISASTER RESPONSE PLANNING</u>** DESPP/DEMHS IDMTF member verbally contacts AshBritt that the written Task Order No. 1A will be issued. AshBritt begins coordination with EOC/IDMTF. • AshBritt's Pre-Execution Planning Team must report to the EOC designated person within 12 hours of the Task Order being issued. • AshBritt must submit required State instruments (i.e., Certificate of Insurance; $5 million bond) to DAS within 24 hours of receipt of Notice to Proceed. Within 7 days of issuance of Task Order 1A, DAS will require an additional bond of up to $100 million. • AshBritt must submit an Accident Prevention Program to the IDMTF. IDMTF will review and provide to Conn OSHA and US OSHA. • AshBritt and IDMTF will begin discussion on developing a scope of work, which will be revised as needed as the event unfolds. This scope of work will be the basis for the Management/Operations Plan.	DESPP/DEMHS, AshBritt, DAS, IDMTF, DOL, other State Agencies related to "required State instruments"

Item	Pre/Post Event (Days)	Activity	Responsible Party
Pre-Landfall Phase (continued)			
22	-1	**EXECUTE: TASK ORDER NO. 1B – NOTICE TO PROCEED** DEEP IDMTF member verbally contacts Tetra Tech that the written Task Order 1B – Notice to Proceed will be issued. • Tetra Tech Pre-Execution Planning Team must report to the EOC designated person within 24 hours of the Task Order being issued. • Tetra Tech Pre-Execution Planning Team to assist in the response planning, and assist in debris generation projections. • Tetra Tech must post required State instruments (i.e., Certificate of Insurance; $1 million bond) within 24 hours of receipt of Notice to Proceed. Tetra Tech to post $1 million bond to DAS.	DEEP, Tetra Tech, IDMTF
23	-1	**EXECUTE: TASK ORDER 2A – MOBILIZATION/ EQUIPMENT** • AshBritt to mobilize personnel and equipment to the state. • Assist the State of Connecticut with preliminary damage assessment. • Begin equipment certification at the rally point to include: Load volume certification, safety inspection and compliance, truck numbering, insurance certification, and digital photos of all trucks and equipment.	AshBritt, Tetra Tech, and State agencies responsible for licenses, certifications, permits
24	-1	**EXECUTE: TASK ORDER 2B – MOBILIZATION OF PERSONNEL AND EQUIPMENT IN COORDINATION WITH DEBRIS REMOVAL CONTRACTOR** • Tetra Tech to mobilize and deploy personnel with equipment per scope of work identified by AshBritt/Tetra Tech and State IDMTF. • Tetra Tech to certify types of vehicles, make and model, license plate numbers, equipment number, and measured maximum volume, in cubic yards • Tetra Tech to assist the State of Connecticut with preliminary damage assessment.	Tetra Tech, AshBritt, and State agencies responsible for licenses, certifications, permits
25	-1	Public Information disseminated to media and towns. On-going activity. • Press releases, interviews and outreach to media: o Alert public to anticipated hurricane/storm and steps they should take to secure their property and safety o Provide any advice and guidance being suggested by federal/state officials • Prominently feature storm “alert” information from state agencies on ct.gov homepage and other social media.	PIO – Governor’s Emergency Communications Team
26	-1	AshBritt to coordinate with ConnDOT Oversize/Overweight permit program.	AshBritt, ConnDOT
Phase 1: Initial Response and Debris Clearance			
27	0	Coordination continues among IDMTF, AshBritt and Tetra Tech. State to provide updates and discuss preliminary damage reports to the Unified Command. On-going activity.	IDMTF, AshBritt and Tetra Tech
28	0	1. AshBritt Management Team deployed to State EOC reporting to IDMTF. 2. Tetra Tech Management Team deployed to State EOC reporting to IDMTF.	AshBritt, Tetra Tech, IDMTF

Item	Pre/Post Event (Days)	Activity	Responsible Party
Phase 1: Initial Response and Debris Clearance (continued)			
29	+0 to +30	Public utilities to provide to EOC/IDMTF a prioritized listing of critical facilities and routes essential to power/telecommunications restoration. On-going activity.	Utilities (Eversource, UI, others), IDMTF
30	0 to +30	Initial assessments of State and local roads. On-going activity.	ConnDOT, CSP, towns, AshBritt, Tetra Tech
31	0	DESPP/DEMHS to mission assign Civil Air Patrol to conduct flyovers of State to assess damage.	DESPP/DEMHS, Civil Air Patrol
32	0 to +100	ConnDOT directs activities related to emergency road clearance.	ConnDOT - Sole Lead; (IDMTF-stays informed)
33	0 to +100	1. ConnDOT continues emergency road clearance, and assesses the need for additional resources by State contractor for "Push-and-Shove". 2. ConnDOT informs Unified Command of ongoing assessment findings. 3. If resources are needed, the IDMTF will issue Task Orders and ConnDOT will issue work assignments to the contractor.	ConnDOT , Unified Command, AshBritt, Tetra Tech, IDMTF
34	+0 to +30	Coordinate clearance of areas with downed utility poles and other damaged utility infrastructure. On-going activity.	IDMTF, Utilities, AshBritt, Tetra Tech, ConnDOT
35	0	DEEP executes Emergency Authorizations for DMS for municipal use. On-going activity.	DEEP
36	0 to +60	Public Information disseminated to media and towns. On-going activity. • Press releases, interviews and outreach to media: o Debris management issues. o Emergency Authorizations for DMS for municipal use. • Prominently feature storm "recovery" information from state agencies on ct.gov homepage and other social media.	PIO – Governor's Emergency Communications Team
37	+1 to +10	Before, during, and following the event, the Governor will conduct: press conferences two times a day; meetings/ conference calls with Commissioners two times a day, AM and PM; and a conference call with municipalities once a day.	Governor, state agencies
38	+1 to +20	Governor requests (through DESPP/DEMHS) FEMA Region 1 Administrator's deployment of FEMA Preliminary Disaster Assessment (PDA) Teams.	Governor, DESPP/DEMHS, FEMA
39	+1 to +30	Coordinate with GIS support to record debris clearance and removal operations regarding State clean-up status.	IDMTF, AshBritt, Tetra Tech, GIS Lab at EOC
40	+1 to +10	1. Conduct preliminary damage assessment for debris to determine quantity and composition for debris cleanup needed. 2. Tetra Tech and AshBritt assist IDMTF in generating initial debris quantity estimates, by county, by municipality, and by debris type. 3. IDMTF prepare a draft debris estimate for use at the EOC.	IDMTF, State agencies, AshBritt, Tetra Tech
41	+1 to +30	IDMTF with the state contractors prepares a preliminary scope of work so that the contractors can establish work crews and begin to prepare a management/operations plan. IDMTF will continue to issue Task Orders to address needed missions.	Tetra Tech, AshBritt, DEEP, ConnDOT, DESPP/DEMHS

Item	Pre/Post Event (Days)	Activity	Responsible Party
Phase 1: Initial Response and Debris Clearance (continued)			
42	+1 to +60	Implement protocols for proper debris management: • Waste segregation (e.g., recyclables, metals, construction and demolition debris, green debris). • Abandoned vehicles and vessels. • Hazardous materials.	DEEP
43	+1	1. AshBritt to post $ 5 million bond to DAS. 2. Tetra Tech to post $ 1 million bond to DAS.	AshBritt, Tetra Tech, DAS
44	+1 to +60	1. ConnDOT contacts U.S. Department of Transportation/ U.S. Federal Highway Administration for Federal-Aid Highway Emergency Relief program assistance. 2. ConnDOT will provide information to local governments regarding U.S. FHWA funding.	ConnDOT, IDMTF, AshBritt, Tetra Tech, local governments
45	+1 to +60	STATE AGENCIES REQUIRING DEBRIS REMOVAL ASSISTANCE: 1. Submit requests to State EOC Operations Desk 2. EOC Operations Desk will record the request and forward it to the IDMTF. 3. If necessary, the IDMTF prioritizes requests and assigns the contractors for follow-up. 4. State contractors are deployed to the requesting agency's damage site(s) to assist requesting agency in developing the "Scope of Work". 5. Contractor notifies the IDMTF on results of assessment, identifying the work/equipment needs. 6. IDMTF approves the scope of work. This activity will fall under an existing task order or a new task order will be issued. 7. Contractor schedules the work. 8. IDMTF notifies the EOC Operations Desk of the action(s) taken. *IDMTF continues to assess and evaluate requests for assistance, and where appropriate, develops and approves a scope of work. The IDMTF will continue to add to existing task orders or will create new task orders as needed. Continuing daily throughout the event.*	State EOC, IDMTF, AshBritt, Tetra Tech , State Agencies
46	+1 to +60	LOCAL DEBRIS PROBLEM REPORTING: 1. Town will report/request through the DESPP/DEMHS Regional Coordinators who will transmit the report to the State EOC Operations Desk 2. EOC Operations Desk will record the report/request/question and forward it to the IDMTF. 3. IDMTF will coordinate with Utilities, ConnDOT, CTNG, and others, and evaluate the needed response. 4. Appropriate action(s), consistent with State authority, will be taken. 5. If appropriate, the IDMTF will refer the interested municipalities to the State debris contractors regarding individual municipal agreements at the municipality's expense. 6. IDMTF notifies the EOC Operations Desk of the action(s) taken.	Local governments, EOC, IDMTF, AshBritt, Tetra Tech, ConnDOT, CTNG, Utilities

Item	Pre/Post Event (Days)	Activity	Responsible Party
Phase 1: Initial Response and Debris Clearance (continued)			
47	+2 to +10	Assess damage to potential DMS and vehicle and vessel aggregation sites. Confirm DMS and vehicle and vessel aggregation sites selection and post-storm viability.	AshBritt, DEEP, DESPP/DEMHS
48	+3 to +10	1. Governor requests Major Disaster Declaration by the President through FEMA Region 1 Administrator. 2. Connecticut receives the President's Major Disaster Declaration. 3. Governor provides public announcement regarding the Presidential Declaration of Major Natural Disaster.	Governor, DESPP/DEMHS, FEMA
49	+3	Tetra Tech may assist State in preparing request for Expedited Payments for those applicants, State or local, in need of such funding.	Tetra Tech, DESPP/DEMHS
50	+4 to +60	Public Information disseminated to media and towns. • Press releases, interviews and outreach to media: o Provide "What you can do info" on cleaning up and segregating debris • Prominently feature storm "recovery," including debris pickup information, from state agencies on ct.gov homepage and other social media.	PIO – Governor's Emergency Communications Team
51	+4 to +30	Final identification and approval of site plans for development of DMS and vehicle and vessel aggregation sites and implementation, and issuance of Emergency Authorizations.	DEEP, state agencies permittees, AshBritt
52	+4 to +30	AshBritt begins preparation (i.e., baseline testing, security, other) of DMS and vehicle and vessel aggregation sites in declared counties. ***Note: DMS and vehicle and vessel aggregation sites must be established and ready to accept debris prior to initiating the debris collection operations.***	AshBritt, DEEP, DESPP/DEMHS
53	+4 to +30	Assist contractors with planning truck routes. On-going.	ConnDOT, AshBritt, Tetra Tech, Public Utilities, IDMTF
54	+4 to +10	Priority emergency road clearance on-going or completed. State requests from FEMA a confirmation of eligibility to continue with emergency road clearance on a time and material basis unless these operations have already been completed. Full mobilization of resources.	ConnDOT, IDMTF, AshBritt, Tetra Tech; EOC/DESPP/DEMHS, FEMA
Phase 2 – Debris Removal and Recovery			
55	+4 to +30	Determine if the integrity of the bridges or other highway structures have been affected by debris. DESPP/DEMHS may (on ConnDOT's behalf) request FEMA to provide engineers to assist ConnDOT or may pursue an EMAC request for engineers.	ConnDOT, DESPP/DEMHS, FEMA
56	+7 to +100	In conjunction with IDMTF and Tetra Tech, AshBritt prepares a dynamic Management/Operations Plan for review and additional revisions as necessitated by the changing scope of work as identified by the IDMTF. A final report or addendum will be submitted to the IDMTF after the majority of the operations have been completed.	AshBritt, Tetra Tech, IDMTF
57	+7	Per DAS and DESPP/DEMHS, AshBritt to post up to $100 million bond.	AshBritt, DAS, DESPP/DEMHS

Item	Pre/Post Event (Days)	Activity	Responsible Party
Phase 2 – Debris Removal and Recovery (continued)			
58	+7	1. Commence quality assurance and compliance program to identify, track, and correct deficiencies. 2. Deploy Quality Control Coordinators (AshBritt, DEEP/ConnDOT/Tetra Tech field monitors, and the DEEP/Tetra Tech tower monitors).	AshBritt, Tetra Tech, DEEP, ConnDOT
59	+7 to +60	Remove debris from State lands. Ongoing.	AshBritt, Tetra Tech, State agencies
60	+8 to +60	Contractors continue to draft/update Scope of Work(s) and submit to the IDMTF for review, approval, and subsequent issuance of Task Orders (#A-AshBritt; #B-Tetra Tech).	IDMTF, AshBritt, Tetra Tech
61	+21	Request an extension of the Governor's Declaration of a state- wide civil preparedness emergency.	IDMTF, DMV, ConnDOT, Governor's Office
Post Recovery Activities – Public Assistance, Close-out DMS, and Quality Assurance			
62	+30	Governor/DESPP/DEMHS directs that the EOC be closed after daily emergency response and recovery actions have transitioned to day-to-day recovery.	EOC
63	+30	Public Assistance (PA) funding process initiated for State and local cost recovery. State/FEMA conducts Applicants' Briefings in Declared Counties.	DESPP/DEMHS, FEMA, Applicants
64	+30	Request for Public Assistance Forms due from applicants within 30 days of the date of the declaration.	DESPP/DEMHS, FEMA, Applicants
65	+30	DEEP to inspect reports of illegal dump sites or incidents of illegal dumping, and the mixing of recyclable materials with other debris. On-going.	DEEP
66	+40 to +60	FEMA conducts Kick Off Meetings with applicants.	FEMA, Applicants
67	+80 to +180	Review of FEMA Project Worksheets; Notifications to Applicants; Processing of Payments for Public Assistance Projects.	DESPP/DEMHS, DEEP, ConnDOT
68	+180	Public Assistance deadlines: Emergency Work must be completed within 6 months of the date of the declaration. Possible 6 month extension. Permanent work must be completed within 18 months of the date of the declaration. Possible extension of up to 30 additional months.	DESPP/DEMHS, FEMA, Applicants

Item	Pre/Post Event (Days)	Activity	Responsible Party
Post Recovery Activities – Public Assistance, Close-out DMS, and Quality Assurance (continued)			
69	+180	Close-out DMS: 1. Complete chain of custody records for the site. 2. Prepare documentation of DMS operational and management costs. 3. Dismantle and remove temporary structures; remove equipment. 4. Spills remediated, if any; then determine specific testing and sampling requirements for subject site (soil, groundwater and ash). Conduct testing and remediate as may be necessary. 5. Location of storage area stockpiles marked on site plan; then begin disposal of all residual debris from the DMS to an approved final disposition site. 6. Topography regraded as may be necessary and site secured for wherever stockpiles may remain for longer term. 7. Existing groundwater monitoring wells identified on site plan, secured and restored.	AshBritt, Tetra Tech, DEEP
70	+180	Close-out Aggregation Sites for abandoned vehicles and vessels. 1. Complete chain of custody records for the site. 2. Prepare documentation of DMS operational and management costs. 3. Dismantle and remove temporary structures; remove equipment. 4. Spills remediated, if any; then determine specific testing and sampling requirements for subject site (soil, groundwater and ash). Conduct testing and remediate as may be necessary. 5. Existing groundwater monitoring wells identified on site plan, secured and restored.	AshBritt, Tetra Tech, DEEP, DMV, Permittees
71	+180	State contractor to submit final report or addendum to DESPP/DEMHS summarizing all activities.	AshBritt, DESPP/DEMHS
72	+180	Review of FEMA Project Worksheets; Processing of Payments for Public Assistance Projects; Prepare for Project Close-Outs.	DESPP/DEMHS, DEEP, ConnDOT
73	+180	Evaluate success of clean-up effort.	IDMTF, all agencies, AshBritt and Tetra Tech
74	+180	Revise contracts, as needed.	DAS, DESPP/DEMHS, DEEP, ConnDOT, AshBritt, Tetra Tech

IX: Key Contact List

Role	Name	Title	Phone	Fax	email
Emergency Services & Public Protection, Department of /Division of Emergency Management and Homeland Security					
IDMTF	**Judy Pahl**	Emergency Management Program Specialist	**EOC:** **860-566-3180** **Office:** **860-256-0877**	EOC: 860-247-0664 Sig. St: 860-256-0821	Judy.pahl@ct.gov Demhs.pa@ct.gov
Emergency Services & Public Protection, Department of					
	24 hour lines	CT State Police, DESPP	**Office:** **860-685-8190** **Office:** **800-842-0200**		
Energy and Environmental Protection, Department of					
IDMTF	**DEEP Debris Main #**	DEEP Debris Main #	**Office:** **860-424-3366**	860-424-4059	DEEP.debris@ct.gov
IDMTF	**DEEP EOC**	DEEP at DEEP EOC	**EOC** **860-920-3277**	860-424-4059	DEEP.EOC@ct.gov
DMS	**Gabrielle Frigon**	Supervising Environmental Analyst – Solid Waste Permitting Programs - East	**Office:** **860-424-3795**	860-424-4059	Gabrielle.frigon@ct.gov
IDMTF	**Frank Gagliardo**	Supervising Environmental Analyst – Solid Waste Permitting Programs - West	**Office:** **860-424-3130**	860-424-4059	Frank.p.gagliardo@ct.gov
	Dennis Greci	Municipal Facilities Section	**Office:** **860-424-4067**	860-424-4067	Dennis.greci@ct.gov
IDMTF	**Robert Isner**	Director – Solid Waste and Hazardous Waste Programs	**Office:** **860-424-3264**	860-424-4059	Robert.isner@ct.gov
IDMTF	**Chris Nelson**	Supervising Environmental Analyst – Source Reduction and Recycling Program	**Office:** **860-424-3454**	860-424-4059	Chris.nelson@ct.gov
IDMTF	**Joseph Schiavone**	Supervising Environmental Analyst – Hazardous/Solid Waste Enforcement Program - West	**Office:** **860-424-3206**	860-424-4059	Joseph.schiavone@ct.gov
Transportation, Department of					
IDMTF	**John S. DeCastro**	Transportation Maintenance Manager, Emergency Relief Coordinator	**Office:** **860-594-2614**	860-594-2655	John.DeCastro@ct.gov
IDMTF	**Sherri L. Ruiz-Clark**	Transportation Maintenance Special Services Section Manager	**Office:** **860-258-4502**	860-258-4507	Sherri.ruiz.clark@ct.gov
IDMTF	**Bart Sweeney**	Transportation Maintenance Director	**Office:** **860- 594-2604**		Bartholomew.sweeney@ct.gov

Role	Name	Title	Phone	Fax	email
Administrative Services, Department of					
IDMTF	**Paul Greco**	Contract Specialist	**Office:** **860-713-5189**		Paul.greco@ct.gov
	Doug Moore	Construction Services	**Office:** **860-713-5885**		Doug.moore@ct.gov
IDMTF	**Ray Philbrick**	Director of Safety & Security, Construction Services	**Office:** **860-713-5811**		Raymond.philbrick@ct.gov
IDMTF	**Carol Wilson**	Director of Procurement	**Office:** **860-713-5095**		Carol.wilson@ct.gov
Labor, Department of					
IDMTF	**James Pierce**	CONN-OSHA Program Manager	**Office:** **860-263-6922** **Cell:** **860-462-5421**	860-263-6940	Pierce.james.1@DOL.gov
IDMTF	**Kenneth Tucker**	CONN-OSHA Director	**Office:** **860-263-6929** **Cell:** **860-462-5578**	860-263-6940	Tucker.Kenneth@DOL.gov
U.S. Department of Labor					
IDMTF	**Robert Kowalski**	Bridgeport Area Director	**Office:** **203-579-5581** **Cell:** **203-804-8474**		Kowalski.bob@dol.gov Kowalski@snet.net
IDMTF	**Paul Mangiafico**	Compliance Assistance Specialist – Hartford Area	**Office:** **860-240-3152**		Mangiafico.paul@dol.gov
IDMTF	**Warren Simpson**	Hartford Area Director	**Office:** **860-240-3152**		Simpson.warren@dol.gov
Federal Emergency Management Agency (FEMA)					
	Paul F. Ford	Regional Administrator for FEMA Region 1	**Office:** **617-956-7566**	617-956-7519	Paul.ford@fema.dhs.gov
	Albie Lewis	FEMA-FCO Cadre	**Office:** **802-338-1571**		albie.lewis@dhs.gov
	Jean McDonough	PA Coordinator	**Office:** **617- 595-7404**	617-956-7507	Jean.mcdonough@dhs.gov
US Environment Protection Agency (EPA)					
	Ted Bazenas	EPA On-Scene Coordinator, Region 1 NE	**Office:** **617-918-1230**	617-918-0230	Bazenas.ted@epa.gov
	Stuart Gray	EPA Chief RCRA Hazardous Waste Section	**Office:** **617-918-1302**		Gray.stuart@epa.gov
US Department of Agriculture, National Resources Conservation Center (NRCS)					
	Diane Blais	District Conservationist, Hamden Field OFC	**Office:** **203-287-8038**		Diane.blais@ct.usda.gov
	Raymond Covino	District Conservationist, Danielson Field OFC	**Office:** **860-779-0557**	860-779-0607	raymond.covino@ct.usda.gov
	Javier Cruz	District Conservationist, Norwich Field OFC	**Office:** **860-887-3604**	860-887-4082	javier.cruz@ct.usda.gov

Role	Name	Title	Phone	Fax	email
US Department of Agriculture, National Resources Conservation Center (NRCS) - Continued					
	Vivian Felten	District Conservationist, Windsor Field OFC	**Office:** **860-688-7725, ext 118** **Cell:** **860-921-8255**	860-688-0083	vivian.felten@ct.usda.gov
	Amy Fischer	District Conservationist, Torrington Field OFC	**Office:** **860-626-8258, ext 200**	860-626-8850	amy.fischer@ct.usda.gov
	Brunilda Velez	Acting State Conservationist, Tolland State OFC	**Office:** **860-871-4011**	860-871-4054	Barb.alexander@ct.usda.gov
	Arde Ramthun	State Conservation Engineer	**Office:** **860-871-4030** **Cell:** **860-578-0304**	860-871-4054	arthur.ramthun@ct.usda.gov
Utilities					
IDMTF/ UI	**Terri R. Eller**	UI Director, Commercial & Industrial Sales, Liaison Leader (1)	**Office:** **203-499-2317**		terri.eller@uinet.com
IDMTF/ UI	**Roddy Diotalevi**	UI Sr. Director, Sales & Marketing, Liaison Leader (2)	**Office:** **203-499-3632**		roddy.diotalevi@uinet.com
	Carlos Vazquez	UI Senior Director, Government Relations, State EOC Liaison Lead	**Office:** **203-499-2825**		carlos.vazquez@uinet.com
	James Cole	UI Director of Operations, Incident Commander (1)	**Office:** **203-926-4437**		jim.cole@uinet.com
	Mark Biron	UI Manager of Emergency Preparedness and Response, Incident Commander (2)	**Office:** **203-499-2570**		mark.biron@uinet.com
	Dave Goodson	UI Mgr - Vegetation Management	**Office:** **203-499-3230**		david.goodson@uinet.com
	Eoc.ui@po.state.ct.us	UI EOC			Eoc.ui@po.state.ct.us
IDMTF/ Eversource	**Mark Fangiullo**	Manager-Emergency Preparedness, Eversource **ELECTRIC** Operations	**Office:** **860-665-2064**		mark.fangiullo@eversource.com
IDMTF/ Eversource	**Garry Daigle**	Manager –Emergency Preparedness, Eversource **GAS** Operations	**Office:** **203-596-3149**		garry.daigle@eversource.com
IDMTF/ Eversource	**Daniel A. Hagan**	Manager – Electric Field Operations, Eversource	**Office:** **860-447-5808**		Daniel.hazan@eversource.com
	Catie Burns, PMP	Emergency Coordination, Eversource	**Office:** **860-665-5272**		catie.burns@eversource.com
		Eversource at EOC			
	Kelly Beckmann	Marketing Coordinator – Vendor Contact	**Office:** **954-725-6992**		kbeckmann@ashbritt.com

Role	Name	Title	Phone	Fax	email
Contractors – Debris Removal and Management - AshBritt					
IDMTF	**Ralph Dahlgren**	Senior Vice President/Operations Manager for CT	**Office:** **954-545-3535** **Cell:** **954-818-3564**	954-545-3585	ralph@ashbritt.com
IDMTF	**Dow Knight**	Senior Vice President	**Office:** **954-725-6992** **Cell:** **954-818-4416**		dknight@ashbritt.com
IDMTF	**Terry Jackson**	Chief Marketing Strategist	**Cell:** **954-683-0248**		Tmjackson2011@gmail.com
IDMTF	**John Noble**	Chief Operating Officer	**Office:** **954-545-3535** **Cell:** **954-683-0247**	954-301-3890	jnoble@ashbritt.com
Contractors – Debris Monitoring – Tetra Tech					
IDMTF	**Jonathan Burgiel**	VP- Division Manager	**Cell:** **407-342-2282**		Jonathan.Burgiel@tetratech.com
IDMTF	**John Buri**	Financial Recovery Director	**Cell:** **713-737-5763**		john.buri@tetratech.com
	Jeffrey Dickerson	Automated Data Management System	**Cell:** **407-615-1462**	321-441-8501	jeffrey.dickerson@tetratech.com
IDMTF	**Dick Hainje**	Senior Advisor (FEMA expertise)	**Cell:** **321-246-3308**		Dick.hainje@tetratech.com
IDMTF	**Betty Kamara**	Contracts Manager	**Cell:** **407-803-2551**		Betty.kamara@tetratech.com
IDMTF	**Ralph Natale**	Response and Recovery Director	**Cell:** **407-580-8184**		ralph.natale@tetratech.com
Municipal Outreach Distribution					
	Elizabeth Gara	Connecticut Council of Small Towns	**Office:** **860-676-0770** **Cell:** **860-841-7350**	860-676-2662	bgara@ctcost.org gara@gmlobbying.com
	Mike Muszynski	Connecticut Conference of Municipalities	**Office:** **203-498-3026**	203-498-5825	MMuszynski@ccm-ct.org
	Kevin Maloney	Connecticut Conference of Municipalities	**Office:** **203-498-3025**	203-498-5827	kmaloney@ccm-ct.org
	William Abbott	State Fire Marshal	**Office:** **860-713-5750**	860-713-7424	osfm.engineer@po.state.ct.us
	Donna Shea	UCONN Technology Transfer Center	**Office:** **860-486-0377**	860-486-5718	shea@engr.uconn.edu

CONNECTICUT DEPARTMENT OF TRANSPORTATION

POLICY STATEMENT

Policy No. P-5
June 27, 1994

Subject: Policy on General Maintenance and Transportation Improvements for the Merritt Parkway

It is the Department's policy that the Merritt Parkway should receive special treatment, particularly in the areas of design, landscape, and maintenance procedures. This policy is based on the Merritt Parkway's listing in the National Register of Historic Places, its designation as a State Scenic Road, and its aesthetic value.

The Merritt Parkway is a distinct type of roadway having an important aesthetic value, in addition to its vital transportation function. It is the Department's responsibility to maintain this crucial transportation artery as a safe and efficient roadway while also preserving and enhancing it as an important State scenic, cultural, and historic resource.

In meeting this policy, all Merritt Parkway transportation improvements and maintenance activities shall be undertaken in accordance with the Department's Merritt Parkway Guidelines for General Maintenance and Transportation Improvements.

Emil H. Frankel
Commissioner

List 3

A LANDSCAPE MASTER PLAN
FOR THE MERRITT PARKWAY

FINAL REPORT

MERRITT PARKWAY
LANDSCAPE MASTER PLAN

October 31, 1994

State Project No. 173-228
FAP No. STPE-150 (136)

Prepared by:

Milone & MacBroom, Inc.
Cheshire, Connecticut

In association with:

Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday, Inc.

CONTENTS
MERRITT PARKWAY LANDSCAPE MASTER PLAN

ACKNOWLEDGMENTS

The Landscape Master Plan consultant team wishes to extend its sincere appreciation to W. Thayer Chase, the original Landscape Architect for the Merritt Parkway, for providing personal photographs, memoirs, and comments on his design objectives during the construction of the Parkway; to A. Earle Wood, former Commissioner of Transportation, for providing historical photographs; and to Carl Johnson of Ann Arbor, Michigan for his artistic talent in preparing the sketches of the Parkway as it once appeared and as we all hope it will look after this plan has been implemented.

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday, Inc.

EXECUTIVE SUMMARY

By its placement on the National Register of Historic Places in 1990 and its subsequent designation by Governor Lowell P. Weicker, Jr. as a Scenic Highway in 1993, the Merritt Parkway has now received the accolades for which its planners and designers had hoped some 60 years ago. As do most things that are heavily utilized, the Parkway shows its age and is in need of rehabilitation. Thus, this Landscape Master Plan has been commissioned by the Connecticut Department of Transportation to identify opportunities to improve the landscape returning it to its park-like quality for which it is well known.

The Merritt Parkway is a major transportation route in southwestern Connecticut linking Bridgeport and the shoreline communities of Fairfield County to New York to the southwest and to New Haven and other places to the east and north. Built in the late 1930's, the Parkway carries as many as 68,000 vehicles per day along its 38 miles through narrow rock cuts, old fields, and mature woodland, around sharp curves, traversing the hillsides of eight towns.

When the Parkway was under construction, its landscape architects hoped to place the road in a park-like setting where the natural woodland would be preserved and the construction scars healed with new plantings. Areas disturbed by construction were replanted with indigenous planting. The architecture of each of the 38 bridges, each with its individual art deco, art moderne, or classical design, was enhanced with new evergreen trees and flowering shrubs. The spatial and visual variety created by the juxtapositions of open meadows and dense forest and experienced by the travelling motorist has been the hallmark of the Merritt Parkway.

The landscape of the Merritt Parkway reached its zenith in the late 1950's. Since that time with changing maintenance practices, the park-like quality of the Parkway has diminished. The defined edges between woodland and meadow have become blurred; the plantings at bridge abutments have become overgrown; plantings in the median are reaching old age; and the guiderail which was originally wood beam has been replaced with utilitarian materials typical of interstate highways.

The initial task in the preparation of the master plan was to inventory the existing conditions of the landscape. Existing Department mapping was supplemented with aerial photography, ground level video, still photography, and field investigation. The findings were plotted on 40 sheets at 200 scale.

In addition to the field inventory, land uses surrounding the Parkway right-of-way were examined. For the most part, the land uses adjacent to the Parkway are now, and are likely to continue to be, low density residential. Non-residential uses which may occur at the larger interchanges at Routes 7, 8, and 25 conceivably could alter the visual quality of the Parkway at these limited locations.

The consultant team observed as part of the inventory process that the elements which adversely influenced the visual quality of the Parkway were not isolated to a single location but were repeated throughout its length. For example, the inconsistent placement and material of the median guiderail occurs from one end of the Parkway to the other. The location of the problems have been recorded on Inventory and Analysis Maps and have been tabulated in this report. The observations and issues are summarized as follows:

- Parkway identity is greatly influenced by the tight vertical and horizontal curvature of the original engineering design.

- Horizontal and vertical curves, and the placement and approach of the bridges emphasize the views and vistas, while enhancing the visual experience.
- Dramatic change in adjacent land use has resulted in areas of non-parkway type views from the roadway.
- Plant material has been used to emphasize the views to and through bridges, to frame views, and to screen off-site views.
- Though installed for safety reasons, the use of evergreens on curves adds focal points and terminating views.
- General condition of the median and the inconsistent details (guiderails, signs, new interchange lighting, chain link fences, etc.) significantly detract from the visual quality of the Parkway.
- Bridge abutments and details are generally obscured by overgrown vegetation.
- The unpruned cedar groves are more naturalistic and appropriate than the pruned cedars occurring in the median.
- Opportunities exist to clear and reveal attractive details such as the bridge architecture and the low stone walls.
- Generally, consistency and repetition of design elements and principles add to the aesthetic experience of driving the Parkway.
- Major areas of alteration and construction present the most significant opportunities for major landscape rehabilitation.
- The Merritt Parkway is a resource that must be preserved as a scenic highway.

The primary design goal of the Master Plan is to re-establish the quality of the landscape as it existed at its peak approximately 30 years ago. To achieve that park-like quality, the following design principles should be followed:

- Reinforce and re-establish the variety and modulation of the spatial experience by contrasting the mature forest with open lawns and meadows.
- Manipulate both terminating and leading views through screening, enframing, and filtering by the addition of mass vegetation in some instances and thinning or removing overgrown vegetation in others.
- Provide additional vegetation to further enhance the vertical and horizontal alignment of the roadway and further enhance areas of overhead canopy.
- Bring the landscape closer to the Parkway edge while recognizing the required standard of safety.
- Keep new plantings in context with the surrounding landscape character and plant communities to provide consistency across the entire right-of-way and the median.
- Provide seasonal color through the massing of plants.
- Provide for a consistent treatment for the median including plant material, grasses, barriers, and guiderails.
- Provide consistency in details, signage, and other elements contributing to the landscape.

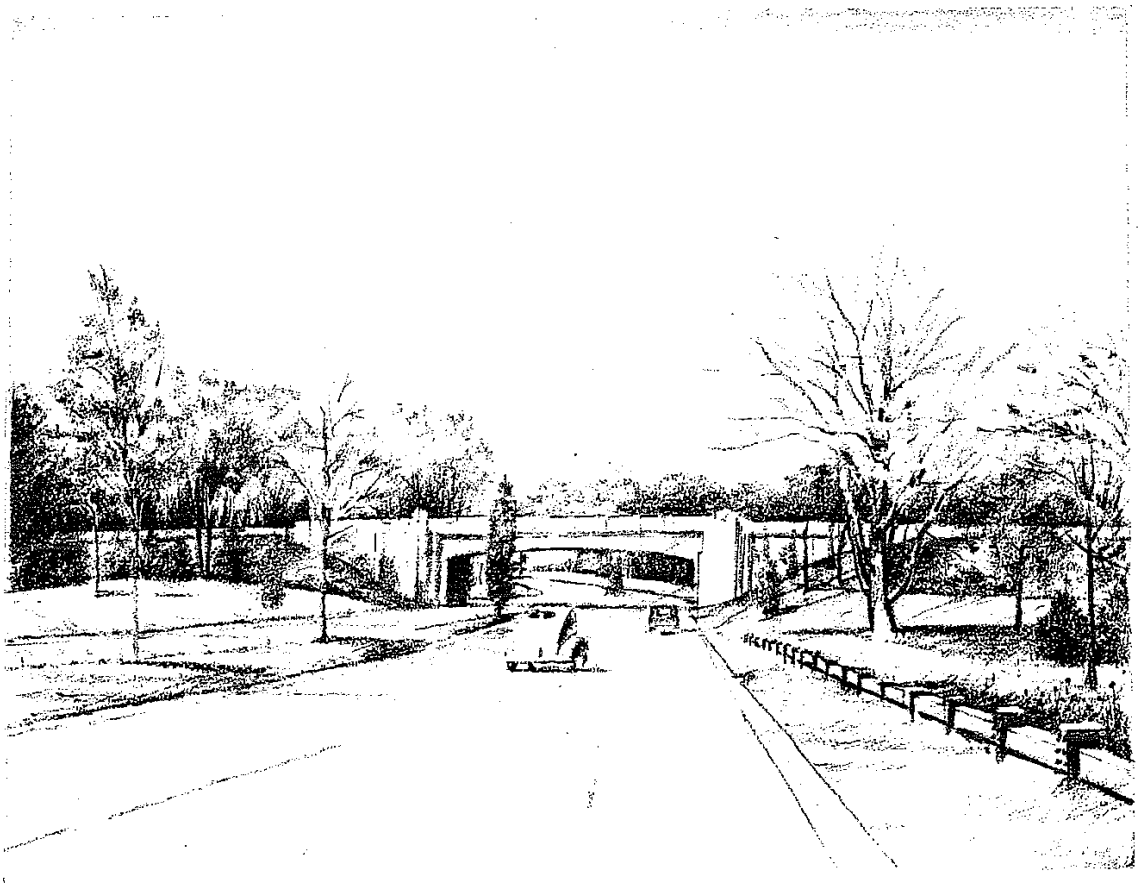
The problems observed on the Parkway have been placed into one of six groups: Gateways, Service Areas, New Interchanges, Bridges, Edges, and Medians. For each group of problems, a series of alternative design solutions has been developed to illustrate how to treat the problem. These typical solutions form the basis of the Landscape Master Plan and will serve as the landscape architect's design palette.

The design treatments illustrated in this report have been applied to the entire length of the Parkway in a somewhat generalized way and presented at 200 scale. (Reduced scale color renderings have also been prepared for incorporation into this document.) Budgetary cost estimates for the improvements have been prepared and have been broken down into landscape improvements and related safety improvements.

Maintenance of the Parkway was examined as part of the assessment phase of the study. Recommendations for maintaining the aesthetics of the Parkway have been made as part of this study with specific guidelines for treating lawns, pruning, land clearing, reforestation, etc. In general, it is anticipated that the maintenance effort for the median will decrease since all mowing will be performed within the parallel guiderails. This decrease will be offset by the replacement of invasive vegetation with revitalized meadows along the forest edge.

With the completion of the Landscape Master Plan, the department now has a blueprint for action. Over the next 15 years or so, it is the Department's intention to implement these improvements. Such improvements as removal of invasive vegetation, pruning of vegetation, and the installation of new plantings and lawn can be implemented in the near future, while the replacement of guiderail with steel-backed wood and the installation of the curb/gutter will occur over a longer period of time in conjunction with ongoing roadway safety improvements. In the end, the citizens of Connecticut will once again be able to enjoy the drive in a park-like setting experienced by the motorists of the 1940s and 1950s.

o31mp6.2



Section 1

Introduction

1. INTRODUCTION

1.1 BRIEF CHRONOLOGY OF PARKWAY DEVELOPMENT

When the Merritt Parkway was designed some 60 years ago, who would have envisioned the volume of traffic that it now carries daily, and the intensity of surrounding development that squeezes this ribbon of open space that links the communities of Fairfield County to New York, New Haven, and places beyond. For those people who have grown up with the Parkway, it would be hard to imagine the Merritt without its art deco, art moderne, and classic design of its bridges, each with its unique details; or the six rest areas with the small stone or brick buildings and the post and beam guiderail; or the 38 miles of designed landscape that complements the surrounding natural vegetation and creates a park-like experience.

The concept for an "automobile" boulevard between New York and Boston dates back to the early 1900's when the Connecticut Automobile Parkway Corporation received a charter to build and operate such a facility. But it took 20 years before Highway Commissioner Charles Bennett recommended that a parallel route to the Post Road be built and the Connecticut Highway Department initiated field reconnaissance. In 1927, the Connecticut General Assembly authorized the construction of a road through Fairfield County, appropriated the initial funding, and named the road after Congressman Schuyler Merritt.

In 1931, legislation was passed to create a commission to supervise the construction of the road. It took nearly four years to select the appropriate route, resolve political issues, and acquire land. In 1934, the first construction contract was awarded and work began the following year in Greenwich and Trumbull.

The first section of the Merritt Parkway was opened for traffic in 1938, some 30 years after the project was conceived. This section, from the New York state line in Greenwich to U.S. Route 7 in Norwalk, was praised in the New York Times for its "lavish decorative scheme" of trees, shrubs, and flowers which had been planted to beautify the roadside and median, thus creating the park-like character for which the Merritt is so well known. In fact, the Parkway was an instant success with an average daily traffic of 25,000 cars four months after its opening.

Over the next four years, the remaining sections of the Parkway were completed allowing the motorist to travel to the Housatonic River through a magnificent linear park for a distance of 38 miles.

1.2 NATIONAL REGISTER AND SCENIC HIGHWAY DESIGNATION

For its first 20 years or so, the changes to the Merritt Parkway were incremental. For example, speed limits increased slightly, guiderail systems were modified, shrubbery in the median was removed, and interchanges were modified to handle increased traffic volumes and speeds. In the mid-1960's, landscape maintenance procedures began to change. Mechanized operations replaced hand labor. The character of the Parkway became more mature as the woodland grew in and the level of lawn mowing decreased.

The first significant change in the overall character of the Parkway occurred beginning in the 1980's with the construction of the interchanges for Route 8 and Route 25 in Trumbull, and most recently, Route 7 in Norwalk. Designed to "interstate" standards, this deviation from the Parkway's historic character precipitated the popular movement to have the Merritt Parkway placed on the National Register for Historic Places. In recognition of its unique bridges, its significance in fostering the "parkway movement" as part of the American landscape, and its overall contribution to the quality of the Connecticut motoring experience, the Parkway was officially listed as a "Designed Historic Landscape" by the National Park Service in April 1991.

With its placement on the National Register, the maintenance of the Parkway's general character is nearly assured - at least where changes involving the expenditure of federal funds are involved. However, the dedication of the Merritt Parkway in 1993 as a "Scenic Road" gives strength to the movement to preserve its overall visual character.

1.3 PURPOSE OF STUDY

In his dedication of the Merritt Parkway as a scenic road, Governor Lowell P. Weicker, Jr. proclaimed:

> "that highways can still be constructed in this way for preserving the natural beauty. There's no reason why they can't be utilitarian and beautiful..."

With this principle in mind, Department of Transportation Commissioner Emil Frankel created the Merritt Parkway Working Group having the overall purpose of advising the Department of ways to preserve and enhance the Parkway while maintaining it as an important transportation artery. The Working Group has wrestled with the central issue: is the Parkway a major transportation facility or is it simply a beautiful place? The apparent answer from this on-going debate is that the Parkway is both.

As a result of its efforts, the Working Group identified five major issues which need to be addressed as part of the conservation of the Parkway's character:

- Parkway Design Standards
- The Landscape
- The Bridges
- The Parkway Median
- The Roadside Area

Each of these factors or elements contribute in some way to the quality of the motoring experience. While each of these issues can be addressed separately, the Department felt that a more comprehensive evaluation of the Parkway's condition was warranted.

The Department of Transportation has commissioned this study to evaluate the present condition of the landscape in light of the historical design concepts followed by W. Thayer Chase, the landscape architect responsible for the original plantings. The Landscape Master Plan will serve as a guide for the department in establishing design and maintenance standards and practices. This effort is not intended to create detailed planting plans for the Parkway. Rather, the design treatments illustrated in this plan will be the basis for the creation of detailed improvement plans to be implemented over time as funds become available, both for development and maintenance.

1.4 ELEMENTS OF THE LANDSCAPE MASTER PLAN

Four major elements comprise the Landscape Master Plan. The first element is an overview of the historical aspects of the Merritt Parkway with emphasis on the original planting and design concepts employed by Mr. Chase. This effort included a review of previous compiled historical documents and, more importantly, interviews with Mr. Chase and an examination of his personal files.

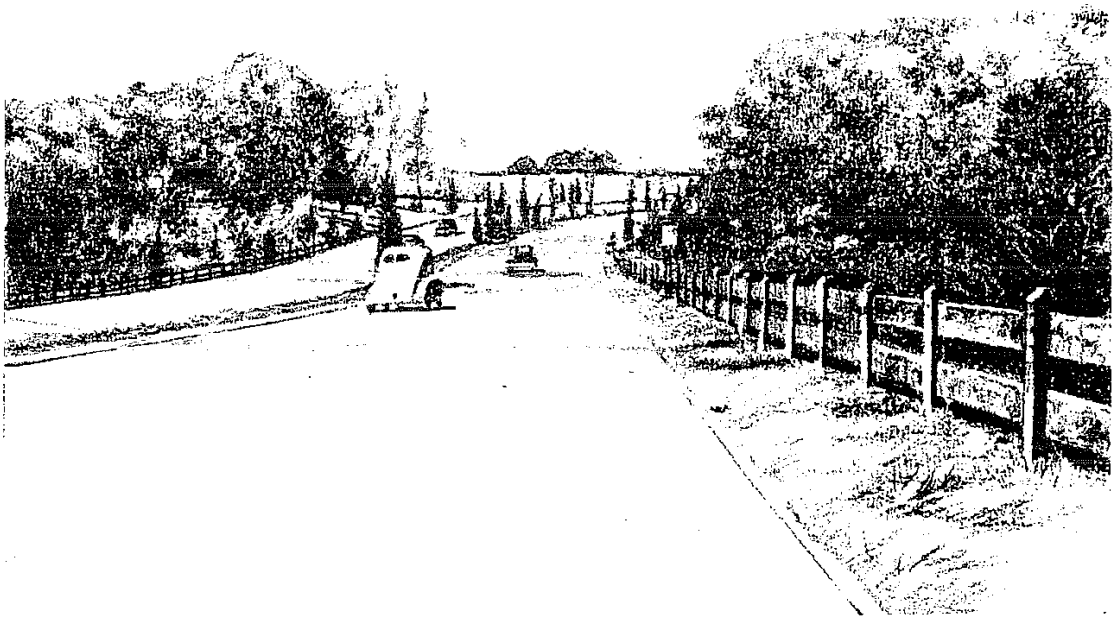
The second study component is an inventory and analysis of the existing condition of the Parkway. This effort encompassed extensive field investigations to supplement the Department's maps and plans. Aerial and ground photography was utilized to record field observations. Once the base maps for the entire 38 miles of the Parkway were complete, a critical evaluation of the data was made and a summary of the findings was prepared.

When presented with a problem, any designer will develop several solutions for presentation to the client. In this case, the problems needing solutions were placed into one of six broad categories and a palate of typical design alternatives was developed. Those design alternatives found to be most suitable, both from a technical and aesthetic perspective, have been included in the Landscape Master Plan. These alternative treatments will serve as a reference guide during the detailed design process.

The landscape plans for the Parkway were prepared at 200 scale (40 sheets) but have been reduced in scale for incorporation into this report. The plan illustrates where the existing plantings are to be improved and the location of new plantings. It also identifies the location for guiderail, median barriers, and other landscape features. The plan is generalized so that the designer of site-specific improvements will have some flexibility to apply the design guidelines and details to resolve problems which are identified at the detailed site level.

Finally, the Landscape Master Plan discusses such administrative issues as project phasing and budgets. Emphasis has been placed on operation and maintenance issues so that the Parkway character can be preserved over the long term once the suggested design treatments have been implemented.

o31mp1.2



Section 2

Historic Overview

2. HISTORIC OVERVIEW

2.1 INTRODUCTION

The initial task in preparing a landscape master plan for the Merritt Parkway was to understand what the design intent of the original engineers and landscape architects was when the Parkway was built some 50 years ago. It is fortuitous indeed that the recent interest in the Merritt Parkway as a significant historical asset in Connecticut has precipitated the publication of numerous articles and a new book documenting the Parkway's political and engineering history. This chapter of the Master Plan is simply an overview of not only the original landscape design intent but also the history of the Parkway as it may influence the design standards to be used in preparation of the new landscape plan. It is not the intention of this section of the Master Plan to restate what has already been published. Rather, this effort is only a summary of those design items which contributed to the overall appearance of the Parkway.

2.2 METHODOLOGY

The following methodology has been utilized in this study in order to place the Merritt Parkway in its appropriate historical context.

2.2.1 Review of Historical Reports

a. The Historical American Building Survey/Historical American Engineering Record (HABS/HAER) report, prepared by the National Park Service in 1992, was reviewed in its entirety with special focus being placed on the section dealing with the landscape.

b. The application to place the Merritt Parkway on the National Register of Historic Places was reviewed also. It should be noted that there are some discrepancies between this document and HABS/HAER but none of those seem to affect the landscape features. When there is a conflict, HABS/HAER is considered to be the more authoritative treatise.

c. The New Canaan Historical Society Annual "The Merritt Parkway" (1991) provided additional background information.

d. The recent book by Bruce Radde, The Merritt Parkway, (1993) served to support much of the data in the HABS/HAER documents.

2.2.2 Review of the Chase Files

It is fortunate that W. Thayer Chase, the original landscape architect for the Merritt Parkway, was gracious enough to discuss the landscape design and construction. Three lengthy interviews and an examination of his personal files have provided critical bits of background information not available from

published sources. His planting lists, photographs, personal notes, and most important, his comments and statements contained in the HABS/HAER report, together with the critique of HABS/HAER, has proven to be very helpful in the new design.

2.2.3 Historical Photos and Newspaper Clips

The Department of Transportation's archives include numerous photographs and newspaper articles pertaining to the Parkway. Many of these documents are duplicates of data contained in the Chase files. Additional photographs and illustrations contained in the HABS/HAER reports were also obtained as part of this effort.

2.2.4 National Park Service Requirements

The National Park Service has prepared (in draft) "Guidelines For the Treatment of Historical Landscapes". This document has been examined and those elements applicable to the Merritt Parkway have been summarized in this report.

2.3 PLACING THE LANDSCAPE IN CONTEXT

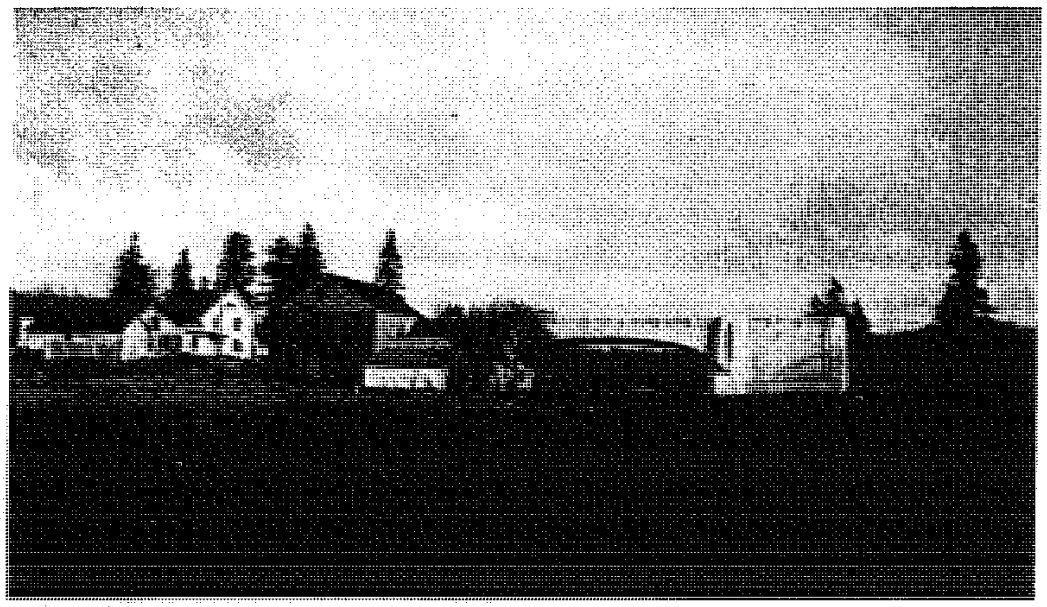
2.3.1 The Character of Landscape

The natural land form of Fairfield County typically consists of a series of ridges and valleys generally having a north to south orientation. Geologists attribute this topographic form to the advance and retreat of the Ice Age glaciers. These land forms are overlain by glacial till soils having a fairly high lime content making the land generally suitable for farming on the more gentle side slopes, flatter valleys, and hilltops.

Streams and alluvial bottom lands are found in the valley floor, with the flatter land adjacent to such watercourses as the Saugatuck River or the Norwalk River being subject to flooding. The side hill springs (now known as upland wetlands), which produce smaller streams, typically are underlain by bedrock and poorly drained soils.

Another natural land form which is evident throughout the lower sections of Fairfield County are the rocky ridges. The rural roads throughout the area wind through these hills carefully avoiding the steeper slopes, thus preserving the rural landscape.

By the 1920's, most of the virgin stands of trees in Connecticut had been cleared for farming. As farming began to decline, initially in the lower section of Fairfield County, in favor of large estates for wealthy landowners, the cleared land began to revert naturally back to woodland. By the mid-1940's, about 90% of Connecticut's forests were less than 60 years old. However, the reversion was rapid so that stands of coniferous and deciduous trees were dense enough to give the appearance of being much older. In contrast, the active farms in the more rural sections of Fairfield County gave a more open appearance to the landscape.



Easton Turnpike Bridge
Formerly "Sport Hill Road" Bridge ***Fairfield, CT 1939***
Looking east with the bridge complete and entirely free standing at this time. The farm house was moved to another location and the barn was razed.

The Merritt Parkway travels east/west so that it crosses the ridges and valleys at right angles or diagonally. Not only was this contrary to the parkway design principles espoused by Robert Moses, for example, in his designs for parkways in nearby New York, but it changed the character of the natural landscape. In the more densely wooded areas of the lower sections of the Parkway, the swath cleared for construction in order to achieve appropriate grades were quite significant. Similarly, little attention was given to the presence or value of wetlands as evidenced by the extensive wetland systems immediately adjacent to the fills created for the road. On the positive side, however, by traversing the topography perpendicularly, steep cuts were created exposing the bedrock to the traveling motorist. At the same time, long views were created by the fairly steep gradients of the Parkway. In the farming communities of the upper sections of the Parkway, the agricultural heritage could be seen a short distance from the road. In fact, farming operations continued within the right-of-way as the bridges were under construction.

2.3.2 The Parkway Concept

Parkways were originally proposed by the City Beautiful Movement as a way to help alleviate urban problems. By surrounding the major cities with parks that were reached by parkways, it was thought that parkways would provide both transportation and recreation/aesthetic enjoyment. Parkways helped institutionalize the Sunday afternoon drive, as more Americans bought cars.

One of the most important features of parkways was separating them from commercial streets and pedestrian movement by using grade separators. This was first demonstrated by landscape architect Frederick Law Olmsted and architect Calvert Vaux for New York City's Central Park in 1858.

Easton Turnpike Bridge
Formerly "Sport Hill Road" Bridge ***Fairfield, CT 1939***
Looking east from further back on the base line for the future Parkway. Notice that much of the land was farmland or meadow. The project landscape architects estimated that probably 50% of the land was open or in wetlands.

In 1906 the New York State Legislature authorized the planning that resulted in the first Westchester parkway, the Bronx River Parkway, which was completed in 1923. As early as 1907, the Connecticut Automobile Parkway Corporation received a charter to build and operate an "automobile boulevard" between New York and Boston. By 1933, the Hutchinson River Parkway and many others were completed. In the late 1930's, the term "parkway" was more formally defined within National Park Service regulations.

As documented in the HABS/HAER report, the Department of Interior used the following criteria in defining parkways as compared to other roads:

- Limitation to non-commercial, recreation traffic.
- Prohibition of unsightly roadside development and signs.
- Rights-of-way that were wider than average to provide buffers from abutting property.
- Granting of no frontage or access rights, thereby encouraging preservation of natural scenery.
- Preference for a new site to avoid congested and built-up areas.
- Giving best access to native scenery.
- Elimination of major grade crossings.
- Well-distanced entrance and exit points to reduce traffic interruptions and increase safety.

By 1939, the Connecticut General Assembly in Section 427E Supplement to the Connecticut General Statutes "Parkways and Freeways" had legislated its own definition:

> *A parkway shall mean any trunk line highway receiving special treatment in landscaping and marginal planting, which shall be especially designed for, and devoted exclusively to,*

the use and accommodation of noncommercial motor vehicle traffic, and to which access may be allowed only at highway intersections designed by the highway commissioner and designed by him so as to eliminate cross traffic of vehicles.

These were the basic standards to which the Merritt Parkway was built.

2.3.3 The Connecticut Approach

Fairfield County, at the time when the Merritt Parkway was being contemplated, was quite rural in character. New Yorker's would wax nostalgically about "going to the country" when referring to a 30-plus mile excursion into Connecticut.

In the early 1900's, the population of Fairfield County was less than 200,000 persons, generally concentrated in the village centers and in the larger cities such as Bridgeport. The population centers were separated by farms and wood lots. When the Parkway was under construction, the County's population had grown to 350,000 with projections of doubling by 1980. Such estimates by the Fairfield County Planning Association, a reluctant supporter of the parkway concept, have proven to be low by some 200,000 people.

The Merritt Parkway, unlike its New York predecessors, was not conceived to link large publicly owned parks. Its purpose was to solve the problem of traffic congestion on U.S. Route 1 (the Boston Post Road) between New York and New Haven. The Post Road was a major commercial corridor and tourist route linking New York to Providence to Boston. Even with widening and pavement improvements to Route 1, accident rates and volumes of traffic kept climbing. Traffic surveys of the late 1920's showed that the majority of cars on the Post Road originated from west of the Hudson River, from New York City and points south. So, in 1925, a "Parallel Post Road" which was to become the Merritt Parkway was proposed.

The proposal of the Merritt Parkway polarized the citizens of southwestern Connecticut. Commuters to New York welcomed the alternative of being able to enjoy country living without having to cope with commuting by rail. New York would be closer for businesses and employment. In obvious contrast, large landowners perceived an invasion of "dreaded New Yorkers" (Radde) and a depreciation of property values. As Radde reports, the Fairfield County Planning Association took up the banner of promoting a parkway, instead of a highway, in order to preserve as much as possible the natural beauty of the landscape.

The Merritt Parkway was the first divided lane, limited access roadway built in Connecticut. According to Thayer Chase, the original intention was to link the 38 mile Merritt Parkway through New Haven County and Hartford to the Massachusetts border, for a total length of 116 miles. Eventually, the Wilbur Cross Parkway was constructed but, because of the commercialization of the Berlin Turnpike and with the incorporation of part of the Wilbur Cross Highway into Interstate 91, the parkway concept ends in Meriden.

Initially there was concern for whether the road would be a parkway or another highway. Congressman Schuyler Merritt took on the issue in his address at the dedication ceremony in 1938 and attempted to rally public support for a parkway:

This great highway is not being constructed primarily for rapid transit but for pleasant transit. This country is fortunate in having such beautiful back country and it is our great duty to see that these beauties are preserved.

Interestingly, Congressman Merritt even went so far as to suggest that picnicking be permitted in designated areas for "the city dweller" to enjoy and to give the rising generation a little chance for "freedom and country air" (Radde). Picnic areas were constructed at the rest/service areas, both as later alterations to the Parkway.

2.3.4 Right-of-Way Considerations

Though the right-of-way was planned with a minimum width of 300 feet, for portions of the Merritt's route it was substantially wider, larger parcels of land having been purchased to preserve the scenic appearance of the roadside, or simply because of special agreements with property owners. In the 1930s, a 300-foot right-of-way was considered quite large particularly when compared to the Post Road's right-of-way of less than 66 feet for most of it length. It should be noted, however, that the right-of-way today appears to be fairly uniform having a width of 300 feet with the exception of interchanges, service areas, and the former toll station in Greenwich. Whatever excess land that may have existed at the time of construction does not appear in the right-of-way maps provided by the Department of Transportation for this study.

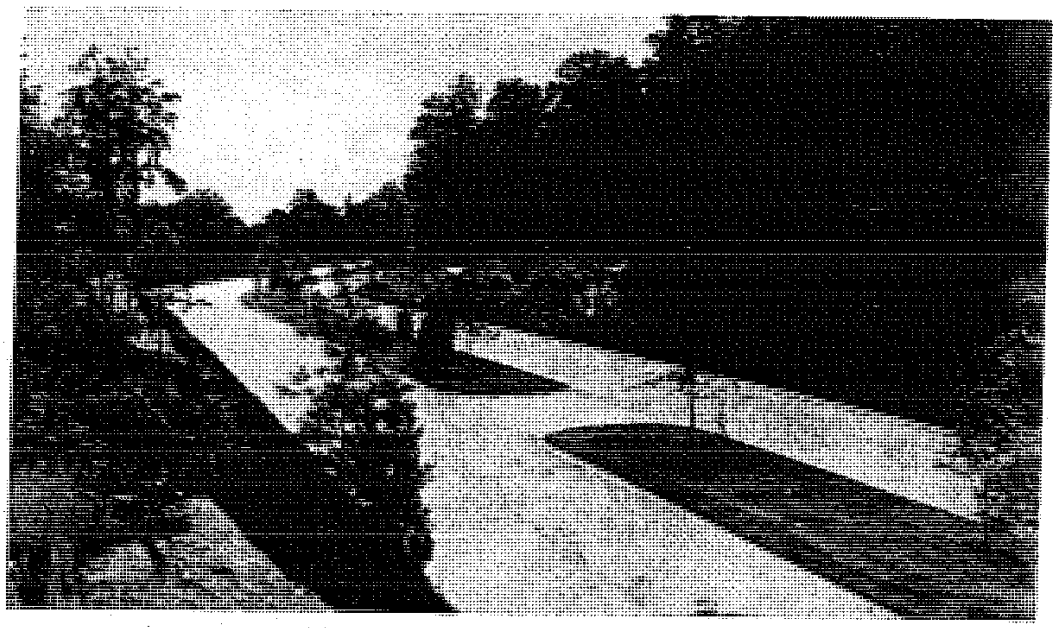
As documented in the HABS/HAER, one purpose of the Merritt's wide right-of-way was to provide a buffer strip between the Parkway and bordering residential and commercial developments, both those existing and those anticipated. This buffer was not only a visual barrier, it was a safety measure as well, to prevent cars from careening off the road and into developed and populated areas. The right-of-way was also a provision for the Merritt's future expansion. A base line was established to bisect the right-of-way into two strips, each not less than 150 feet wide. Generally, the present roadway occupies the northerly half of the right-of-way and the balance is heavily wooded for the most part.

Near New York State Line ***Greenwich, CT 1936***

One mile east of the New York state line, the rock has been excavated and the road is rough graded. The areas in Greenwich tended to be more wooded than the remainder of the Parkway but were still almost 50% open.

2.3.5 The Roadway Design

The Merritt's travelways consist of two reinforced concrete pavement strips, each 26 feet in width creating two 13-foot travel lanes from curb to curb. The concrete curbs have almost disappeared over time as subsequent layers of asphalt have been laid down. Crossovers existed initially but were short-lived with only a few remaining for police and maintenance vehicles. The concrete curbs originally were four inches in height and eight inches wide sloping at 45 degrees to almost three inches at the top. The curb also contained the "cat's eye reflector", which was considered a new innovation in the late 1930's.



Near New York State Line ***Greenwich, CT 1939***

The same view three years later. The standard wood guiderail is barely visible on the distant curve. Many crossovers existed initially but were later closed for safety reasons. Casual picnicking was also stopped.

While there is no formal documentation of the specific design standards to which the Merritt Parkway was constructed, it can be deduced from its horizontal and vertical curvature that the Parkway was designed for a driving speed of 45 miles per hour. This is supported by the fact that the original speed limit was also posted for 45 miles per hour. Such a speed gave the traveling motorist the opportunity to view the intricacies of the natural landscape and the ornamental plantings. Today, according to the Department's own statistics, the average speed approaches 65 miles per hour and, in areas of major reconstruction in the vicinity of Route 8/25, over 68 miles per hour. Consequently, any intricate planting becomes only a blurry mass of vegetation at such high speeds.

2.3.6 The Bridges

The Merritt Parkway was designed to function as a highway, with limited access and no cross traffic. As such, grade separation structures were an essential part of the Parkway concept. The need for crossovers

resulted in 72 bridges, including large culverts, which served either as underpasses to carry the Parkway under intersecting roads and railroad tracks, or as overpasses to carry the Parkway over other roadways, rivers, and streams.

At the same time, the Parkway concept demanded structures that not only served a vital purpose but that were pleasing to the eye and that added to the beauty embodied by the Parkway. In addition, the Highway Department wanted to vary the architectural treatment of the bridges to provide constantly changing scenery. The bridges of the Parkway were designed by a collaboration of bridge-design engineers and architects, with engineer Leslie G. Sumner responsible for structural design and architect George L. Dunkelberger having the leading role in determining the form, style, and ornamentation. Through the various use of materials, ornamentation, and architectural styles, each bridge is unique.

The bridges of the Merritt Parkway have been well documented because of their historic and architectural significance. The Historic American Buildings Survey and Historic American Engineering Record divisions of the National Park Service have produced individual historic reports for 71 of the Parkway's bridges and culverts, providing detailed information on the engineering and architectural characteristics. This inventory includes the bridges (noted as overpasses or underpasses), as well as other resources, identifying their location and status (contributing or non-contributing to historic designation), and noting historic information such as date of construction, architectural style, materials used, distinguishing features, and any changes or repairs since construction.

a. Structural Characteristics

The Merritt Parkway is distinguished by having one of the country's largest collections of early rigid-frame bridges. Almost all of the bridges were of rigid frame construction, a fairly recent development at the time, although more traditional arch and post-and-beam systems were occasionally used, apparently as a way to maintain variety. Rigid frame construction had a number of advantages in terms of both economic and aesthetic considerations, not the least of which were ease of construction and adaptability to a variety of architectural form and expression. Both features affected the landscape. The ease of construction limited, to some extent, the disturbance of the land during construction limiting revegetation requirements to a lesser area. The adaptability of the system permitted abutments to be adjusted to adjacent land forms while still permitting the designer the freedom to create his structure.

b. Materials and Ornamentation

Bridges were built primarily of reinforced concrete, although several steel span and stone-faced bridges were constructed. Concrete was the material of choice primarily because of the lean economy of the Great Depression. Although the aesthetic qualities of concrete bridges were not highly thought of at the time, the Parkway bridges were designed and crafted to overcome this perception. Rather than allowing flat concrete structures, bridge architect George Dunkelberger used sloping and curved wingwalls to lend visual interest and to tie bridges into the surrounding landscape. He also paid particular attention to adding small details, projections and ornaments to bridge facades, contradicting the trend of bland and uninteresting concrete bridges.

Practicality apparently played a part in the extent of bridge ornamentation, however. It has been observed that underpasses, which were more visible to Parkway travelers, were generally more ornate than the overpasses, although some overpasses were quite elaborate in the initial areas of construction.

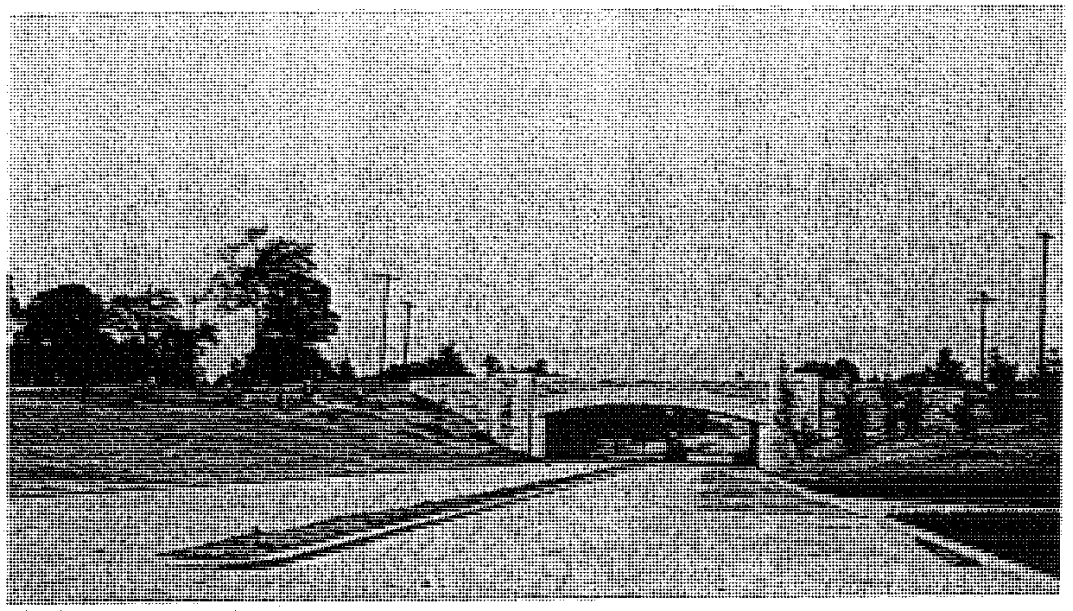
Dunkelberger carried out extensive inspections of potential bridge locations so that he could adapt the design to the particular site. Concrete was not always his preferred choice. Structural necessities aside, he believed the bridge should blend with the surrounding landscape as much as possible, to preserve the natural appearance of the site (HAER 1992). Stone or cast-stone bridges, for example, were built at the Rippowam River, Guinea Road in Stamford, and Main Avenue in Norwalk, appearing to blend with the surrounding natural rock outcroppings.

By design and craftsmanship, color and texture were introduced into the concrete ornamentation. Colored aggregates such as marble were added to the concrete, or other materials were used, such as glass shards, metal chips, or mother-of-pearl. The cement was also tinted via mineral pigments. These characteristics may not be as evident today since colors have apparently weathered over time. By becoming more muted, the bridges may have lost some of their contrast with the planted landscape.

c. *Styles*

The typical parkway bridge of Dunkelberger's day was the rustic stone-faced bridge. While several of the Merritt's bridges were similar to this design idiom, most departed significantly from the standard. Dunkelberger borrowed from the popular and commercial architecture of the 1930s, utilizing motifs of Art Moderne, Art Deco, and classicism, with ornamentation including stylized skyscrapers and fountains, faceted sunbursts, fluted classical columns, griffins, owls, pilgrims, and Indians.

King Street Bridge ***Greenwich, CT 1936***
Looking west toward future King Street Bridge and in the direction of the New York state line.



King Street Bridge ***Greenwich, CT 1938***
Looking toward the completed King Street Bridge and New York State beyond. The landscaping is complete on the right and in progress on the left. Note the low concrete curb on all road edges. This has virtually disappeared today as layers of bituminous have been added.

The variety of architectural styles used, and Dunkelberger's preference for the Moderne, are demonstrated by the 33 underpasses, of which 21 are Moderne; eight are Art Deco; and four are Classical, Gothic, or Renaissance. The same styles are found on the overpasses, although they tend to be simpler, some being primarily utilitarian in nature. Several of the bridges have been altered from their original design. Concrete barriers have been added to their bases to reduce vehicular damage. Parapets have been modified sometimes with chain link fence to address similar safety concerns.

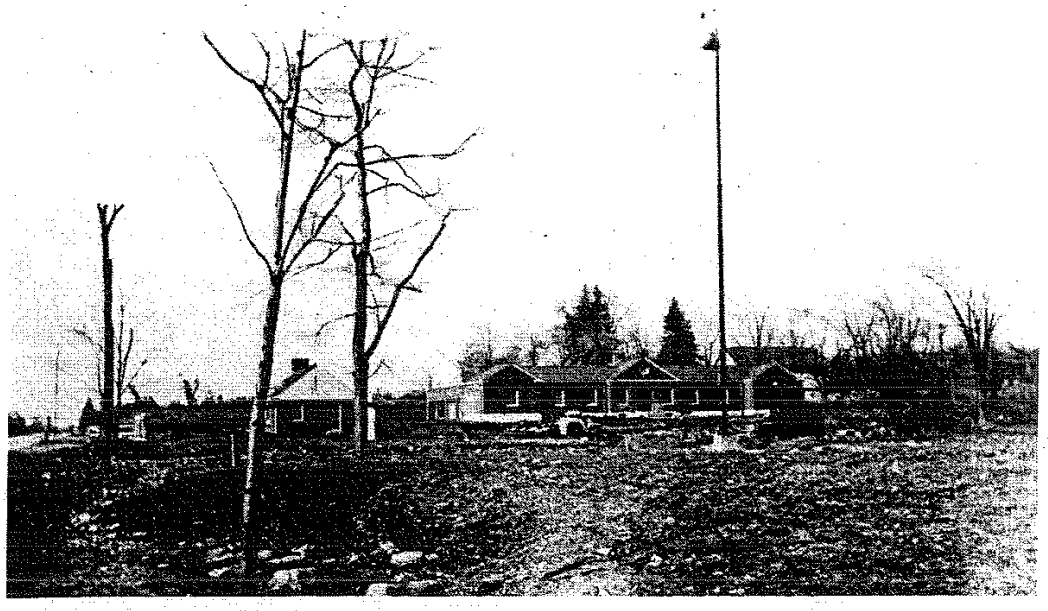
A significant effect that the bridge design has on the landscape of the Parkway is the width of the bridge opening. In every instance where there is only one "barrel", the median tapers to the point of being nonexistent as the travelways merge together. As a result, the green buffer between lanes becomes interrupted creating a somewhat disjointed appearance. With today's speeds, the need for separation of vehicles and the installation of the concrete safety barriers, the quality of the original landscape appearance is further diminished. Dunkelberger could not have anticipated the potential problem caused by such narrow bridge openings.

2.3.7 Other Parkway Features

a. Service Stations

While not in the original plans, service stations were constructed in response to the frequent vehicle breakdowns and the lack of fuel stations on what were then rural roads at the new interchanges. Six

service areas were constructed, three in each direction. Their design was not to the same standard as the bridges but were more traditional in character. All had small picnic areas adjacent to the parking area.



Gas Station and Maintenance Building ***New Canaan, CT 1940***

The gas station and maintenance building on the north side of the Parkway. The Parkway is barely visible to the left side of this view. The only lighting on the Parkway occurred at the service areas in the form of a high-mast source which seems unique for the times.

In 1935, Wilbur Simonson, senior landscape architect for the U.S. Bureau of Public Roads, called for architectural roadside improvements that expressed "the distinctive beauties of the individual states or regions" through "appropriate design and local materials." Simonson favored well-designed gas stations that reflected the "craft and materials" of the region and counteracted current trends toward standardization.

While the stations were under construction, Parkway advocates such as the Fairfield County Planning Association (FCPA) wanted "offensive" but necessary mechanical equipment such as pumps placed to the rear of the stations, out of sight of the roadway so as not to "mar an otherwise beautiful strip of Parkway planting." Despite lobbying efforts, the gas pumps remained in front of the stations, but set back from the road on concrete pads that curved outward toward the Parkway, between the median and the station building.

Each station faces the Parkway, but is set back from the roadside. Though there were plans to build the stations behind natural screen such as knolls or outcrops, they were never realized. A thin divider separates the service station from the roadway, which was originally landscaped with a formal arrangement of trees and shrubs around a flagpole. The stations are reached by at-grade exits from the right traffic lane. These lanes were designed to permit motorists to re-enter the Parkway without

greatly diminishing their cruising speed. They are considered too short to allow deceleration under today's standards.

Gas Station and Maintenance Building *New Canaan, CT 1940*
A close-up of the station shows that the building has been closed in. The "dormer" later housed a clock which exists to this date.

b. Guiderails

Wood post and beam guiderails were used in areas of steep fill embankments. From historical photographs, it appears that the posts were approximately 16 inches square with heavy double rails tenoned into each post. The design detail, however, shows smaller wooden members, perhaps not used due to inadequate dimension. Single rail systems were also used.

The post and beam system gradually was replaced over time by round oak bollards connected with steel cable. A few of these remain today but most guiderail systems are the galvanized "W" beam, steel post and cable, or steel box beam. In some locations where the median is very narrow, concrete "Jersey" barriers have been installed.

c. Toll Stations

Shortly after the Parkway opened, a toll station was installed in Greenwich. While highly controversial at the time of construction, the tolls did assist in retiring the revenue bonds used to fund the construction of the Parkway. The toll booths were rustic, cabin-like structures, decidedly different from the bridge structures and akin to what one would find at a national park. Removed in 1988, the toll plaza was landscaped but the age difference in plant material, together with the wider road pattern, indicates its previous location.

d. Bridle Paths

At one time early in the Parkway's life, bridle trails were constructed in sections of the undeveloped right-of-way. While they were part of the original design concepts, the then Attorney General McLaughlin ruled that the State had no authority to construct them (Radde). The informal system of links to old logging roads was eventually abandoned although remnants exist today.

2.4 THE DESIGNED LANDSCAPE

If one were to survey the literature about the design of the Merritt Parkway, particularly the design intent for the landscape, it might be concluded that there was an overall plan for each section of the project. Much has been written about the naturalistic approach to planting where native plants were preserved from the right-of-way and replanted once new slopes were established. The new planting compositions were reported to be a reflection of the surrounding plant communities found in southwestern Connecticut.

The Merritt Parkway lies within the Western Coastal and Southwest Hill ecoregions primarily composed of a central hardwood-hemlock forest (Dowhan and Craig: Rare and Endangered Species of Connecticut and Their Habitats, 1976). On well-drained upland soils, the forest is likely to contain oaks, hickory, poplar, birch, ash, and hemlock. While cedar would be found in an old field succession regime, red maple, shadbush, and birch would be typical of the lowland environment.

Assuming that a naturalistic approach had been taken to the planting design, evidence of such forest composition should be able to be found today. As part of the field inventory for this study, the typical forest composition described by Dowhan and Craig was indeed observed but appears to be limited to the edges of the road not disturbed by the Parkway's construction. In contrast, the planted Parkway does not appear to be "naturalistic" but is more park-like in character. What tends to mask the planting schemes is the profound influence of nature. That is, the vegetation which had been planted years ago at the time of construction has matured, or has become overgrown, giving the casual observer the impression that the design intent was to replicate the forest condition.

2.4.1 Discussions with W. Thayer Chase

In order to better understand the original design intent for the landscape, several discussions were held with W. Thayer Chase, the original landscape architect for the Merritt Parkway, who provided personal photographs, notes, and other data for use on this project. What has proven to be most helpful in understanding the design intent was a comparison of the statements contained in the HABS/HAER report to Mr. Chase's recollections and the field observations of the consultant team.

The following comments are based on discussions with W. Thayer Chase held on December 30, 1993, January 14, 1994, and February 1, 1994. Mr. Chase also reviewed the HABS/HAER report in light of these issues. The initial statement, in each case, is from the 1992 HABS/HAER report. The response or clarification from Mr. Chase is indicated here in italics:

a. Too often, landscape architects complained, the roadway and the right-of-way were treated as separate and unrelated elements that gave the highway an incongruous, un-unified, and artificial appearance. In New York, designer Gilmore Clarke had skillfully avoided this by carefully blending the roadway and the right-of-way into "the normal landscape of the region." With this principle as a guide, Chase determined that his landscape would be as natural as possible.

> ***Mr. Chase sought to use native material almost exclusively. Cedars were both planted and transplanted in the open areas to replicate the open field association. Laurel was used along wooded edges. Dogwood, pine, hemlock, oak, and maple were the other major species used.***

b. Chase's design for The Merritt reflected fully the rugged, hilly character of the Fairfield County countryside through which the Parkway passed. Of course, roadway-landscape harmony was the ultimate goal of all Parkway landscaping.

> ***One method employed was to use taller material at the bottom of a slope and shorter material at the top when in a cut situation. And vice versa in a fill situation. Also, (and this seems very significant), Mr. Chase had the cuts and fills extended by the earthmovers and the disturbed edges rolled more gently to blend with the existing grade.***

c. Chase dealt with this problem through a dual program of preservation and restoration. The Federal Bureau of Public Roads, which promoted this type of landscape program, defined preservation as "protecting and enhancing the existing growth of trees and other native plants," and saw restoration as "removing the raw appearance of new construction."

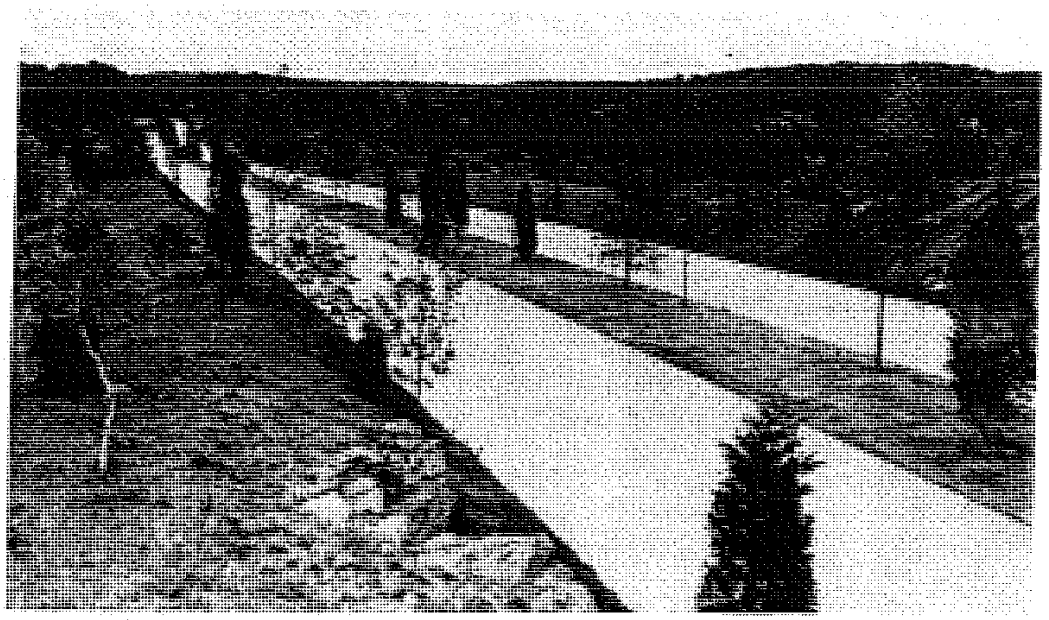
> ***Mr. Chase wanted to reduce the impact of construction as quickly as possible and return the prior plant types. This was done by planting replacements with similar species or transplanting the same species from the same area. The transplanting was usually done with shade trees or cedars. In one case, part of an apple orchard was transplanted.***

d. Those involved in highway design complained that regardless of a site's topographical realities, engineers would inevitably lay out the road as a series of long railroad-like tangents. Landscape architects, by contrast, would lay out the road as a progression of sweeping curves and shorter tangents-an "organic" approach that was sensitive to the terrain, be it rolling, flat, or rocky.

> ***One of the main methods which Chase and the others used in handling the finished grading as proposed by the highway engineers was for the slopes of the cuts and fills were to be softened and the toes of the slopes be more rounded. An engineer was instrumental in supporting them on this rework. Initially, the slopes and bank toes were done like "railroad embankments," (steep slopes and abrupt toe or top of slope), but this was then altered. In Greenwich, some of the horizontal curves were so abrupt that they had to be modified after construction.***

"Ripples Cut" Area ***Greenwich, CT 1936***

Located just east of the New York state line, this area got its name from the series of rock outcrops which occurred with undulating regularity. The road has been subgraded and the cuts and fills have been fine graded and seeded.



"Ripples Cut" Area ***Greenwich, CT 1939***

The same view three years later with the road completed and the landscaping installed. Notice the field juniper planted in an open field setting and the close proximity of the trees to the road edge.

e. Along some sections of the Parkway the right-of-way was completely cleared.

Chase indicated there was a misunderstanding in the HABS/HAER as the only place where the entire 300' right-of-way was cleared was at the bridges and the interchanges. Almost all the cuts and fills occurred within the 150' northern portion of the right-of-way.

f. Because these disparate field conditions (from undisturbed to paving under way) were less than ideal for planning a single, grand landscaping scheme, landscape architect Chase was forced to adopt a piecemeal approach--designing the landscape section by section.

Chase indicated that there was no real overall idea or plan. He simply tried to blend or restore the edges as they came, along each section of the Parkway.

g. After following the contractors for more than a year from one end of the Parkway to the other, Chase's field notes included numerous sketches of the "lay of the land" and what vegetation the contractors had left. With bureau instructions, Chase recorded all data concerning existing trees, including definite locations, sizes of trunks, and branch spreads.

This information was obtained as a separate operation before the planting plans were prepared. He also noted cuts and fills, drainage, and rock outcrops.

h. Chase's plans consisted of planting layouts superimposed onto black and white prints of the engineering drawings he had used in the field.

Apparently this information was placed on black and white prints and then given to the main highway bureau office in Hartford which reproduced the drawings for each of the three section leaders for the Parkway. The method of reproduction is unclear as there was no method of copying large drawings at that time, short of conventional photography. When asked about how the contractors were able to bid on the planting plans, Chase indicated that contractors bid from the specifications and not the drawings.

i. According to contemporary reports, the only non-native plant on the Merritt was Hall's Japanese honeysuckle, which Chase used only because of its ability to bind soil on steep slopes.

When asked about the other vines shown on the plant list, Chase indicated that he used some vines to "soften" some of the bridges. Although bittersweet is shown on the National Trust application as one of Mr. Chase's proposed plants, he indicated this was a mistake in the report and that he was "dead set against bittersweet," a vine which invaded the treed Parkway by bird droppings and which multiplied with lack of maintenance.

j. Trees and shrubs in the right-of-way, after being marked by Chase and his workers, were saved from the path of the concrete roadways by transplanting them elsewhere along the right-of-way or off-site to temporary state nurseries.

Apparently the transplanting was not as extensive as the report would suggest. There was some transplanting of existing cedar, deciduous trees in good form, and apple trees from orchards. The maximum size was about 6" caliper. Another method employed was using the "sods" of bayberry, sweetfern and sumac (discussed further in Item 2 below).

k. During the 1930s, nearly 80 percent of the approximately 40,000 shade trees, flowering trees, evergreens, shrubs, and flowers was native collected plant material conserved ahead of highway construction and stored at state nurseries or donated to the state by "generous landowners" who wanted to rid their lands of unneeded plants. The remaining 20 percent of the stock was purchased "at bargain prices from commercial nurseries" because of plant surpluses.

According to Mr. Chase, these percentages should be reversed. Twenty percent of the material was conserved and the balance purchased.

l. For example, if the road passed through densely treed areas, open fields, or marshes, Chase would plant it appropriately with evergreens, wildflowers, or willows and red maples, respectively.

The one correction Mr. Chase would make here is that no wildflowers were ever specified or planted by the contractors. They simply grew in when the maintenance was reduced.

m. Following departmental roadside-development guidelines, Chase usually chose one of four practical types of planting, most often the informal and random planting schemes. For informal schemes, small masses or clumps of between one and five trees were placed at irregular intervals in the landscape.

When asked if his approach to the planting for the Parkway was naturalistic or park-like, Chase indicated he wanted to create more of a park-like setting. This is usually meant to convey the appearance of an informal grouping of trees and evergreens in a mown lawn or meadow with the edge of existing woodlands cleaned up and augmented with native plants.

n. Screen planting was also used to outline curves in the road's alignment in the same way that directional signs are used today. Upon perceiving a dense screen of trees ahead, motorists would supposedly slow down subconsciously while passing them, thus ensuring safe movement through curves.

Mr. Chase used the conifers on curves in the median and road edges to help guide the driver along a better defined road edge. One should realize that he was referring to young conifers which branched to the ground and not the mature trees and trimmed trunks (up to 16') that exist today.

o. To safeguard the copious mountain laurel and hardwoods that lined the Parkway, Chase planted cedars, birches, and black birches. The quick growth of these trees would ensure proper shading for the less mature plants. Later, when hardwoods like oaks had fully developed, they would shade the laurel and the other trees would be removed.

The eventual removal of the fast growing "weed trees" (cedars and birches) never occurred so that the original planting affect was not always achieved as intended.

p. Generally, Chase tried to soften the lines of the bridge through his plantings without sacrificing clear sight lines, the end result usually being a landscape treatment more formal than other places on the Parkway.

There was never any intention to treat the bridges in a more formal landscape treatment. It may have occurred in some cases, that pine groupings were planted at

both bridge abutments or cedar groupings in others, but only the species were the same. The groupings were always informal in their layout.

q. According to one contemporary account, the conifers were intended to completely screen out the bridge abutments within a few years of their planting, so that motorists would not notice them at all.

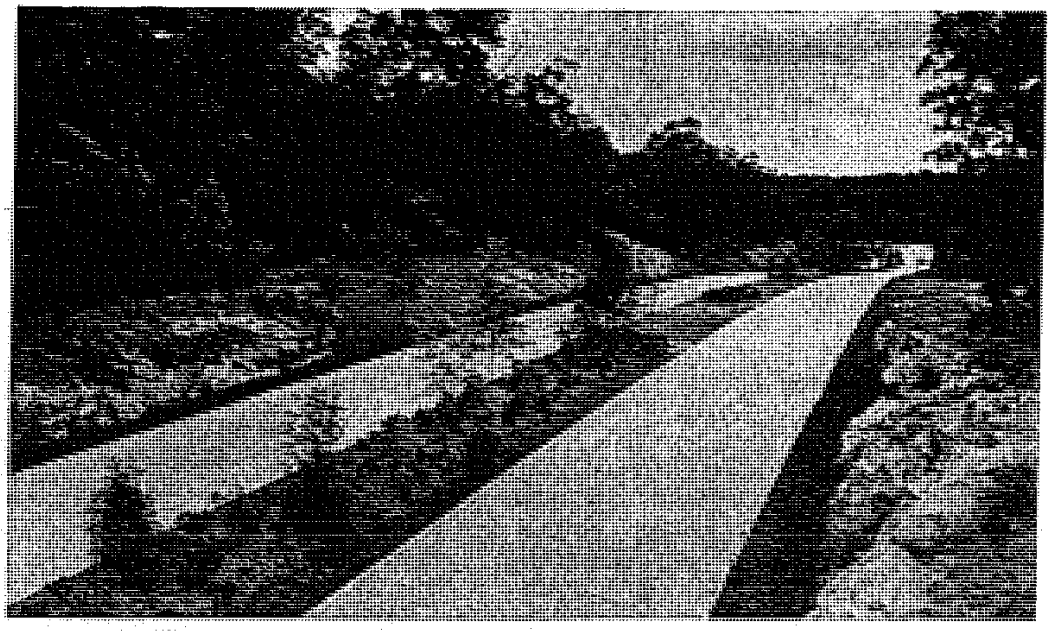
Mr. Chase indicated that it was never his intent to screen out the bridge abutments. He and Dunkelberger were never at odds on the planting approach Chase took at the bridges. If fact, Dunkelberger praised him on the planting that was done. When one views pictures of the planting shortly after it was done, the abutments are clearly visible. However, 8" diameter by 12' height pine can become 30" diameter by 60' height pine in fifty years. Chase feels that lack of maintenance has been the biggest culprit. It does seem that as the mature pine are trimmed up and the understory and succession growth are removed, the bridges and their abutments will become more visible.

r. Landscaping the Merritt's median presented several problems. Though the median divided traffic physically, it had to unite visually the entire right-of-way development--otherwise the Parkway would appear as two separate roads.

When asked how he sought to achieve this visual unity, Mr. Chase indicated that he would carry the same species that had been interrupted, from one side of the cleared right-of-way to the other, including the median. If one travels the Parkway today, even though most of the median planting has been modified or removed, one can still sense this planting concept.

Riversville Road Area ***Greenwich, CT 1936***

Looking west toward Riversville Road, the subgrade has been complete and it appears that topsoiling and fine grading are in progress.



Riversville Road Area ***Greenwich, CT 1939***

The same view three years later. Notice the amount of laurel planted in the median. The low planting was to disappear within five years due to road salts and maintenance needs.

s. On narrower portions of the median Chase resorted to essentially straight rows, but here he dramatically varied tree height by incorporating existing trees into his scheme.

> ***Because of the major amount of material that has died or been removed from the median, this concept is not at all apparent today.***

t. Though Chase believed the spaces between existing trees (in the median) could be filled in with laurel to act as a glare barrier immediately upon completion, it was only after several years growth that the median landscaping even partially served this purpose.

> ***Mr. Chase indicated that this was the intent but not what happened. Earl Wood indicates elsewhere in the report that most of the laurel was gone in four to five years, the victim of road salts, snow, and no maintenance.***

u. Often, very large or spectacular trees were singled out for special treatment, as in the case of the Lapham Oak in New Canaan. Construction photographs taken before and after the erection of the Darien Road Bridge show that the existing vegetation of the bridge approach, including the oak, was left virtually intact, except for the addition of minimal median planting.

> ***Mr. Chase indicated that if the choice had been his, he would have had the tree removed. It was too close to the edge of the road and in a fill situation. Unfortunately it had become a cause celebre with the local garden club and the public at large.***

v. In naturally occurring groves on the buffer strips, selective thinning was necessary foremost to preserve proper growth. Where trees had grown too close to each other, the undesirable ones were removed, allowing those remaining to "grow to maturity under more ideal conditions."

> ***Mr. Chase indicated that much more selective thinning was done in the early stages of the project particularly in Greenwich. As the Parkway proceeded east, much less was done and the buffer was left intact or "more park-like."***

w. Sometimes small shrubs or vines were the only cover that would take hold in the rocks to hide the raw appearance of the cuts (CT-63-92). Occasionally, before such plants had matured, Chase would conceal rock ledges from the approaching motorists by screen planting. The ledges would then only become visible as the motorist drove past.

> ***Chase would search for good soil pockets before the ledge and note that on the plan. The intent was to soften the appearance of the ledge rather than conceal it. It would create a dappled shade on the ledge and greater visual interest.***

x. The first step in all slope landscaping was mucking. Muck conserved from other sites on the Parkway was spread over graded slopes as a base for subsequent treatment.

> ***Demucking of the swamp areas was necessary for a proper road base. The muck was stockpiled and later used as a subbase for the placing of loam on the slopes. It was done more as a money saver since muck usually has little nutrient value.***

y. Next, slopes were topped with soil and finally covered with some sort of vegetation to hold the soil in place. Though Chase disliked it because it "ran all over the trees," he often planted honeysuckle on slopes because of its ability to check the flow of water runoff and at the same time stabilize soil.

> ***Most slopes were stabilized with loam and grass seed. Steeper slopes or unmowable areas called for laurel and dogwood plantings in wood chips.***

z. Other shrubs were used on slopes in the same way that honeysuckle was. At the Greenwich-Stamford town line, for example, the slopes were planted with sweet fern, bayberry, and sumac.

> ***This was usually done by planting the "sods" of these plants. This practice has gone out of style over the years as the depression mentality has faded and these economical practices are no longer utilized. Basically it meant digging up squares of soil which were matted together by the mass of roots created by the particular plant. This operation was rather labor intensive and they next went to the laying of regular sod. Even by today's standards, sod is considered expensive and the immense areas of slope become prohibitive. Chase indicated that one of the Bureau of Roadside Development landscape engineers then created a system for spraying on grass seed mixed with water. This practice is quite common today and is called hydroseeding. If this system was invented or utilized first on the Merritt, that in itself is quite significant.***

Guinea Road Bridge
Formerly "Rocky Craig" Bridge ***Stamford, CT 1937***
The construction scaffolding is holding up the granite voussoirs with ashlar fieldstone to follow. The rough grading is in progress with many rock outcrops exposed.

Guinea Road Bridge
Formerly "Rocky Craig" Bridge ***Stamford, CT 1939***
The bridge has been completed and the finished grading is in progress. Notice the soft transition grades at the top and bottom of the slopes as proposed by the State's landscape architects.

aa. Most roadside-development experts agreed that careful grading, designed by a landscape architect and not an engineer, was an effective means of creating a natural appearance at cuts and fills. By widening and flattening cuts, and rounding out fills to a gentle curvature, Chase created a contour that shifted almost seamlessly from cut to fill and from roadway to roadside. He covered these areas with informal planting groups that continued the natural character of the undisturbed buffer strip.

> ***The careful regrading and softening of the no cut - no fill line was requested by the landscape architects and supported by several of the highway engineers (see Item No. 4 above). The plant material removed due to cut and fill was usually replaced with similar species to retain the continuity. Mr. Chase also used a great deal of laurel on the slopes and edges. It was felt that this was "what made the Parkway."***

bb. As the Parkway originally wound through the Fairfield County countryside, each successive grade, curve, or tangent provided a new view of rolling farmlands, thick woods, lakes, bridges, and rock outcroppings. Vistas along the Merritt Parkway were either naturally occurring or created through landscaping.

> ***Initially, and for the first few years, the vistas ahead and to the sides were much more evident because of the clearing that had been done for the Parkway construction and the fact that the Parkway went through farm and pasture land in many areas. With the planting next to the highway, but primarily because of the reduced maintenance and natural growth, these views were greatly reduced or have become totally eliminated. There was no preconceived goal to achieve a particular view or vista.***

cc. Vistas and compositions were also established by adding new trees and shrubs to the landscape. Such plantings were strategically placed to act as a frame through which the motorist could view a scenic feature, be it an open hillside, rock outcropping, or even a ribbony old stone wall in the right-of-way.

> ***As stated in Item bb above, most of these views and vistas have been eliminated over time due to unrestricted plant growth. Because of the numerous field stone walls which were shown on the old survey and are still visible in some area, it was inquired as to whether a conscious attempt was made to save or recreate them. It was indicated that no major effort was ever made to save the stone walls as they were everywhere and did not have the significance that they have today. Plus, it would have seemed extravagant to rebuild old stone walls in that era.***

dd. Some of the most impressive scenic features of the Merritt were not naturally occurring, but rather were artificial, having been completely created by landscape architect Thayer Chase. In 1933, Wilbur Simonson counseled landscape architects to incorporate the distinctive landscape characteristics of their regions into their work, creating scenic features through native vegetation.

> ***Mr. Chase feels that the most memorable landscape features about the Parkway are the fall color and spring flowering laurel and dogwood trees. He felt that the spring***

display has been greatly diminished because of the loss of dogwood to disease and the loss of laurel to road salt, canopy overgrowth, and lack of maintenance. An inquiry made about rhododendron indicated that some had been planted, but not a significant quantity. When Chase was asked about using improved or similar species, he felt there was no reason at all if it had the same character and fit within the overall setting.

ee. From the open planting of the 1930s, which encouraged views into the surrounding countryside, the landscape grew into the "solid wall of greenery" by the 1950s, which permitted vistas only ahead and behind, and finally into the "green tunnel" of today, which completely obscures all vistas and permits a view of only the outer edge of the buffer. Contemporary aerial views make clear how dense the vegetation has become after fifty years, as do comparisons of bridge landscaping from the 1930s and today.

As stated early, the primary goal was to create a park-like setting, where the vistas and composed views would stay open; that there would be an "orderly maintenance" which was to be continuous. Also, that species which died, due to disease or neglect (laurel, dogwood, hemlock), would be replaced.

ff. Maintenance, or lack thereof, has played an important role in the changes that have occurred in the landscape. Maintenance was the age-old landscaping enemy, as F.H. Brant wrote in 1934:

No matter how carefully a project is planned, and no matter how excellent the plant materials are if maintenance is not carried out in the proper manner and under expert supervision, the project cannot reach its full effectiveness.

Mr. Chase indicated that there is no question in his mind that maintenance has been the number one problem almost from the day the Parkway was completed.

2.4.2 The Maturity of the Parkway

It is difficult to determine when the Merritt Parkway had reached its most park-like appearance or the objective of its designers, since the historical photographs generally reflect the immature landscape of the 1940's and today's observations show the Parkway landscape to be unkempt. Some effort has been made as part of this study to resolve this question.

The Department provided a set (incomplete) of 9" x 9" stereo pairs of aerial photographs taken in 1955-56. When compared to 1990 photographs, the ornamental plantings were quite distinctive, the lawns and meadows were extensive, and the forest edge quite sharp. So, it is reasonable to deduce that sometime between the mid-1950's and today the Parkway's landscape reached its zenith.

In discussing maintenance practices with Department staff, it was learned that labor-intensive "hand" maintenance of the roadside became more mechanized in the early to mid-1960's. The age of the invasive on successional plant species found as part of the field inventory is estimated to be approximately 30 years based on the height and caliber of trees. From these observations, it has been concluded that the Parkway reached maturity in the mid 1960's.

2.4.3 Conclusions

Based on a review of the HAER report, discussions with the principal landscape architect, W. Thayer Chase, and the observations of the existing conditions over the past four months and beyond, these are some conclusions that are felt can be made about the Parkway landscape:

a. There was not an overall plan or grand scheme to the landscaping for the Parkway. The landscape architects simply sought to blend and restore the disturbed edges as they occurred and use primarily native material.

b. The goal was to create a "park-like setting" of shade trees, flowering trees, evergreens, and flowering broadleafs in a field of mown grass rather than a naturalistic setting (or ecologically correct) as the term is used today.

c. One of the major grading changes made during the course of the project was proposed by the landscape architect: that the cuts and fills be rolled more gently to blend smoothly with the existing grade where they met.

d. As the existing plant material altered from valleys to ridges and woodland to meadow, the proposed landscaping was altered to follow this change. The "sods" of some root-spreading natives were used initially. No wild flowers were specified.

e. The contractors bid from the specifications and plant list and not from the drawings. Locations and adjustment of plant material were done by the landscape architect in the field.

f. Although some transplanting was done, it was not as great as earlier reports had stated. Some existing cedars, deciduous shade trees in good form, and apple trees from several orchards were the principal species transplanted. A portion of the plantings did come from state nurseries which were maintained at that time.

g. The effect of the conifers as a transition plant at curves or terminating or screening views has been greatly reduced because the mature pine and cedars have usually been trimmed to 16' or higher and have the appearance of a tree trunk with the needles occurring above normal driving level.

h. The bridges have become obscured over time due to normal plant growth, unregulated secondary plant growth, and general lack of maintenance. Where some recent clearing has occurred, the bridges become much more visually accessible.

i. With the medians, the concept was to carry the existing landscape back across the interrupted (cleared) sections, including the medians. Laurel was used quite heavily in the medians to act as a glare barrier, but the road salt and harsh environment was too stressful for the plants to survive.

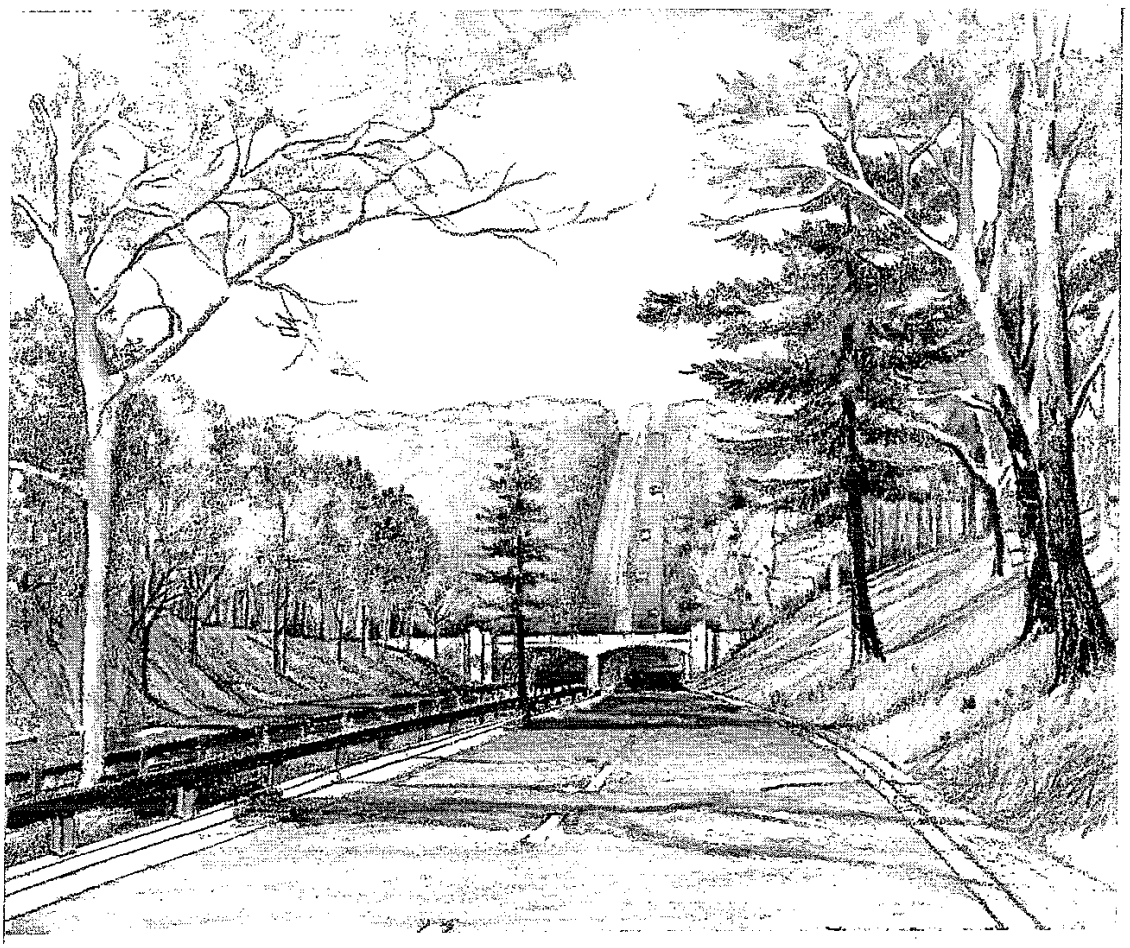
j. More selective thinning of adjacent woodland was done in Greenwich than the rest of the Parkway. Because of tight budgets and the large quantity of woods passed through, virtually none was done beyond Greenwich.

k. The most impressive landscape features from the original landscape architect's view are the fall color and the spring flowering laurel and dogwood. The latter has been greatly diminished because of loss due to disease, lack of maintenance, and overgrowth.

l. At the time of the Parkway construction, the countryside was more open because probably more than half the land passed through was farmland, pasture land, or fallow fields. The clearing for the proposed construction opened up the area even further to long vistas or selected views. There was no predetermined goal to create a particular view or vista. They were simply there as a result of the topography, open land, and cleared right-of-way.

m. The over-riding problem to any landscape over time is maintenance. On a project of the scale and nature of a Parkway, the result of a lack of maintenance has the most impact and yet probably is least apparent. Except where bridges and their abutments are obscured, one would not be aware of the amount of "original" open space that has disappeared due to normal succession growth. Many areas that were originally planted as shade trees and evergreens set in lawn areas have been engulfed and are hard to distinguish from the original woodlands and succession woodlands.

o31mp2.2



Section 3 *Existing Conditions Survey*

3. EXISTING CONDITIONS SURVEY

3.1 INTRODUCTION

In order to provide a working document consisting of a plan and text to guide the rehabilitation of the landscape that will provide the character for which the Merritt Parkway is so well known, an initial task in the master planning effort has been the preparation of an existing conditions survey which included:

a. Assembly and analysis of natural resources and community planning data which may affect the landscape and visual quality of the Parkway.

b. Conducting a field reconnaissance of the visual features of the Parkway and plotting that information on base maps.

c. Analysis of current landscape maintenance practices undertaken by the Department.

d. Preparation of Parkway maps at various scales for use in the initial and later tasks of the study.

e. Assembly and analysis of available pertinent data concerning traffic conditions and design standards for the Parkway.

f. Identifying opportunities for the improvement of the Parkway's landscape features.

The results of the work effort for this task are described in the balance of this narrative and depicted on the series of maps accompanying this report (separate volume).

3.2 FIELD RECONNAISSANCE

3.2.1 Methodology

Computer tapes of the aerial photogrammetry of the Merritt Parkway were provided by the Connecticut Department of Transportation to serve as the base maps for the Landscape Master Plan. In addition, 200 scale mylar prints (without right-of-way lines) were also furnished. Originally developed in 1989, the aerial photogrammetry was found on the one hand to cover a much greater land area than needed for master planning purposes while, on the other hand, they were not sufficiently detailed to provide an accurate representation of many visual features. Such elements as rock formations, vegetation type (deciduous versus coniferous) and quality, guiderail, and new construction were not evident from this level of existing mapping nor did the existing maps show the location of inland wetlands or small water courses.

In order to provide a reasonably accurate picture of the present conditions of the landscape features, two video tapes of the Parkway were recorded. The first taping focused straight ahead traveling at 40 mph and capturing the "flavor" of the Parkway as seen by a driver. The second taping, performed a month

later when all deciduous foliage had dropped, focused toward the side of the road in order to capture the edge conditions, i.e., the depth of lawns, the extent of invasive vegetation, visible stone walls, and adjacent homes

To supplement the base information provided by the Department and to confirm the video data, 200 scale aerial photographs (1990 flight) were obtained and a field reconnaissance was made by the consultant team. Visual observations were recorded for the entire length of the Parkway using still photography and by placing notes on 100 scale enlargements of the mylar base maps. Particular emphasis was placed on the interchanges, service areas, and the landscape adjacent to bridges, since it is just such points on which a driver tends to focus and remembers what is observed.

The boundaries of the wetland were obtained from the Department's files. For the purpose of this study, these maps are sufficiently accurate but additional mapping and survey should be considered at the time when detailed design is undertaken for activities in close proximity to the wetlands.

The information obtained from the video tapes, the 200 scale aerial photographs, and the consultant's field observations have been plotted at 200 scale modifying the Department's existing base maps. All mapping has been digitized for future use by the Department. Such data as the location and type of woodlands, the location and type of guiderail, rock outcrops, lawns, ornamental plantings, and other significant features are accurately depicted. Field notes of the consultant team, including qualitative judgments, have been added to the base maps.

Summarized in Table 3-1 on the following page are the issues which have been identified along the Parkway. The location of the particular issue has been keyed to the 200 scale existing condition survey.

3.2.2 Recent And Proposed Construction Activities

There have been continual improvements made along the Merritt Parkway to maintain or upgrade safety. Safety improvements include additions or upgrades of guiderails, removal of depressed catch basins, resurfacing, and bridge restoration and/or widening. Other major projects have involved reconstruction of interchanges to accommodate increased traffic volumes or new intersecting roadways, as well as acceleration and deceleration lanes at on-ramps and off-ramps.

The projects listed in Appendix C are only the most recent projects, projects currently in progress, or proposed projects. Awareness of these projects will assist in identifying areas where recent or pending changes in the landscape may warrant special attention to landscape improvements.

Projects are listed in Appendix C by location (town), from Greenwich (west) to Stratford (east.) Current projects are in various stages of completion and proposed projects are in various stages of conception or design. The status of each project is indicated where possible in the comment column.

3.3 SUMMARY OF PRESENT MAINTENANCE OPERATIONS

Based on information provided by the Manager of Maintenance for District III, maintenance issues and operations which may influence the Landscape Master Plan for the Merritt Parkway can be divided into three general categories which are summarized below.

TABLE 3 - 1
SUMMARY OF DESIGN ISSUES

SHEET NUMBER / DESIGN ISSUES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1. Special Conditions																																								
a. Gateways	●																																							●
b. Service Areas	●																●													●										
c. Under Construction													●			●		●	●	●		●	●	●				●			●									
d. High Tension Lines																				●									●									●		
e. Tollgate Plaza	●																																							
2. Wetlands/Watercourses		●	●	●	●		●	●	●	●	●		●					●	●	●	●	●	●				●				●					⊠				⊠
3. Interchanges	●				●	●	●	●				●	●			●	●		●	⊠	●	●		●					●		●	●	●		⊠	●	⊠		●	⊠
a. New Plantings					●												●		●			●										●	●		●	●	●		●	
4. Bridges																																								⊠
a. Underpasses	●				●	●	●			●	●		●	●	●	●	●	●	●	●	●	●	●	●		●	●	●		●	●	●	●	●	●	●		●	
- Narrow Median	●				●		●			●	●		●	●	●	●	●	●	●	●	●		●	●			●				●	●	●						
- Wide Median						●																●				●				●				●	●	●	●		●	
- Bridge Abutment																																								
b. Overpass			●	●	●				●			●	●			●			●	●		●	●	●	●		●		●						●	●	●		●
- Narrow Median			●	●	●				●			●	●			●			●	●		●	●	●	●		●								●	●			
- Wide Median			●																	●		●					●		●								●	●		●
5. Medians																																								
a. Poor Quality Trees				●	●	●	●		●																														●	
b. Lack of Trees		●	●	●	●	●			●	●	●	●	●	●	●	●	●	●	●	⊠	●	●	●	●	●	●		●	●	●	●	●	●	●	⊠	●	⊠	●	●	●
c. Fence in Median	●																●													●										
d. Other (shrubbery, scrubby, or mound						●	●	●														●						●	●											

TABLE 3 - 1
SUMMARY OF DESIGN ISSUES

SHEET NUMBER / DESIGN ISSUES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
6. Landscape Treatments																																								
a. Areas to Open Up			●				●			●																														
b. Areas for Enclosure					●							●								☒			●	●					●		●	●		●	●	☒	☒			
c. Areas to Thin																									●															
d. Enhance Park-like Character			●					●		●	●	●		●	●		●	●	●	☒	●	●	●	●	●	●	●	●	●	☒	●	●	●	●	☒	☒	☒	●	●	●
e. Enhance Rock Cuts			●							●																									●	●	☒		☒	☒
f. Enhance Laurel Plantings													●						●		●	●							●									●	●	
g. New Plantings (non-interchange)																		●					●																	
7. Views/Vistas																																								
a. Open Up Views		●	●				☒			●				●		●							●	●											●					
b. Frame Views			●							●				●		●			●	☒	●		●	●										●	☒	☒	☒		●	●
c. Screen Off-site Views													●			●				☒				●				●	●	●	☒	●	●	☒	☒	☒	☒	●		☒
d. Enhance Leading/Terminating Views		●	●				●			●						●			●	☒			●	●										☒				●	
8. Safety/Pull-Off Areas																																								
9. Guide Rails																																								
a. Median - No Trees	●	●	●						●			●	●			●	●	●		●			●	●		●	●	●		●					●	●	●			
b. Median - Around Trees	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●		●	●		●	●	●
c. Edge	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
d. Concrete/Permanent Barrier	●		●				●		●							●			●												●	●			●	●				●
10. Signage Issues	●												●				●		●						●					●			●	●		●				●
11. Maintenance Issues																																								
a. Clear Invasive Species	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
b. Slope Stabilization													●			●		●	●	●		●	●	●		●				●										

Legend:

- ● Issue occurs, that sheet
- ☒ Major Issue for that sheet

3.3.1 Vegetation Care and Mowing

a. Tree limbs overhanging the travelway are a significant hazard for the motorist. Typically, low hanging limbs are pruned to a height of approximately 16 feet to reduce potential damage from ice and snow laden branches. It should be noted that during the periodic pruning process, dead tree limbs above the preferred 16-foot height are also removed giving the appearance of more drastic activity than necessary. Wood chippers direct ground-up debris into nearby woods.

b. Tree and shrub vegetation which obscures signs are continually cut back to maintain sight lines.

c. Trees are removed on an as-need basis as they die or become significantly damaged from ice or wind.

d. Invasive shrubs, primarily multiflora rose, is a significant problem requiring regular removal and pruning.

e. Tree and shrub maintenance is typically performed in winter months.

f. Generally, mowing of lawn areas is done with tractor-mounted mowers. The mowers need 7' to 8' in width to operate efficiently.

g. The Department has mowers which will cut a swath of 5' to 7' and, in some cases, up to 13'. Hand mowing is required for smaller areas.

h. Trees spaced closer than 10 feet cause mowing machines to get "hung up" and require excessive hand work.

i. Slopes over 2:1 are not maintained with a tractor due to the safety hazard. Hand mowing is required.

j. The Department does not have the manpower to weed planting beds and prefers that no new beds requiring hand work be created.

k. Periodically, an outside vendor is hired to spray growth retardants or sterilants under guiderail to control the regrowth of brush, and, when complaints are made, to reduce poison ivy.

3.3.2 Bridge Landscape

a. With the Department's desire to expose the design features of the bridges, the evergreen trees adjacent to abutments have been limbed and underbrush has been removed. "Weed whackers" are utilized three times per year to control undergrowth.

b. Over the past two years, graffiti has been removed from every bridge on the Parkway. A crew of three people works solely on this task to keep the structures graffiti-free.

3.3.3 Barriers and Guiderail

a. With vehicles hitting these structures on a daily basis, damaged guiderails and barriers are generally repaired within a day or two of the incident.

b. The "boats", i.e. the closed guiderail systems located around the trees in median, cause the biggest maintenance problem for the Department. Mowers have to be lifted over the rail causing one lane to be closed during the operation.

c. Jersey barriers have been found to be weed free. Occasionally, a sweeping machine is utilized to clean around the base.

d. Lawn swaths with no planting immediately adjacent to the travelway having a minimum width of eight feet are recommended in order to facilitate mowing and to obviate the need for crash trucks to protect the mower.

3.3.4 Landscape Personnel

Since the 1950's, the personnel in District III have been reduced by over 50%. Some of this reduction has been made possible by new equipment technology. However, due to the elimination of specialized personnel assigned exclusively to landscape maintenance, the full width of the developed right-of-way is no longer reduced to the full extent as it had once been. Invasive vegetation species have become more prevalent and shrub beds are no longer weeded; mowing is less frequent and generally limited to the Parkway edge.

The reduction in landscape personnel has had a direct impact on the visual character of the Parkway. The meandering vegetation line between woodland and maintained lawn has been blurred. The old farm fields and pastures, many of which were in the process of succession at the time of Parkway construction, have returned to woodland. In short, the original park-like quality of the Parkway has been diminished to the point where ornamental plantings generally are not discernible and invasive vegetation encroaches on the roadside.

3.4 LAND USE AND ZONING

3.4.1 Methodology

The nature of land uses adjacent to the Parkway has been taken into consideration so that functional relationships between the Parkway and nearby activities can be enhanced by any changes or additions to the landscape. Zoning is an indication of the kinds of land uses that could occur along the Parkway and is useful primarily for identifying what activities might occur on undeveloped lands, but, secondarily, for assessing the range of activities that could occur on currently developed lands.

Land use has been mapped for a study corridor consisting of the lands for a distance of 1,000 feet from the Parkway. This distance was selected since it was felt that activities beyond 1,000 feet would not be clearly visible and would probably not have a significant impact on the driving experience. Open space lands in public or private ownership dedicated to recreation or conservation have been mapped to greater distances in order that potential connections and linkages to or across the Parkway could be identified. Such connections are critical for maintaining healthy natural systems and wildlife populations, in addition to offering opportunities for outdoor recreation and appreciation.

Land uses along the Merritt Parkway are shown on the accompanying maps, LU-1,2,3. There are eight towns through which the Parkway runs. From west to east, they are: Greenwich, Stamford, New Canaan, Norwalk, Westport, Fairfield, Trumbull, and Stratford. Land use and zoning information was derived from town maps, municipal plans of development, land use plans, subdivision regulations, and zoning codes, with a number of updates and clarifications provided through conversations with the planning staff of the respective towns.

Present land uses followed the zoning districts very closely in all towns, with the exception of quasi-public and institutional uses and parcels dedicated to open space or conservation uses, which may occur in any zone but are generally included in surrounding residential zone(s). The mapping, therefore, is a reasonable facsimile of zoning, although the particular and sometimes unique zones established by each town were generalized into the broader categories shown on the map.

Commercial and light industrial zones were quite similar among the towns in terms of lot sizes and permitted uses. The greatest variability was in the density of dwelling units allowed by different residential zones. For the purposes of this study, three residential densities were distinguished, as follows:

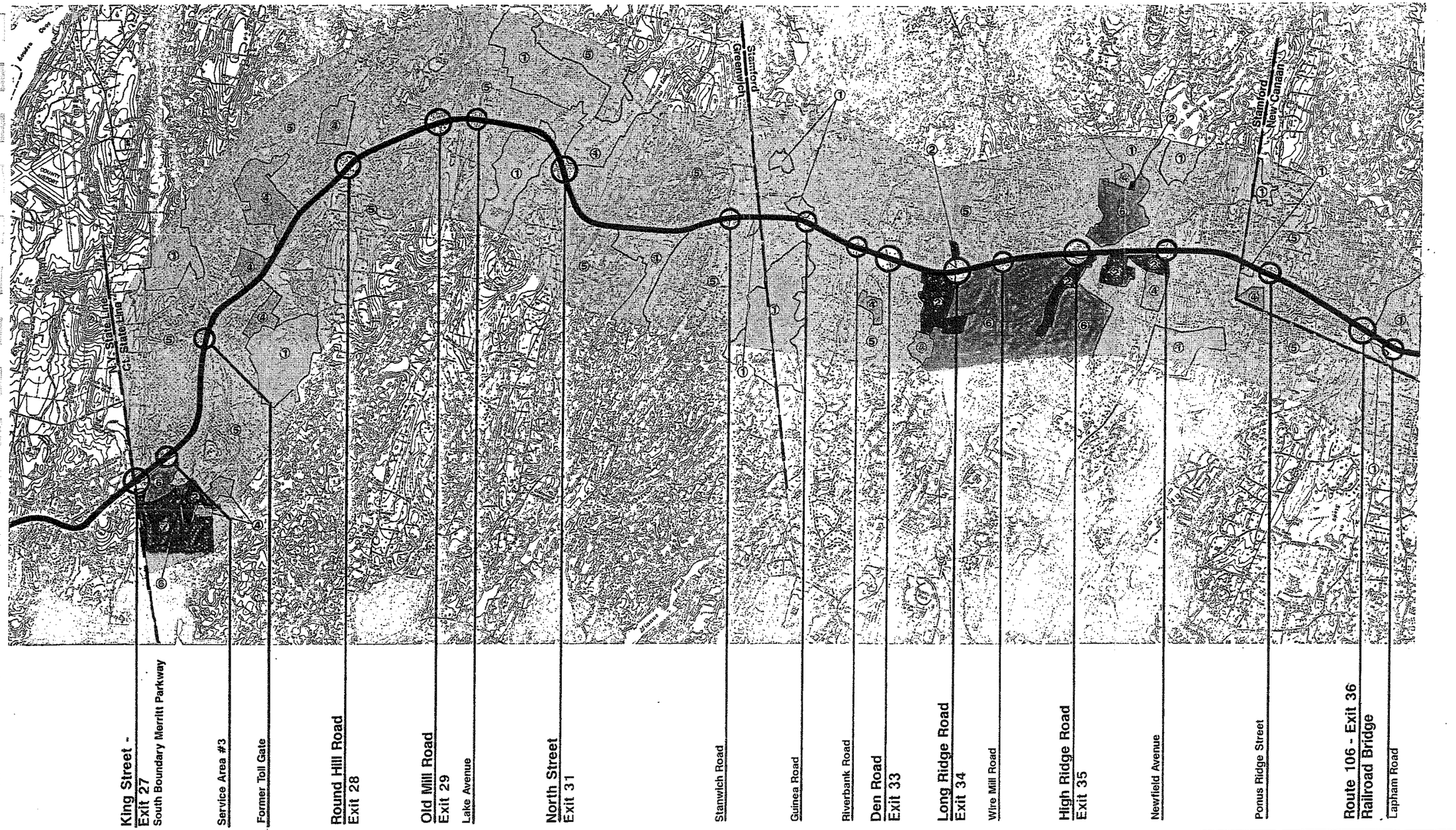
- **low**: one dwelling unit (DU) or less per acre
- **medium**: 2 to 4 DU per acre
- **high**: 5 DU or more per acre

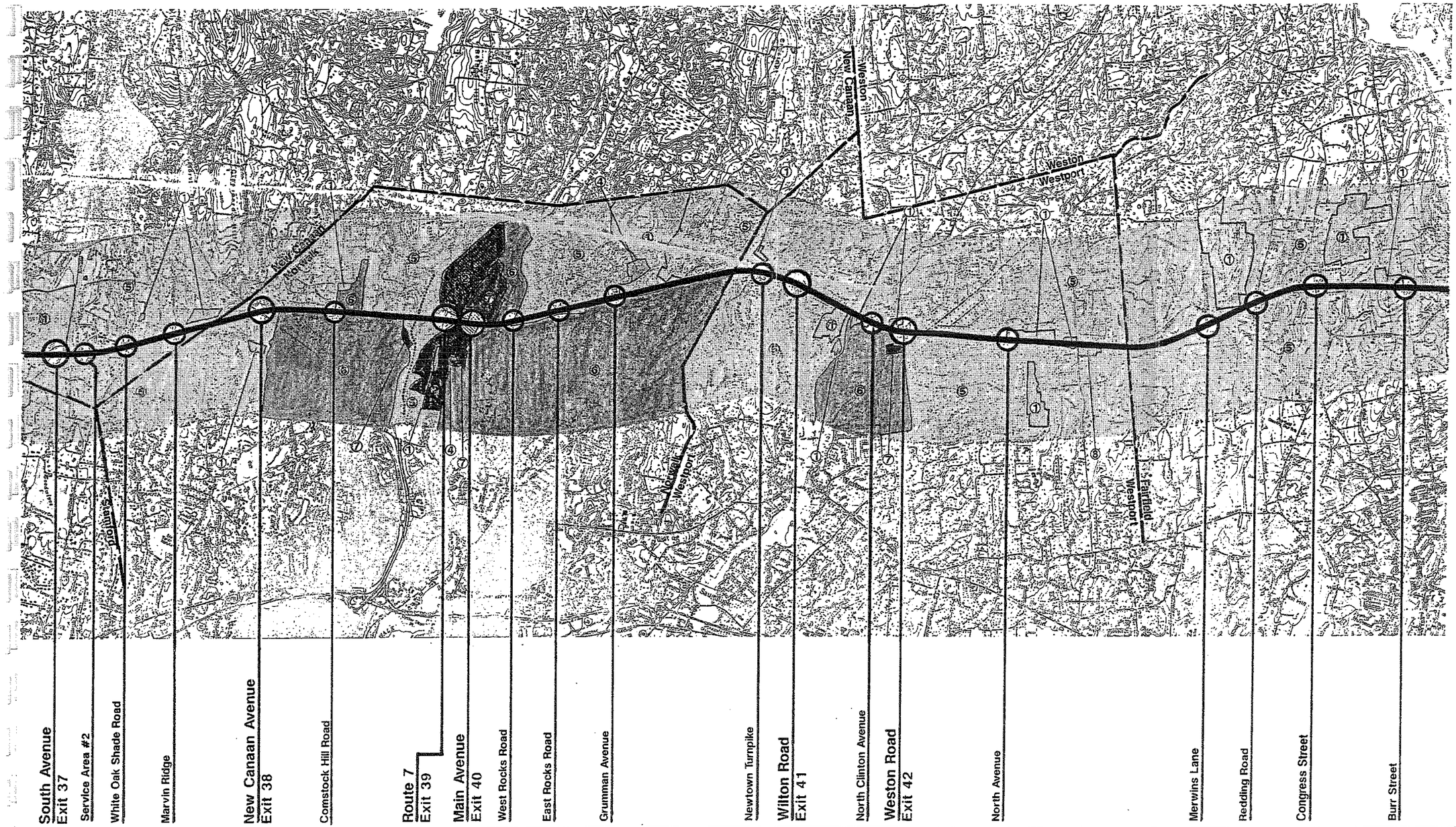
While most of the surrounding towns have zones with even lower densities (e.g. 2, 3, or 4-acre minimum lot size), the lowest density zone in Trumbull and Stratford was 1 DU/acre (1-acre minimum lot size); so 1 DU/acre was used as the standard for low density residential use. Residential developments in zones allowing higher densities (≥2 DU/acre) if open space is provided were mapped as low density because the effective density of the overall development is similar to 1-acre lot zoning.

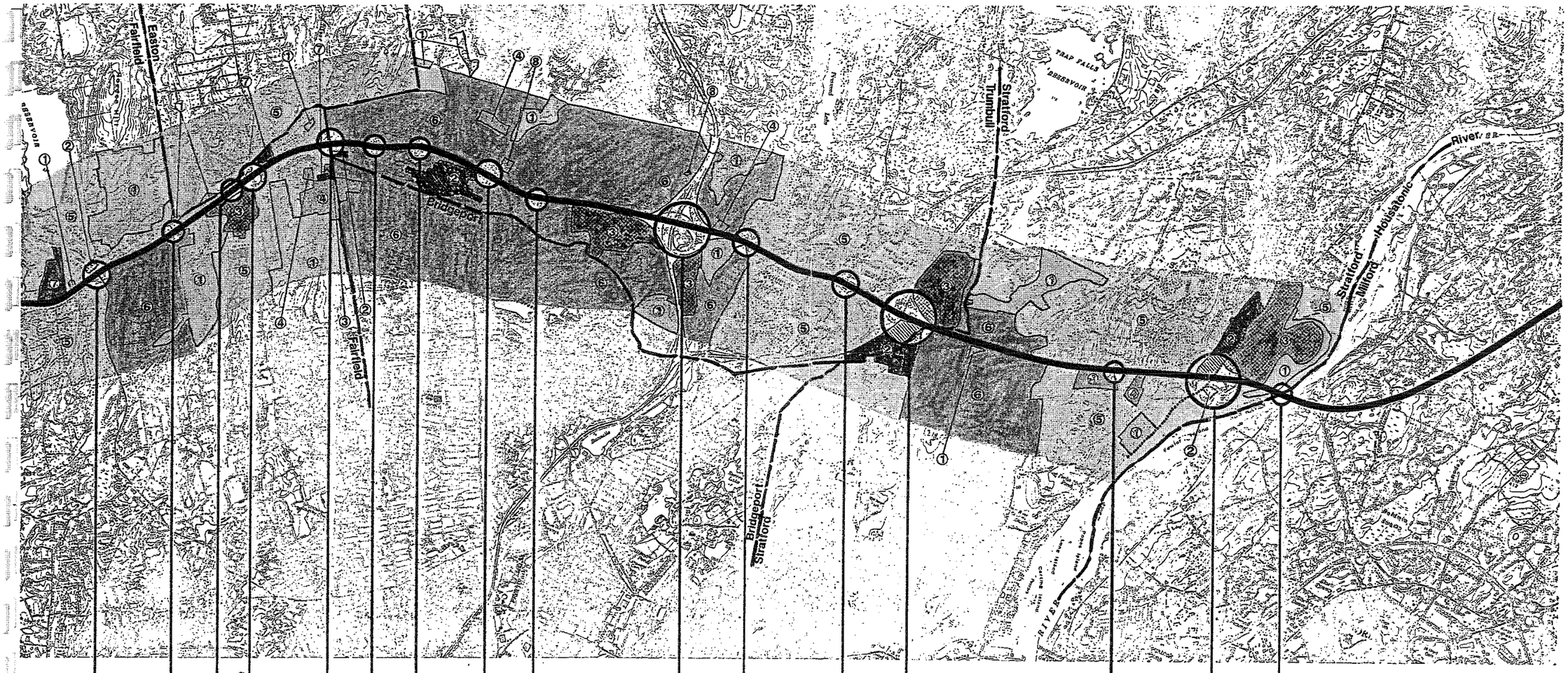
3.4.2 Existing Conditions

The Merritt Parkway is surrounded almost entirely by residential land uses which occupy approximately 87% of the right-of-way frontage. Commercial and light industrial lands abut the Parkway on roughly 7% of the total frontage, and open space/conservation lands on about 6%. Municipal and institutional uses comprise a nominal portion. Trumbull has the longest combined commercial and industrial frontage, followed by Stamford and Stratford. There are no commercial or industrial uses along the Parkway in Greenwich, New Canaan, or Westport. In terms of open space and conservation lands adjoining the Parkway, Westport has the longest frontage, followed by New Canaan and Greenwich, although the inclusion of such institutional uses as schools and church properties would place Greenwich in the lead.

The overwhelming majority of residential lands along the Parkway are low density. All towns but two have over 70% of their adjacent residential frontage in low density residential uses; the exceptions are Trumbull, with approximately 70% of residential lands in medium density, and Norwalk, with approximately half its residential frontage in moderate density and small pockets of high density. Fairfield, Westport, Stamford, and Stratford have relatively small portions of frontage in moderate density; Greenwich has a tiny pocket of medium and high density at the New York border; and New Canaan has only low density residential lands in the study corridor.


Greenwich
Stamford
Stamford
New Canaan
King Street - Exit 27
South Boundary Merritt Parkway
Service Area #3
Former Toll Gate
Round Hill Road
Exit 28
Old Mill Road
Exit 29
Lake Avenue
North Street
Exit 31
Stanwich Road
Guinea Road
Riverbank Road
Den Road
Exit 33
Long Ridge Road
Exit 34
Wire Mill Road
High Ridge Road
Exit 35
Newfield Avenue
Ponus Ridge Street
Route 106 - Exit 36
Railroad Bridge
Lapham Road
LEGEND
1 OPEN SPACE - FOREST, PARK, RECREATION
2 COMMERCIAL
3 INDUSTRIAL (LIGHT)
4 QUASI-PUBLIC (SCHOOL, CHURCH)
5 LOW DENSITY RESIDENTIAL (LDR) (≥ 1 DWELLING/AC.)
6 MEDIUM DENSITY RESIDENTIAL (MDR) (2-4 DWELLINGS/AC.)
7 HIGH DENSITY RESIDENTIAL (HDR) (5-11 DWELLINGS/AC.)
8 MUNICIPAL (UNCOMMITTED OR SERVICE)
AREA OF PROPOSED ZONE/USE CHANGE
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation
LU-1
Land Use and Zoning
Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday


New Canaan
Weston
Weston
Westport
New Canaan
Norwalk
Norwalk
Westport
Fairfield
Westport
South Avenue
Exit 37
Service Area #2
White Oak Shade Road
Marvin Ridge
New Canaan Avenue
Exit 38
Comstock Hill Road
Route 7
Exit 39
Main Avenue
Exit 40
West Rocks Road
East Rocks Road
Grumman Avenue
Newtown Turnpike
Wilton Road
Exit 41
North Clinton Avenue
Weston Road
Exit 42
North Avenue
Merwins Lane
Redding Road
Congress Street
Burr Street
LEGEND
① OPEN SPACE - FOREST, PARK, RECREATION
② COMMERCIAL
③ INDUSTRIAL (LIGHT)
④ QUASI-PUBLIC (SCHOOL, CHURCH)
⑤ LOW DENSITY RESIDENTIAL (LDR) (≥ 1 DWELLING/AC.)
⑥ MEDIUM DENSITY RESIDENTIAL (MDR) (2-4 DWELLINGS/AC.)
⑦ HIGH DENSITY RESIDENTIAL (HDR) (5-11 DWELLINGS/AC.)
⑧ MUNICIPAL (UNCOMMITTED OR SERVICE)
AREA OF PROPOSED ZONE/USE CHANGE
PROPOSED ROUTE 7 LINEAR PARK AND BIKEWAY
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation
LU-2
Land Use and Zoning
Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday



Black Rock Turnpike
Exit 44/45

Morehouse Drive

Service Area #1

Route 59/Easton Turnpike
Exit 46

Park Avenue
Exit 47

Plattsville Road

Madison Avenue

Main Street
Exit 48

Frenchtown Road

Route 25
Exit 49

White Plains Road
Exit 50

Route 108
Exit 51

Route 8
Exit 52

James Farm Road

Route 110
Exit 53

West Bank Of Housatonic River
North Boundary Merritt Parkway

LEGEND

1. OPEN SPACE - FOREST, PARK, RECREATION
2. COMMERCIAL
3. INDUSTRIAL (LIGHT)
4. QUASI-PUBLIC (SCHOOL, CHURCH)
5. LOW DENSITY RESIDENTIAL (LDR) (≥ 1 DWELLING/AC.)
6. MEDIUM DENSITY RESIDENTIAL (MDR) (2-4 DWELLINGS/AC.)
7. HIGH DENSITY RESIDENTIAL (HDR) (5-11 DWELLINGS/AC.)
8. MUNICIPAL (UNCOMMITTED OR SERVICE)

AREA OF PROPOSED ZONE/USE CHANGE

PROPOSED GREENBELT/BIKEWAY

Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

LU-3

Land Use and Zoning

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday

3.4.3 Potential Future Growth

There are no large undeveloped acreages in residential zones along the Parkway that are not dedicated to open space or conservation. Several relatively small undeveloped areas exist in the commercial and light industrial zones in Trumbull and Stratford. However, these are located next to similar existing uses, so their development should not greatly change the character of these areas. There is only one instance where a zone change is proposed; this is an undeveloped area on the west side of Stratford in the vicinity of Route 8 where a portion of the existing commercial zone is proposed to be changed to high density residential. Such a change should not have a negative impact and could possibly have a positive impact on the Parkway.

3.4.4 Open Space and Recreation Lands

All of the towns surrounding the Parkway have some open space lands close to, or directly adjacent to the Parkway right-of-way. These are a variety of lands including private and public golf courses, municipal parks for active recreation, municipal and private nature preserves, water company watershed lands, institutional holdings, and neighborhood parks and open space. In cooperation with the owners and managers of these lands, there may be ways in which the Landscape Master Plan can enhance the natural and cultural functions of these parcels. Such enhancements may include the use of scenic easements which would perpetuate the present visual quality of adjacent properties as seen from the Parkway. Another enhancement could be the construction of pedestrian and/or bicycle trails within the undeveloped Parkway right-of-way linking the public open space parcels.

Three municipalities have specific initiatives to establish recreational or conservation lands adjoining or interfacing with the Merritt Parkway. These will be of particular concern to the Landscape Master Plan.

a. Norwalk is pursuing the development of a Route 7 Linear Park within the Route 7 ROW, crossing the Merritt in the vicinity of the Route 7 interchange (Exit 39), to provide transportation and recreational opportunities. Planning for this project is underway.

b. The 1984 Greenwich Land Use Plan shows open space/recreation lands along the Byram River Gorge extending as far south as Riversville Road (which passes under the Merritt Parkway between Exits 27 and 28), to ensure public access and preserve wilderness qualities of the gorge.

c. Stratford has applied for 1994 Intermodal Surface Transportation Efficiency Act (ISTEA) funds to create a contiguous section of the proposed Housatonic Riverbelt Greenway; the segment would consist of a combination bicycle-pedestrian way linking southeast Stratford to the Stratford-Shelton town line, crossing and interfacing with the Merritt Parkway along Route 110 (Exit 53).

3.5 SPATIAL ANALYSIS

At today's average driving speed, the motorist scarcely has the opportunity to observe the details that give the Merritt Parkway its distinctive character. One may perceive significant objects - the large sign, the ornamentation on a bridge facade - but the driver only gets an impression or feeling as he/she passes from one section of the route to another. While the details of the Parkway have been inventoried for future planning and design use, the visual and spatial characteristics of the Parkway have been distilled in order to analyze its "flavor" and have been mapped at 2000 scale. (See Sheets SV-1, 2, and 3.)

3.5.1 Spatial Sequence

The Parkway experience consists of a series of spatial and visual sequences linked by a common pavement thread. Spatially, the Parkway can be divided into four groups described below:

a. ***Strong enclosure*** consisting of a heavy tree canopy with deciduous or coniferous trees in the median and natural vegetation or rock cuts defining the edge of the road. Typically, one would find the space shady and cool in summer and somewhat dark in the winter.

b. ***Moderate enclosure*** where there would be a thin tree canopy, some median trees, and where vegetation has been held back from the edge of the pavement. Typically, one would find this to be a more neutral space throughout the year.

c. ***Park-like enclosure*** whereby individual trees, both deciduous and coniferous, are located in a maintained lawn. The median trees would be widely spaced and might well include evergreens. The edge would consist of lawns and natural vegetation and would be well back from the pavement. This setting would be typical of how the Parkway was planted immediately after construction in areas that had been fields.

d. An ***open enclosure*** is characterized by the absence of median plantings and vegetation close to the road, resulting in the sense of no enclosure. This typically occurs in the areas of recent construction at major interchanges.

3.5.2 Visual Sequence

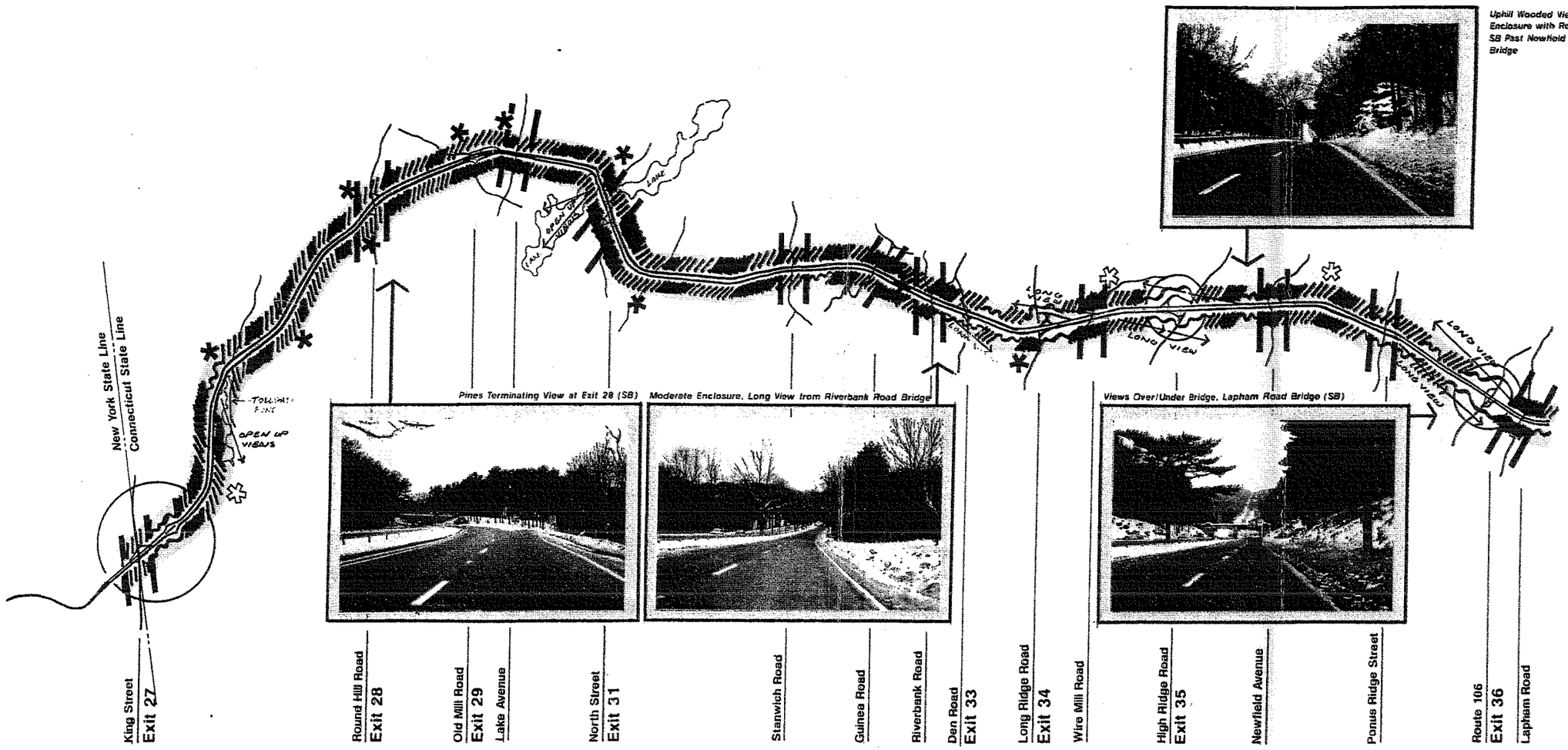
Visually, the Parkway consists of a series of views and vistas described as follows:

a. ***Framed views*** where bridges are framed by heavy vegetation, rock outcroppings, and topography sloping toward the road. In some cases, the horizontal curvature of the road contributes to the framing of the view. Grouped plantings adjacent to the bridges represents a typical design technique used at the time of construction.

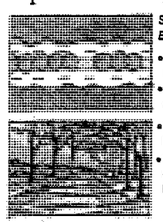
b. ***Leading or terminating views*** where evergreen plantings are located on the median curves leading the driver through the curve. Similarly, evergreens form a visual terminus when planted on the outside edge before the curve.

c. ***Long views/vistas*** typically occur on steep gradients where the motorist is able to see long distances and is limited only by vegetation outlined on the short horizon. In some instances, a framed view over or under a bridge may occur in the foreground.

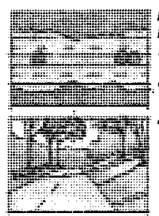
The identity of the Merritt Parkway has been significantly influenced by its horizontal and vertical geometry coupled with its original approach to the designed landscape. Plant materials have been utilized to delineate the curvature of the roadway as well as to emphasize long views on the grand scale and to enframe bridge abutments on the microscale. The repetitiveness of the design concepts tend to create a "rhythm" to the driving experience.



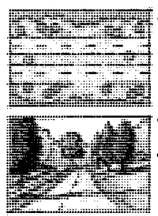
Spatial Sequence:



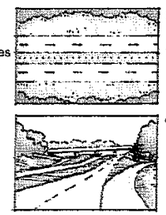
Strong Enclosure
- Strong Spatial Enclosure
- Overhead Canopy
- Trees in Median
- Trees or Rock Cut Defines Edge of Road



Moderate Enclosure
- Less Canopy
- Some Trees in Median
- Trees held Back from Edge of Road



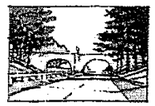
Parklike
- Individual Trees in Maintained Lawn Areas
- Few Median Plantings
- Edge held Back from Roadway



Open
- Edge held Back from Roadway
- No Median Plantings

No Sense of Enclosure

Visual Sequence:

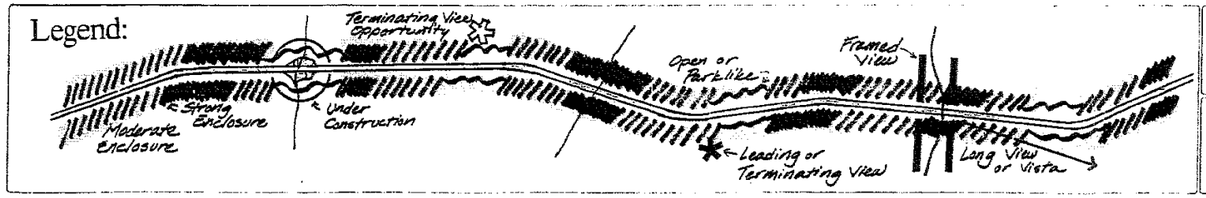


Framed Views
- Bridges Framed by Tree Mass or Rock Outcropping And Topography
- Bridges Framed by Road Curvature

Bridges Frame Views

Leading/Terminating Views
- Mass of Evergreen Planting in Median of Curves
- Mass of Evergreen Planting on Visual Terminus Before Curve

Long Views/Vistas
- Both Open Views and Framed/Wooded Views Uphill and Downhill
- Framed Views Over and Under Bridges



Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

SV-1

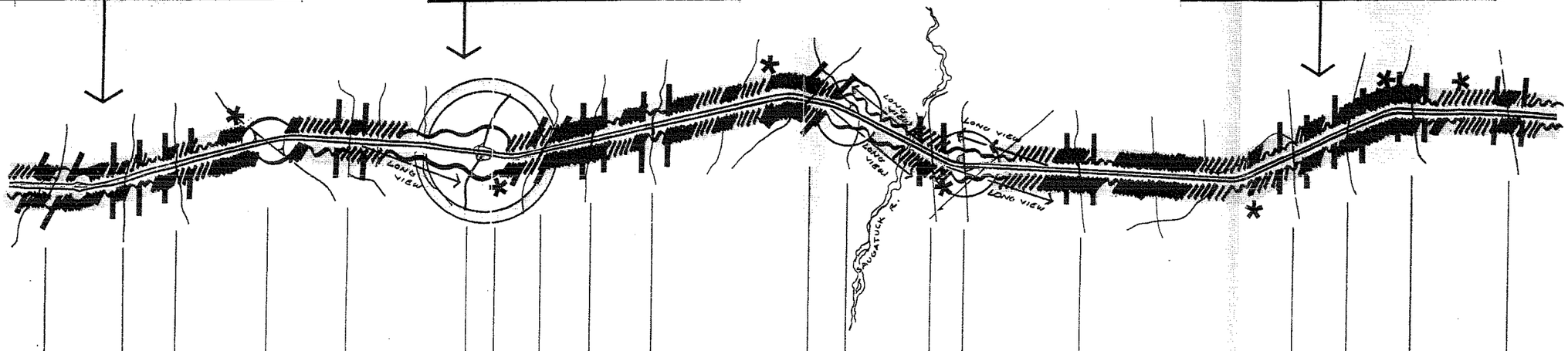
Spatial/Visual Sequence

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday

Moderate Enclosure, with Long View. View Over/Under Bridge. White Oak Shade Road Bridge

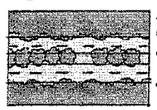
Open-Exposed Edge and Rock Cut. Route 7 Interchange

Framed View with Plantings, Redding Road Bridge



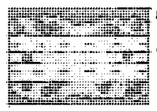
South Avenue
Exit 37
White Oak Shade Road
Marvin Ridge Road
New Canaan Avenue
Exit 38
Comstock Hill Road
Exit 39 Route 7
Exit 40 Main Avenue
West Rocks Road
East Rocks Road
Grumman Avenue
Newtown Turnpike
Wilton Road
Exit 41
North Clinton Avenue
Weston Road
Exit 42
North Avenue
Merwins Lane
Redding Road
Congress Street
Burr Street

Spatial Sequence:

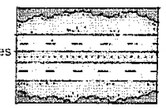


Strong Enclosure
- Strong Spatial Enclosure
- Overhead Canopy
- Trees in Median
- Trees or Rock Cut Defines Edge of Road

Moderate Enclosure
- Less Canopy
- Some Trees in Median
- Trees held Back from Edge of Road

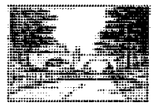


Parklike
- Individual Trees in Maintained Lawn Areas
- Few Median Plantings
- Edge held Back from Roadway



Open
- Edge held Back from Roadway
- No Median Plantings
No Sense of Enclosure

Visual Sequence:



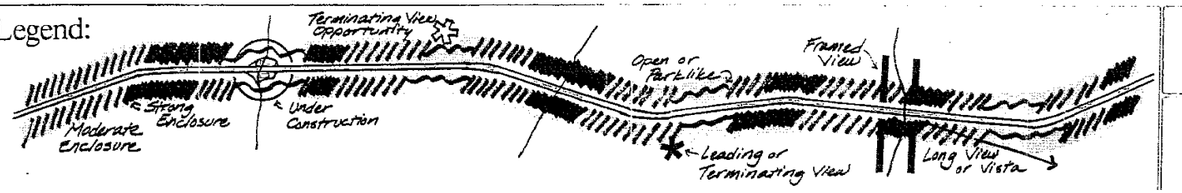
Framed Views
- Bridges Framed by Tree Mass or Rock Outcropping And Topography
- Bridges Framed by Road Curvature

Bridges Frame Views

Leading/Terminating Views
- Mass of Evergreen Planting in Median of Curves
- Mass of Evergreen Planting on Visual Terminus Before Curve

Long Views/Vistas
- Both Open Views and Framed/Wooded Views Uphill and Downhill
- Framed Views Over and Under Bridges

Legend:



Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

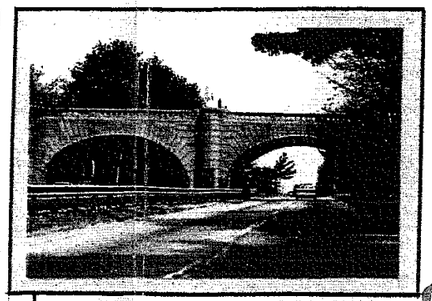
SV-2

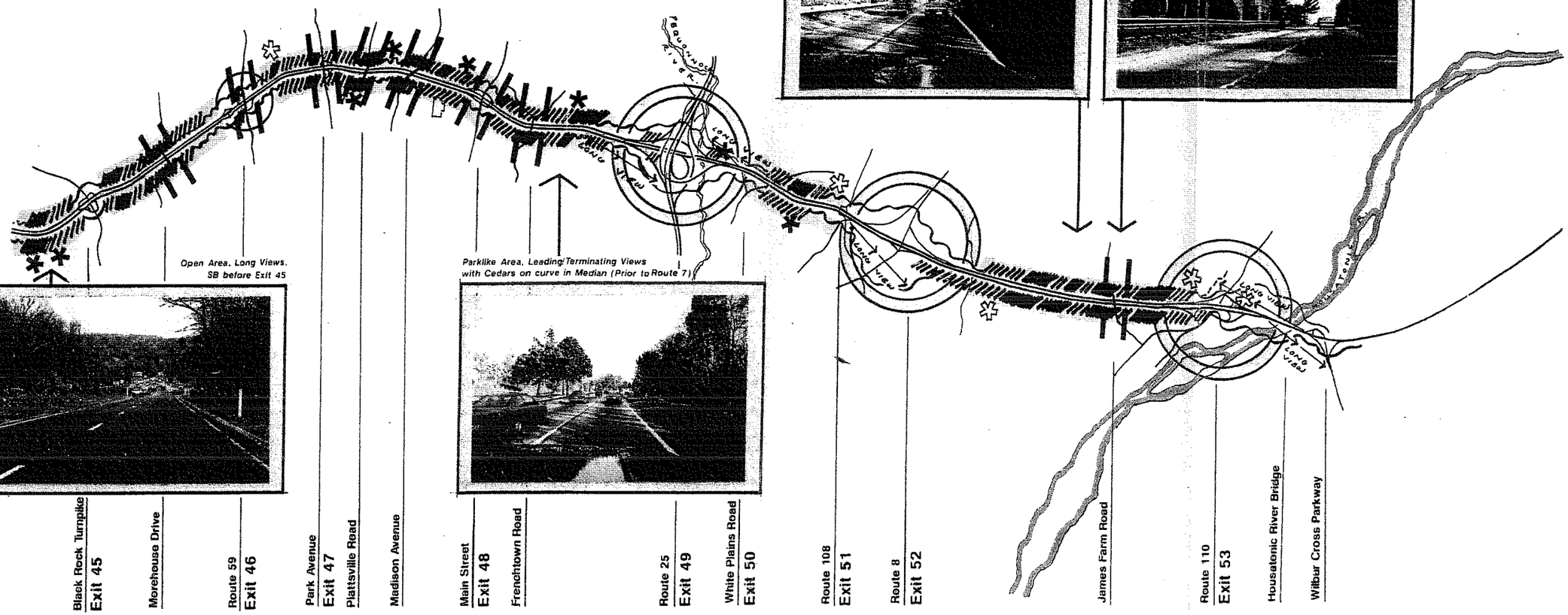
Spatial/Visual Sequence

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday

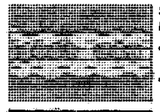
Spatial Enclosure from Woods and Rock Cut, SB past James Farm Road Bridge

Bridge Framing Views - James Farm Road Bridge (NB)





Spatial Sequence:



Strong Enclosure

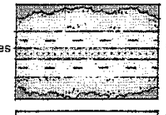
- Strong Spatial Enclosure
- Overhead Canopy
- Trees in Median
- Trees or Rock Cut Defines Edge of Road

Moderate Enclosure

- Less Canopy
- Some Trees in Median
- Trees held Back from Edge of Road

Parklike

- Individual Trees in Maintained Lawn Areas
- Few Median Plantings
- Edge held Back from Roadway



Open

- Edge held Back from Roadway
- No Median Plantings
- No Sense of Enclosure

Visual Sequence:

Framed Views

- Bridges Framed by Tree Mass or Rock Outcropping And Topography
- Bridges Framed by Road Curvature

Bridges Frame Views

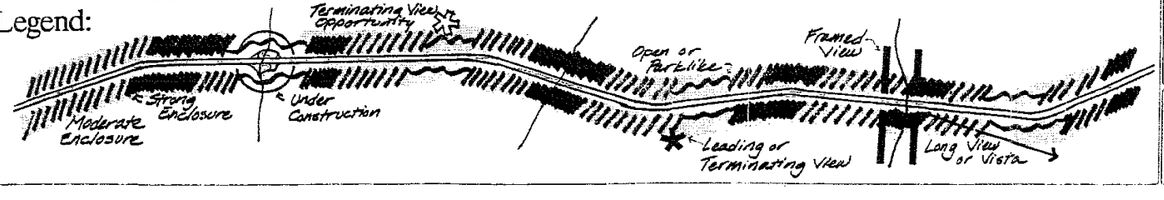
Leading/Terminating Views

- Mass of Evergreen Planting in Median of Curves
- Mass of Evergreen Planting on Visual Terminus Before Curve

Long Views/Vistas

- Both Open Views and Framed/Wooded Views Uphill and Downhill
- Framed Views Over and Under Bridges

Legend:



Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

SV-3

Spatial/Visual Sequence

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday

However, the rhythm or spatial/visual sequence of the Parkway has been observed during this planning process to be broken. The general condition of the median is best described as being unkempt. The inconsistency of guiderails, signage, chain link fencing in service areas, and the absence of intricate landscape improvements interrupt the smooth transition from space to space along the Parkway. Overgrown or invasive vegetation obscures the bridge ornamentation.

Fortunately, overgrown vegetation is capable of being eliminated, or at the very least, pruned back as the Department has been doing in recent months to expose bridge facades. Such an effort can be applied to Parkway edges to reveal the "old field" character. Charges in mowing practices and the introduction of new specimen trees can renew the maintained landscape. Finally, standardizing design details will tend to unify the spaces throughout the entire Parkway and the spatial sequencing can be restored.

3.6 TRANSPORTATION ISSUES

In evaluating the landscape elements of the Merritt Parkway, both historic and current, an assessment of the traffic and safety issues of the Parkway has been undertaken. The following data is presented to provide an overview of the transportation issues and to set the framework for the balancing of aesthetics and operations as the Landscape Master Plan evolves.

3.6.1 Traffic Volumes

Its park-like environment not withstanding, the Merritt Parkway was originally designed and has continued to function as a key component of the state's transportation system, especially within the state's southwest corridor. When the Parkway was conceived and design work undertaken during the early to mid 1930's, design-hour volumes, design speeds, and geometric design standards were significantly different from current American Association of State Highway and Transportation Officials (AASHTO), Federal Highway Administration (FHWA), and Connecticut Department of Transportation (ConnDOT) standards. The original designers engineered the road for a more relaxed time; they never envisioned 70 mile per hour (mph) speeds or Average Daily Traffic (ADT) volumes approaching 69,000 vehicles per day (vpd) in the section of the Parkway between the Route 8 and Route 25 interchanges, or the level of congestion that occurs on a daily basis during the morning and evening peak commuter periods.

Following the completion of construction and the opening of the first section of the Parkway between New York and Norwalk in 1938, traffic volumes at the Connecticut-New York state line grew to nearly 15,500 vpd in 1940. With the exception of the time period during World War II (1940-1945) when traffic volumes decreased to approximately 8,000 vpd and the time period following the opening of the Connecticut Turnpike (I-95) in 1958, traffic volumes at the state line have grown at an average annual rate of approximately eight percent per year, producing some 39,800 vpd in 1992.

When the second section of the Parkway between Norwalk and the Housatonic River was fully completed and opened to traffic in 1940, there was and continues to be, a corresponding, if not more dramatic traffic growth. In 1992 ADT volumes approached almost 69,000 vpd on the Parkway between the Route 8 and Route 25 interchanges. Traffic volumes at the northerly limit of the Merritt Parkway at the Housatonic River have also shown continued growth, with nearly 64,000 vpd crossing the river.

While traffic volumes grew at surprisingly high rates since the Parkway opened, more recent trends between the end of the boom years of 1987-88 and 1992 indicate a much more stable traffic growth pattern, with annual increases ranging from zero percent at the Norwalk/Westport town line to seven percent at the Housatonic River. Table 3-2 presents traffic volume trends at five locations along the Merritt Parkway for the time period 1988-1992.

TABLE 3-2
ROUTE 15 - PARKWAY VOLUMES (ADT'S)

Year	At State Line	Stamford & New Canaan Town Line	Norwalk & Westport Town Line	Fairfield & Trumbull Town Line	Housatonic River
1988	31,400	49,700	47,700	55,400	47,800
1989	30,000	47,600	45,600	56,200	55,700
1990	30,300	48,000	46,000	56,700	56,200
1991	30,600	48,500	46,500	57,300	56,800
1992	39,200	55,500	47,900	58,400	63,800
Average Annualized 5 Year Growth Rate	5%	2.3%	0%	1%	7%

3.6.2 Parkway Speeds And Accidents

Interestingly, while traffic volumes have been increasing along with resultant traffic congestion and operational problems, average and 85th percentile speeds on the Parkway have also demonstrated a continuing upward trend. In general, in 1980 with the posted highway speed at 55 mph, the average speeds were 56.2 mph and 57.1 mph in the northbound and southbound directions, respectively. In 1993, again with a posted speed of 55 mph, the average speeds increased to 62.2 mph and 62.6 mph in the northbound and southbound directions, respectively. Closer examination of this speed data indicates that more than 50% of the total traffic traveling on the Parkway is exceeding the posted 55 mph speed limit by almost 7 mph.

Of even greater concern is the fact that the 85th percentile speeds, which is the conventional speed used for highway design purposes, has shown an even greater increase, growing from an overall average (for both directions) of 61.5 mph in 1980 to almost 67 mph in 1993. Clearly, the fact that both the average and 85th percentile speeds are significantly higher than the probable design speed or the posted speed limit is a major concern.

An analysis of Parkway accidents presents an interesting dichotomy. On one hand, traffic volumes, vehicle speeds, and observed operational problems are increasing while, on the other hand, the total number of accidents, and more importantly the number of fatal accidents, is decreasing.

To facilitate a better understanding of the interrelationship between traffic volumes, vehicle speeds, operating parameters, roadway geometrics, and the impact of interchange location(s), a comprehensive and detailed accident analyses was undertaken on a section-by-section, interchange-by-interchange basis. The findings of these analyses are presented in the Appendix D of this report. The accident analysis is based on Connecticut Department of Transportation data for 1990, 1991, and 1992.

Previously compiled accident data (from the "Draft Guidelines") for 1986 through 1990 presented some telling statistics. During this time period there was:

- One accident every eight hours.
- One injury every 20 hours.
- One fatality every 52 days.
- One tree hit every nine days.
- One rear-end accident every 14 hours.
- One side-swipe accident every three days.
- One guiderail hit every 36 hours.

Other interesting statistics that were obtained from a more detailed analysis of the Department's three-year accident statistics include:

- Of the total 3,300 accidents, 384 (11.6%) involved vehicles classified by the investigating officer as "trucks". This classification could include personal pick-up trucks which are legally permitted on the Parkway or commercial trucks which use the Parkway illegally.
- A total of 808 accidents (24.5%) involved vehicles hitting guiderail or jersey barriers. This statistic is very important and one that warrants further in-depth analysis, as guiderail and barriers are typically installed for safety reasons, often to protect trees, rock, outcroppings, embankments, and structures. If they are found to be a contributing element to the accident, then their value as a safety device is clearly diminished.
- A total of 66 accidents (2%) involved vehicles hitting trees.
- The highest contributing factor for accidents was reported as "following too close", followed by "driving too fast for conditions".
- 60% (1,980) of all reported accidents occurred on the northbound lands, and 40% (1,320) occurred on the southbound lanes.
- The highest fatality rate was reported in the section between Exit 42 and 44 (No Exit 43) locally known as "No Man's Land".

As the development of the Landscape Master Plan proceeds, careful consideration of the accident statistics will be considered so as to ensure both a safe and aesthetically pleasing end product.

3.6.3 Current Highway Design Standards

The Merritt Parkway, as well as most limited access highways in the state, should be designed, upgraded, rehabilitated, and reconstructed in accordance with current design standards adopted by the Connecticut Department of Transportation, based on criteria established by the American Association of State Highway and Transportation Officials (AASHTO), the Federal Highway Administration (FHWA), and always predicated on sound engineering judgement.

These highway design standards address vehicle design and operating speeds, rights-of-way, horizontal and vertical geometric alignment, horizontal and vertical clearance, pavement cross section and super elevation, lane and shoulder widths, medians, control of access, drainage, guiderails and barriers, aesthetics - including landscaping, structures and overpasses, spacing of interchanges, lighting, pavement markings, signing, noise barriers, rest areas, side slopes, and public utilities within the highway right-of-way.

In evaluating the design of the Merritt Parkway it becomes clear that the design standards employed by the Connecticut Highway Department (predecessor to the Connecticut Department of Transportation) in designing the Merritt Parkway in the early to mid 1930's were significantly different from the currently used 60 mph minimum and 70 mph desirable design speed that is generally used for most current upgrading of limited access highways, including the Merritt Parkway. While some of the main-line geometry of the Parkway approaches current minimum design standards relative to general horizontal and vertical alignment, there are numerous sections of the Parkway that fall short of these standards, most notably, the median design, lateral clearances, and many of the unimproved interchanges.

The following table presents a comparison of the "probable" design standards used by the Parkway designers in the 1930's and the current design standards used by the Department on most limited access highways. In comparing these "standards", two important cautions should be considered. First, many of the Merritt Parkway standards are based on extrapolated data from reported information on existing conditions and a review of early Parkway plans. Second, since the Department has not established design standards for parkways, the design standards for limited access expressways were utilized here for comparison purposes.

TABLE 3-3
DESIGN STANDARDS

Design Element	Merritt Parkway	Current Criteria
Design Speed (mph)	30-45 mph (actual)	
Desirable		70 mph
Minimum		60 mph
Lane Width	13 foot (actual)	
Desirable		12 feet
Minimum		12 feet
Right Shoulder	NONE	
Desirable		10 feet
Minimum		12 feet
Left Shoulder	NONE	
Desirable		6 feet
Minimum		6 feet
Maximum Grade	8%	4% to 5%6.
Maximum Curve	7 Degrees	2° - 3° max.
Maximum Superelevation	variable	0.06 ft/ft
Pavement Structure	8" Concrete 6" - 24" Gravel/Stone	4" Bit. Conc. Class I in. 6" Bit. Conc. Class II on 12"-18" Subbase

Design Element	Merritt Parkway	Current Criteria
Curbing	4" high at 45°	not normally used
Bridge Clearance	11'-0" at curb	16"-3" (entire roadway)
Median Width	typically 21'±	100 foot (desirable)
Sight Distance	500'	800'(+)
Lateral Clear Zone	varies	25'-53'

3.6.4 Future Improvements

Traffic projections through 2010 were made as part of the preliminary "1990 Southern Connecticut Corridor Study: Transit Strategies and Highway Concepts". These projections indicate that improvements to the Merritt Parkway may be needed. The improvement options for the Merritt Parkway ranged from expansion of the present four lane configuration to six lanes (three in each direction) to the construction of second "barrel" on the other half of the Parkway. That proposal met vociferous and well-documented opposition, due to the potential impact on the aesthetics of the Parkway.

In contrast to the recommendation for roadway widening, the current administration of the Department of Transportation has taken the position that the Merritt Parkway is a valuable and implacable Connecticut resource that must be preserved as a scenic highway that serves a major transportation link through Fairfield County to New York. Traffic enhancements would be confined to safety improvements, architectural and structural restoration of bridges, and improvements to the visual quality of the landscape. It is on this general policy that this Landscape Mater Plan is based.

3.7 SUMMARY OF ISSUES AND OBSERVATIONS

In addition to providing a base on which an improvement plan can be made, the principal purpose of undertaking a detailed inventory and analysis of existing conditions of the Merritt Parkway is the identification of those issues which will continue to influence the quality of the driving experience. The observations from this extensive analysis are summarized below and illustrated on Overview Sheets 1 through 8.

3.7.1 Visual and Aesthetic Qualities

- Parkway identity is greatly influenced by the tight vertical and horizontal curvature of the original engineering design.
- Horizontal and vertical curves, and the placement and approach of the bridges emphasize the views and vistas, while enhancing the visual experience.

- Dramatic change in adjacent land use has resulted in areas on non-parkway type views from the roadway.
- Plant material has been used to emphasize views to and through bridges, to frame views, and to screen off-site views.
- Though done for safety reasons, the use of evergreens on curves adds focal points and terminating vistas.
- General condition of the median and the inconsistent details (guiderails, signs, new interchange lighting, chain link fences, etc.) significantly detract from the visual quality of the Parkway.
- Bridge abutments and details are generally obscured by overgrown vegetation.
- The unpruned cedar groves are more naturalistic and appropriate than the pruned cedars occurring in the median.
- Opportunities exist to clear and reveal attractive details such as the bridge architecture and the low stone walls.
- Generally, consistency and repetition of design elements and principles add to the aesthetic experience of driving the Parkway.
- The Parkway passes through a large quantity of woodlands.
  - *Right-of-way is undergoing reforestation*
- Majority of the Parkway is moderately to strongly enclosed.
  - *Vegetation, steep slopes, and rock cuts define edges*
- Closed canopy of edge and median trees greatly define the current character and identity of the Parkway.
- Some packets of park-like areas remain.
  - *Most are obscured by lack of maintenance and successive growth*
- Tight enclosure at the crest of vertical curves and the general openness at low points contribute to the design and rhythm of the Parkway.
- Major areas of alteration and construction present the most significant opportunities for major landscape rehabilitation.

3.7.2 Landscape Maintenance

- Current maintenance efforts insufficient to keep ahead of invasive woody vegetation.
  - *Right-of-way is undergoing reforestation*
- Financial constraints have precluded maintaining the open, park-like environment.
  - *Limited maintenance will be the single largest constraint on landscape treatments*

- Invasive vines overtaking mature, high quality of vegetation.
  - *Without control, further significant loss will occur*

- Mowing the brush control of open areas and at bridge abutments are critical.
  - *Definition of these important spaces requires continued maintenance*

- Future landscape treatments should avoid high maintenance solutions.
  - *Minimize ornamental shrub beds in islands and in mowed zones*

- Streamline current maintenance operation.
  - *Maximize treatment of the greatest area with limited manpower and equipment*

- Develop maintenance strategies.
  - *Compare efficiency of in-house versus contract operations*

3.7.3 Land Use

- The Parkway runs through eight towns.

- Present land uses follow zoning districts closely in all of the eight towns along the Parkway.

- The Parkway is surrounded almost entirely by residential land uses.
  - *Majority of residential lands are Low Density*

- Commercial and light industrial land uses occupy roughly 7% of the total frontage of private property on the Parkway.

- Large undeveloped acreages in residential zones along the Parkway are dedicated to open space or conservation.

- Opportunities exist to integrate Parkway landscape elements to municipal open space design efforts.

3.7.4 Transportation

- The Merritt Parkway is a resource that must be preserved as a scenic highway.
  - *Safety improvements must continue to be implemented in this context*

- The Parkway was originally designed and currently functions as a key component of the state transportation system.

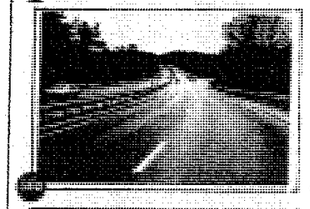
- Traffic volumes and speeds demonstrate a continual upward trend.

- Accidents are decreasing in total.
  - *25% involve guiderail and concrete barrier curb collisions*
  - *2% involve collisions with trees*

- Original design standards were lower than standards employed for speeds of today.
  - *Numerous Parkway sections fall short of these current standards*

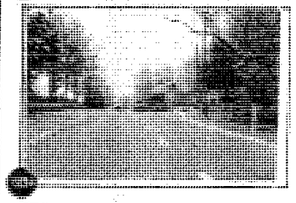
o31mp3.2

Permanent Jersey Barrier (SB)

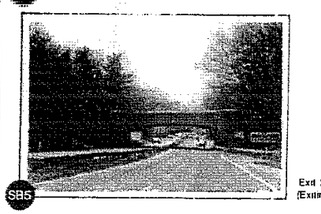


Old Toll Station (SB)

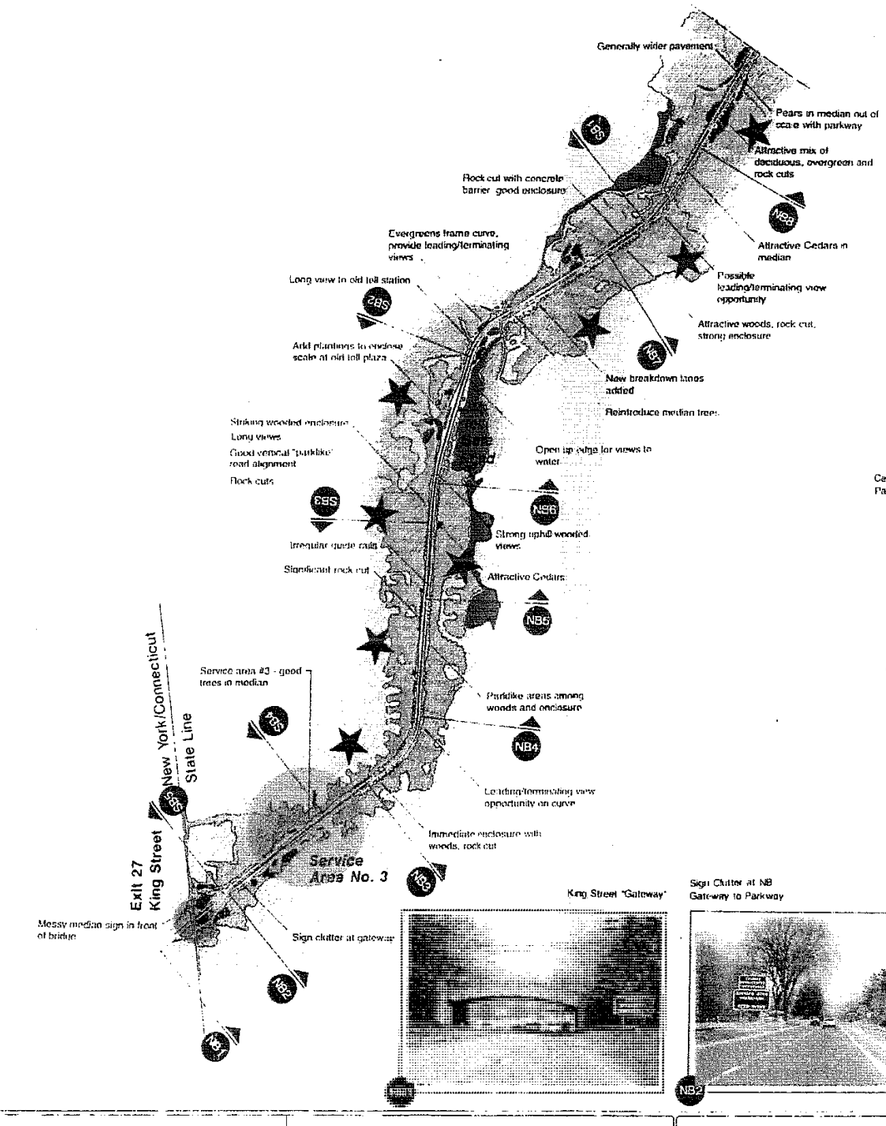
Long Enclosed View (SB)



Entrance to Service Station #3 (SB)

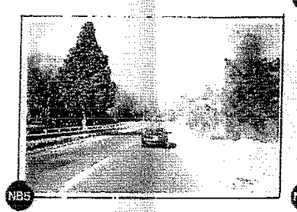


Exit 27 King Street
(Exiting Merritt Parkway) (SB)



Long View (NB)

Wooded Area,
Strong Enclosure (NB)



Cedars in Median,
Parklike Pockets (NB)

Old Toll Station (NB)

Woods, Enclosure,
Rock Cuts (NB)

Moderate Enclosure past Service Station (NB)

Sign Clutter at NB
Gateway to Parkway

Summary Characteristics:

Positive Aspects:

- Generally an area of strong character and identity (dense wooded enclosure, significant rock cuts, park-like pockets)
- Attractive stone bridge at King Street provides entry/gateway image
- Mature median trees at Service Area 3
- Tight horizontal, vertical curvature of road reinforces Parkway character
- Tollgate Pond provides opportunity for opening views to water

Negative Aspects:

- Visual clutter from signage at King Street bridge is most dominant "gateway" feature
- Service Area 3 needs consistent landscape design with the other service stations along the Parkway
- Only one identifying bridge in this section
- New breakdown lanes added for safety, but increases pavement width
- Non-native species (pears) used in median - out of character and out of scale for parkway
- Old Tollgate plaza area needs re-landscaping

Merritt Parkway Landscape Master Plan

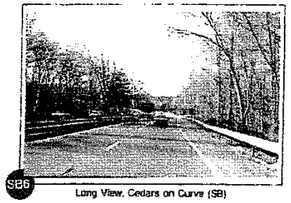
State of Connecticut Department of Transportation

Overview of Features

Over-View 1

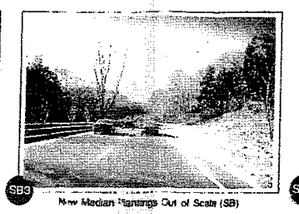
Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday

Pines at Terminating View, Exit 28 (SB)

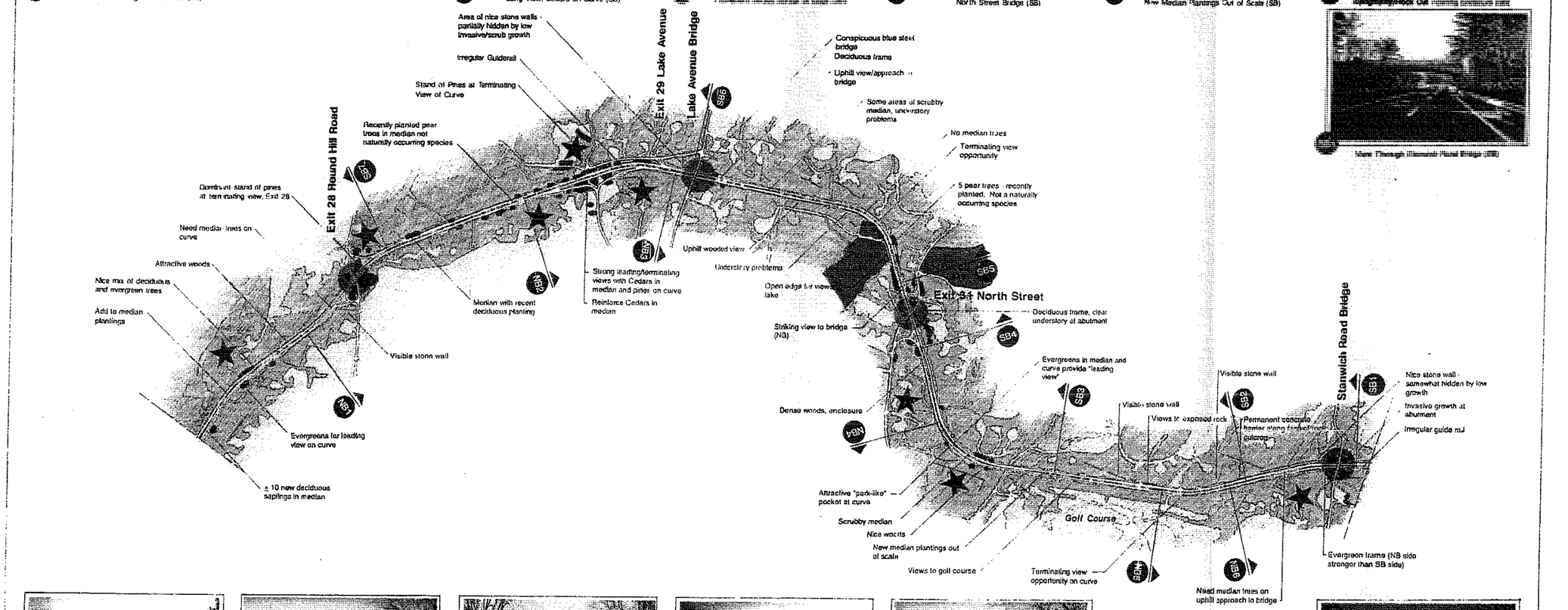


Long View, Cedars on Curve (SB)

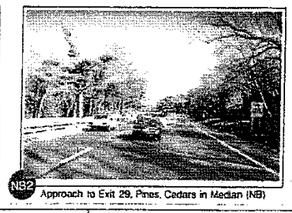
North Street Bridge (SB)



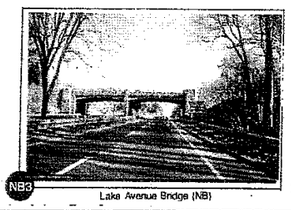
New Median Plantings Out of Scale (SB)



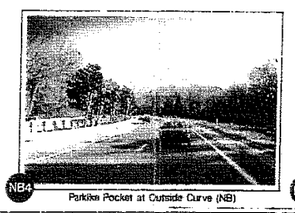
Open Area Needs Median Trees (NB)



Approach to Exit 29, Pines, Cedars in Median (NB)

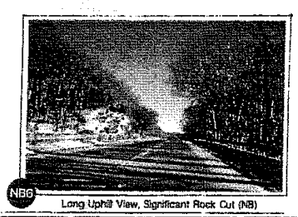


Lake Avenue Bridge (NB)



Parklike Pocket at Outside Curve (NB)

Wooded Enclosure Needs Median Trees (NB)



Long Uphill View, Significant Rock Cut (NB)

Summary Characteristics:

Positive Aspects:

- Opportunity to open lake/water views at Putnam Lake
- Striking evergreen and white pine stands, particularly at exits 28 and 29
- Frequent use of evergreens at edge and in median along curves
- Many visible stone walls
- Attractive views (NB) to adjacent golf course
- Tight horizontal curvature of road reinforces Parkway character

Negative Aspects:

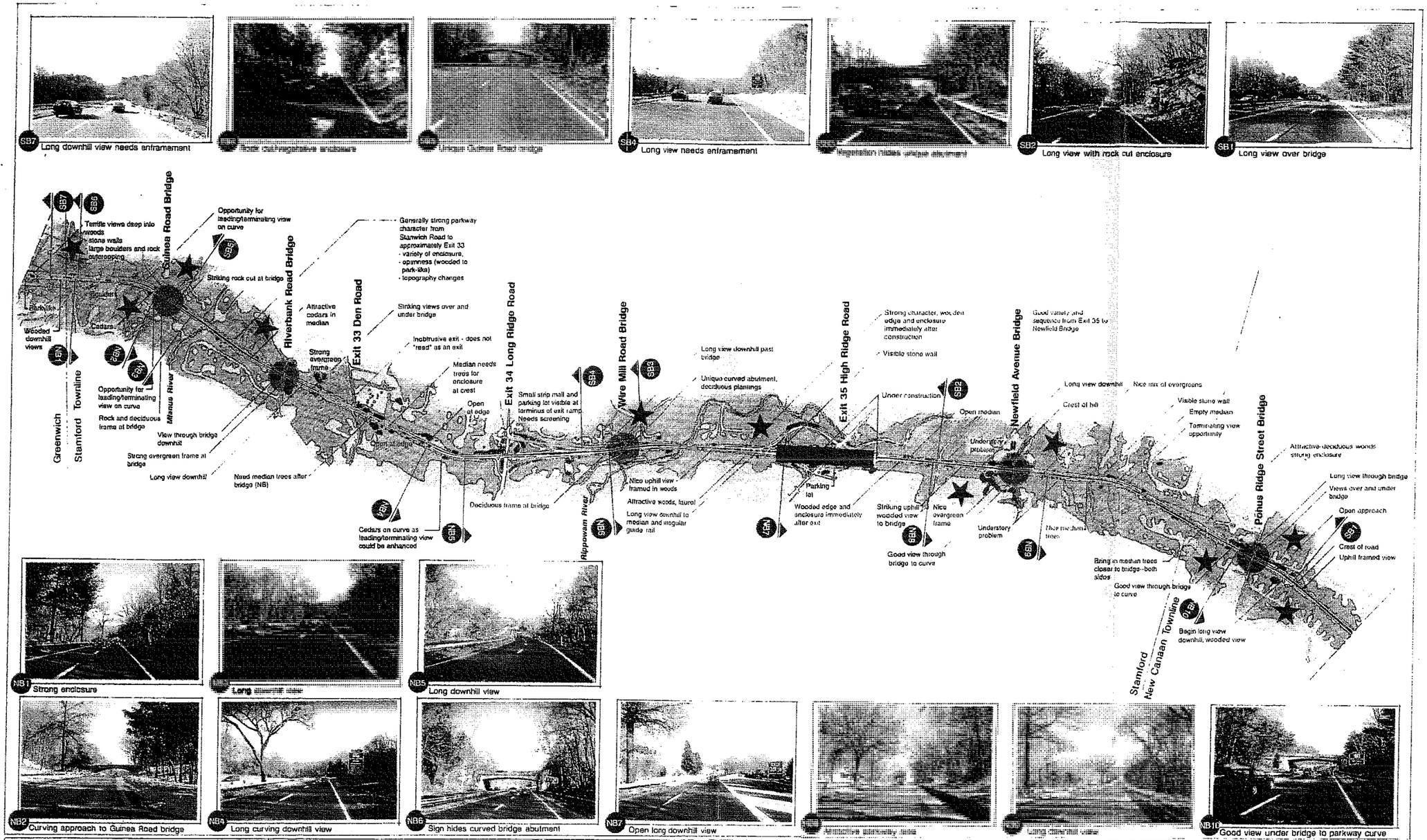
- Median with many new plantings--frequent use of non-native species and small size trees
- Irregular guiderails and "median bumps"
- Invasive growth and understory problems
- Color on Lake Street bridge too conspicuous and not part of original color scheme

Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

Over-View 2

Overview of Features

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday



Summary Characteristics:

Positive Aspects:

- Strong Parkway character (sequence of bridges, variety of park-like to wooded enclosures, rock outcrops, laurel) from Stanwich Road bridge past Riverbank Road bridge
- Attractive woods, enclosure at Ponus Ridge Street bridge area
- Several striking bridges, e.g., the unique curved abutment at Wire Mill Road and the stone work of Guinea Road bridge
- A variety of long views and views through, over and under bridges

Negative Aspects:

- Construction area at exit 35 disrupts character, opens exposed views to adjacent parking
- Invasive growth and signage hides unique curved abutment at Wire Mill Road
- Areas of understory and invasive growth problems
- Areas of open, scrubby, and empty median
- Small strip commercial and parking lot need screening at exit 34

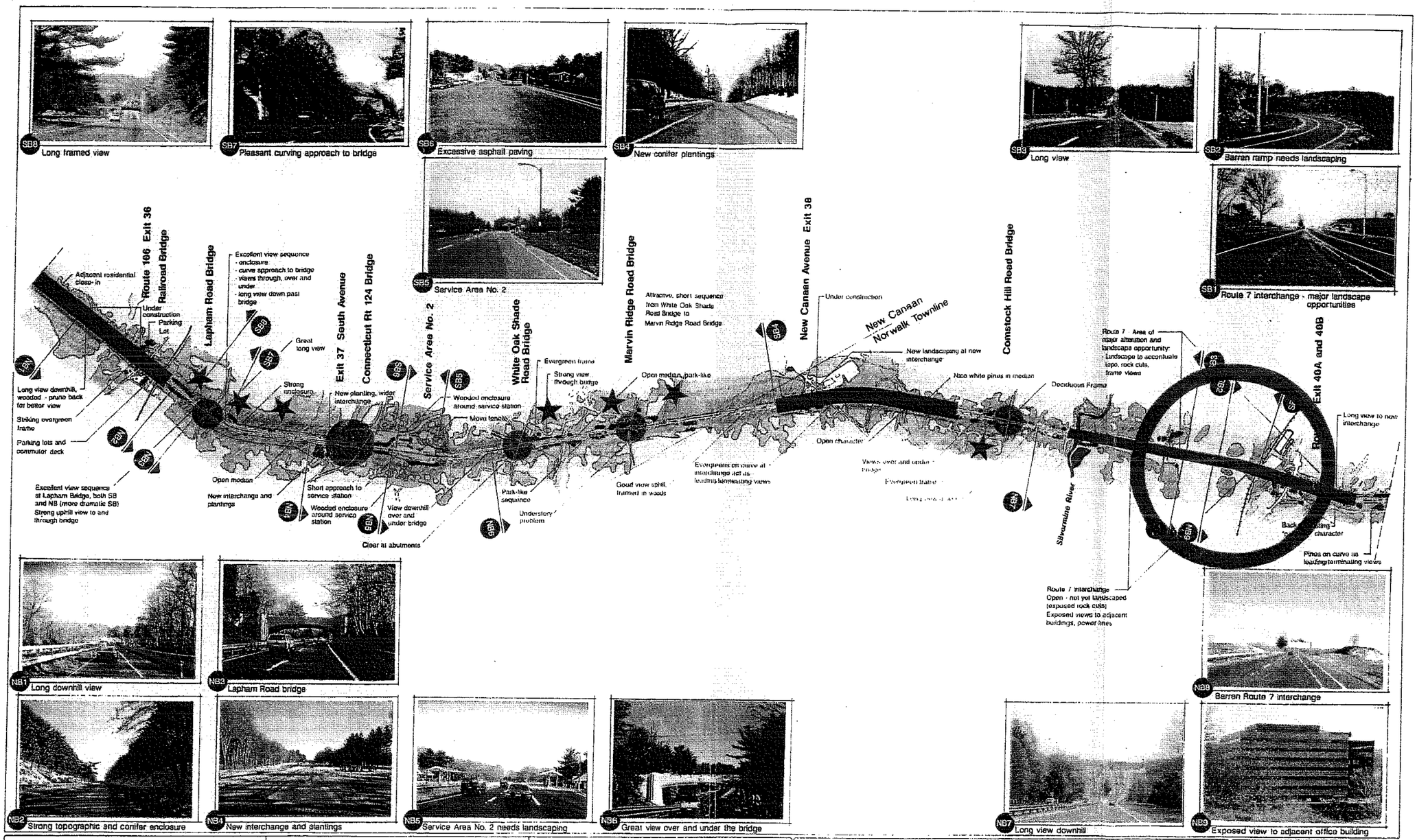
Merritt Parkway Landscape Master Plan

State of Connecticut Department of Transportation

Overview of Features

Over-View 3

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday



Summary Characteristics:

Positive Aspects:

- Attractive short sequence from White Oak Shade Road bridge to Marvin Ridge Road bridge
- Striking views over and under bridges at White Oak Shade Road bridge
- Excellent view sequence (both NB and SB) at Lapham Avenue bridge

Negative Aspects:

- Area of major alteration (exit 40A&B - Route 7) and current construction (exits 38, 36)
- Exposed views to adjacent development at Route 7
- Service Station area median and details distracting
- New evergreen plantings at edge could use more staggered placement and variety in height

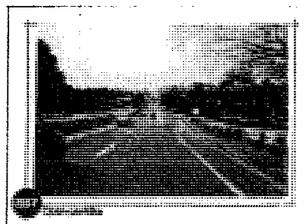
- Some adjacent residential uses and parking lots exposed to view from parkway
- Understory problems
- New plantings at exit 37 somewhat out of scale with mature trees

Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

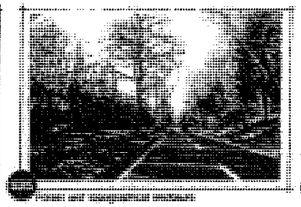
Over-View 4

Overview of Features

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday




SB6 Sign hides Grumman Ave bridge




SB4 Newtown Turnpike bridge


SB3 Parklike with attention drawn to specimen trees


SB2 Rock cut frames long view


SB1 Strong deciduous tree enclosure

NB1 Evergreen frame on curve on bridge

NB2 Forested area provides strong enclosure

NB3 Good evergreen tree massing

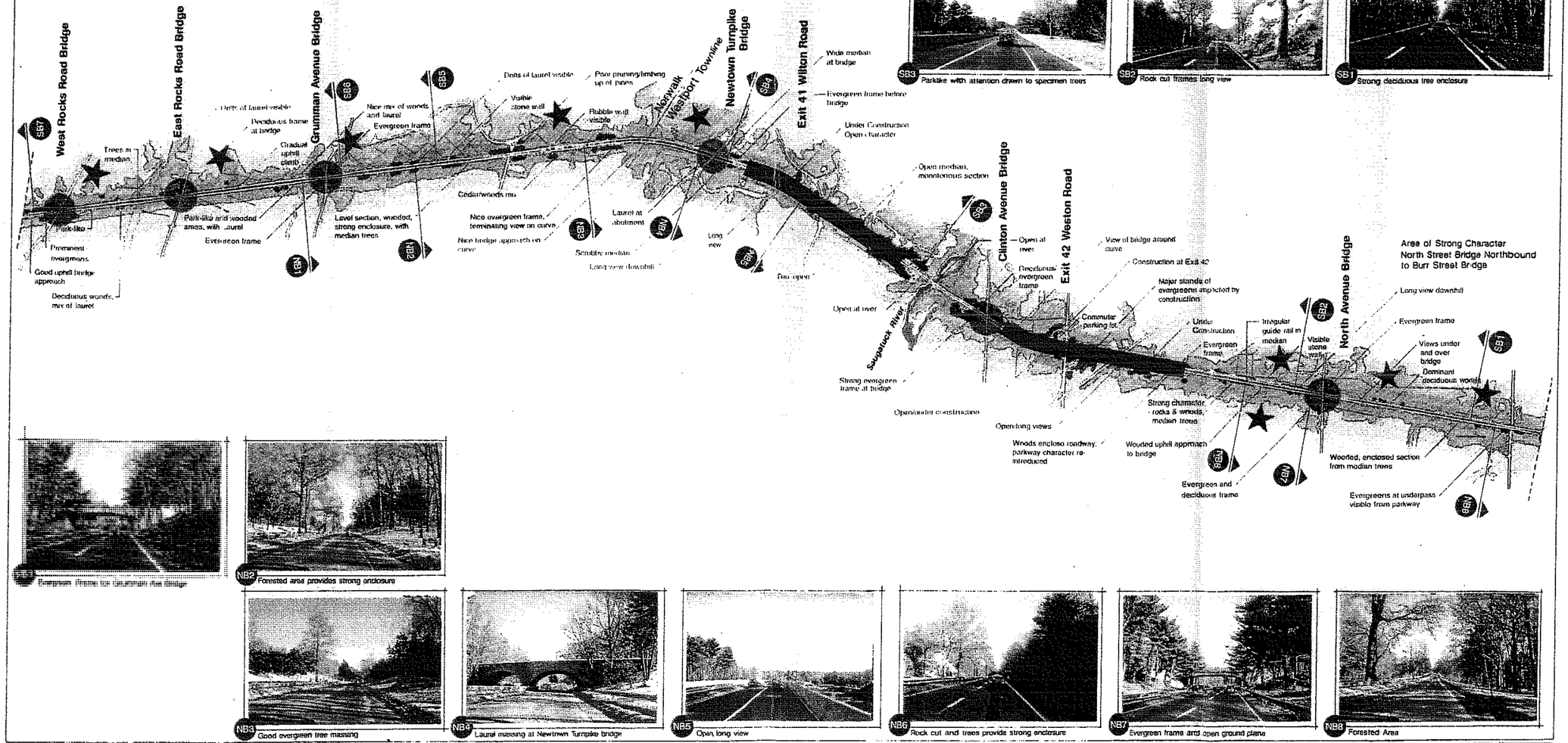
NB4 Laurel massing at Newtown Turnpike bridge

NB5 Open long view

NB6 Rock cut and trees provide strong enclosure

NB7 Evergreen frame and open ground plane

NB8 Forested Area



Summary Characteristics:

Positive Aspects:

- Strong Parkway character from West Rocks Road bridge to Newtown Turnpike bridge and North Street bridge (alternating areas of woods and park-like sections, some remaining median trees)
- Wide median at Newtown Turnpike (one of few)
- Striking masses of evergreen plantings (particularly at exit 42, under construction)

- Visible stone walls and drifts of laurel
- Significant long view SB from North Avenue bridge

Negative Aspects:

- Long stretches of construction at exits 41 and 42
- Major mature stands of white pine at exit 42 impacted by construction

- Poor limbing up of pines at edge of roadway (SB past Newtown Turnpike)
- Irregular median guiderails ("median boots")
- Some areas of scrubby median condition

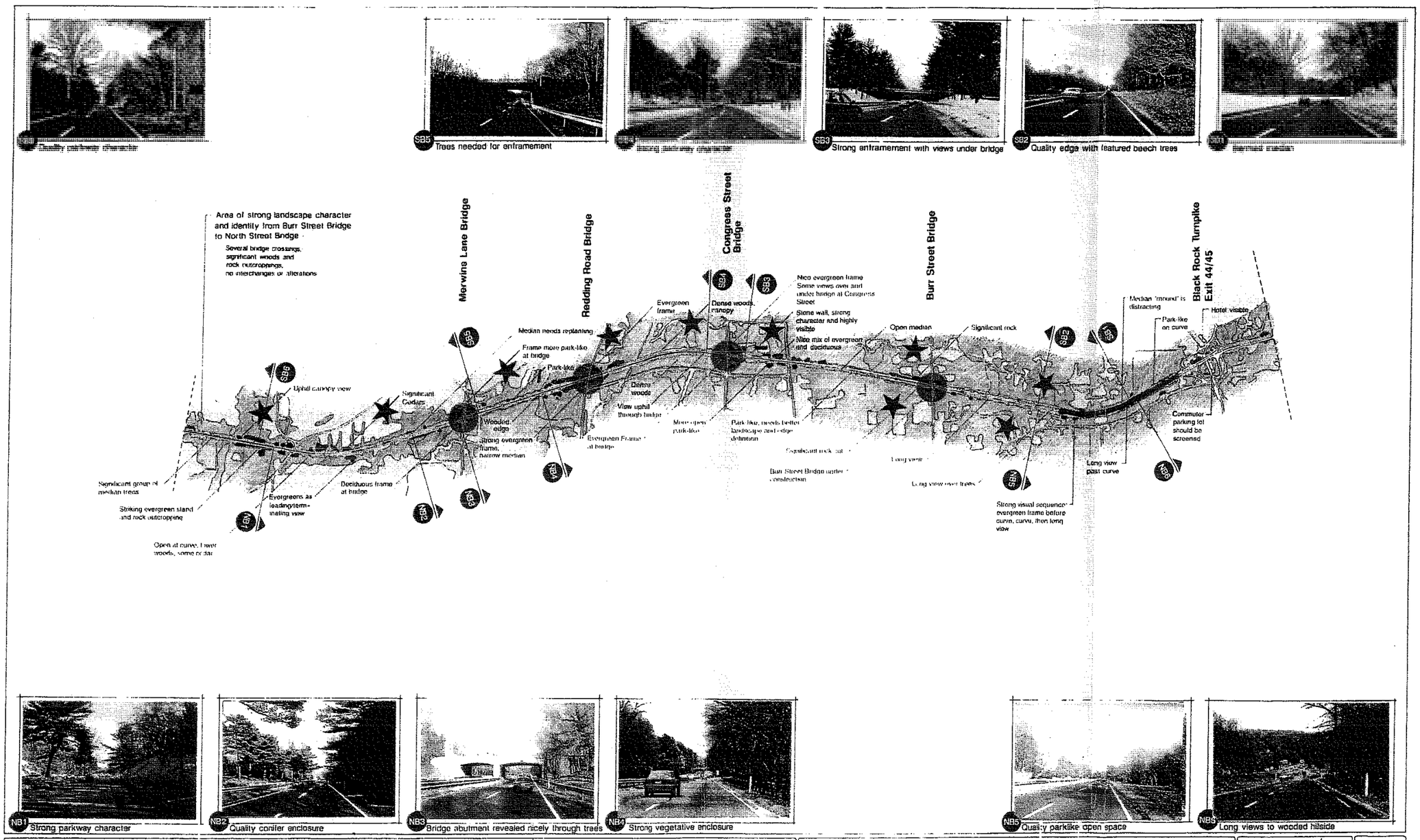
Merritt Parkway Landscape Master Plan

State of Connecticut Department of Transportation

Overview of Features

Over-View 5

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday



Summary Characteristics:

Positive Aspects:

- Longest stretch of Parkway with no interchanges (the Greenfield Hill" section), strongest 'historic'/unaltered character
- Frequent and closely spaced bridges from Merwins Lane to Burr Street (emphasizes each bridge's individuality)
- Parkway passes through significant woods and rock cuts (especially at Burr Street Bridge)
- Many wooded, uphill framed views, plus views through, over and under bridges
- Evergreens used to frame some bridges and on leading curves

Negative Aspects:

- Median "mound" SB past exit 44/45 distracting
- Areas of open median need replanting
- General maintenance issues of keeping bridge abutments visible, clearing invasive growth and pruning overgrown edges
- Construction at Burr Street bridge a temporary distraction
- Adjacent development and parking lots at exit 44/45 need screening

Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

Overview of Features

Over-View 6

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday

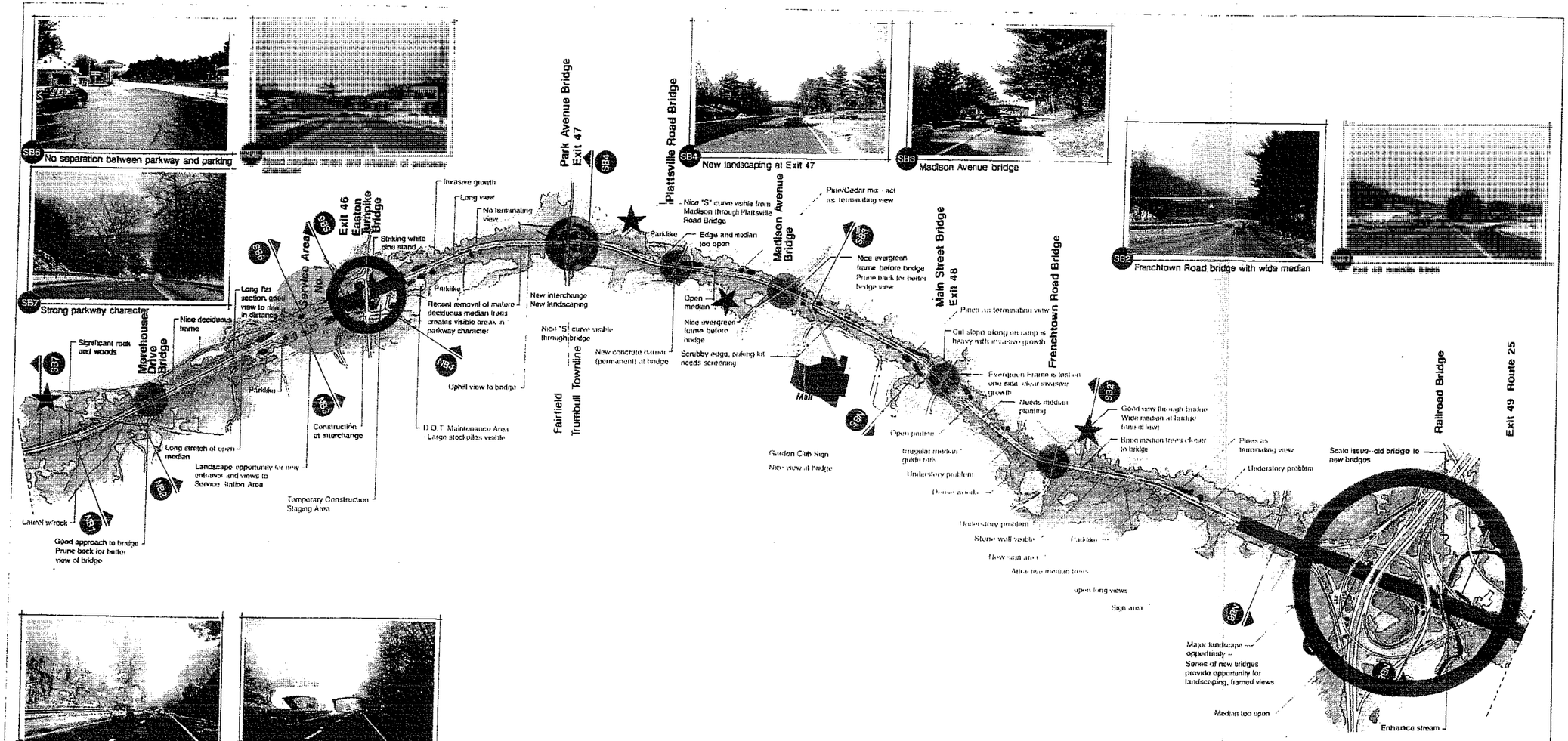
SB6 No separation between parkway and parking

SB7 Strong parkway character

SB4 New landscaping at Exit 47

SB3 Madison Avenue bridge

SB2 Frenchtown Road bridge with wide median



NB1 Trees in median would improve enclosure

NB2 Bridge abutments are hidden

NB3 Seek parkway quality solution to median

NB4 New landscaping

NB5 Sign and planting out of scale with parkway

NB6 Landscape opportunity

NB7 Trees required to create parkway character

NB8 Trees needed on embankment

Summary Characteristics:

Positive Aspects:

- Views through Frenchtown Road bridge and wide median (one of few)
- Curvature of road ("S" curve) visible from Madison Avenue to Park Avenue bridge
- An area of several historic bridges
- Some striking/significant wooded areas, conifer stands, laurel
- Pockets of attractive "park-like" character
- Some visible stone walls
- A few attractive long views

Negative Aspects:

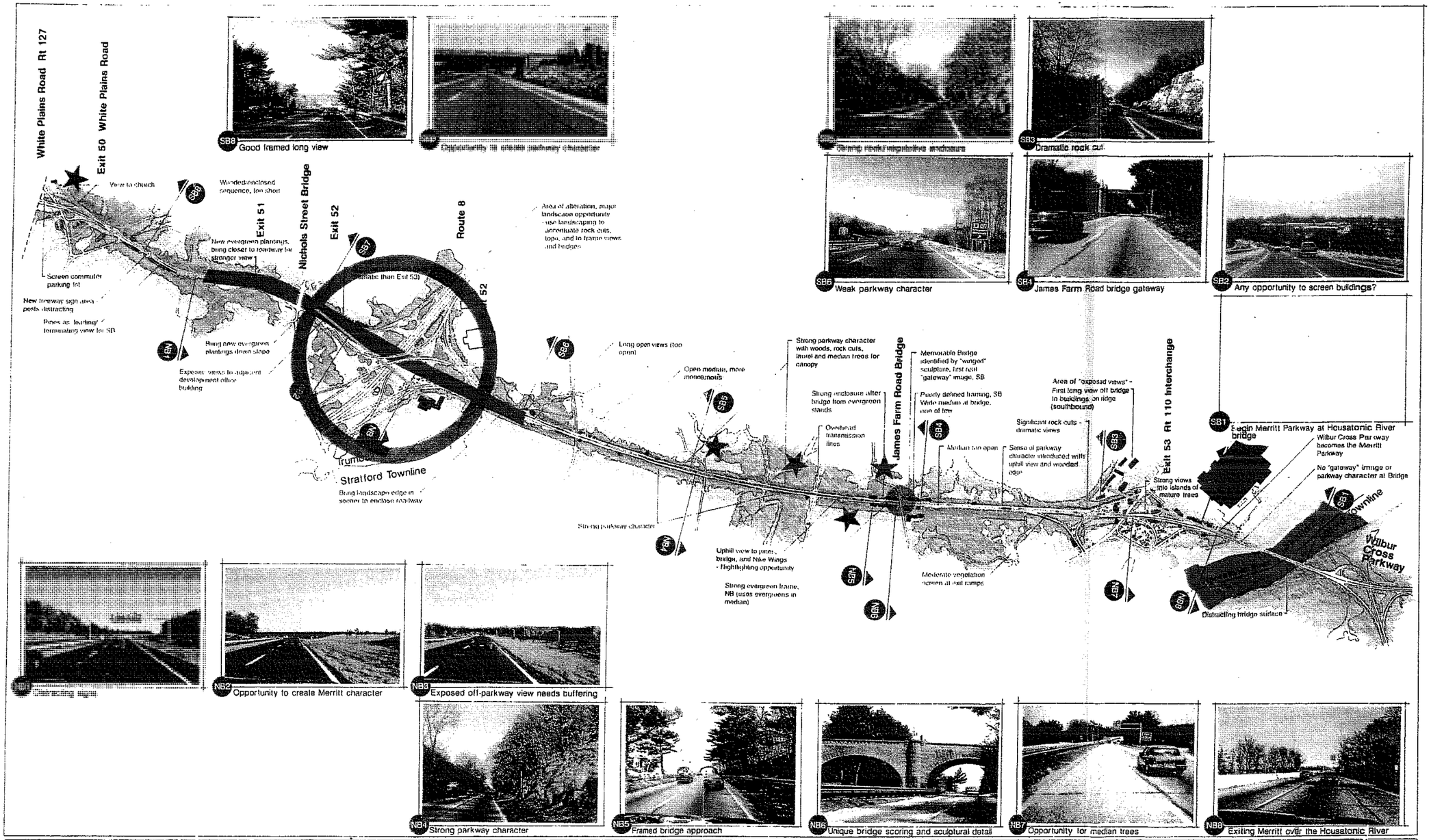
- Exit 49/Route 25 out of scale with (historic) parkway character
  - opportunity to re-landscape several bridges using parkway design principles
- Exposed views to shopping mall (NB)
- Exit 46 under construction - many stockpiles at exit
- Service area provides possible opportunity for improved design, consistent landscape (needs fence distracting)
- Understory/invasive growth problems
- Distracting details (signs, garden club bed, etc.)
- "Median boats"

Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

Overview of Features

Over-View 7

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Pitzgerald & Halliday



Summary Characteristics:

Positive Aspects:

- Significant rock cut past Housatonic River bridge (SB)
- James Farm Road bridge - "Nike Wings" provides real "gateway"
- Strong character from wooded enclosure, rock cuts, laurel, and median trees, James Farm to exit 52
- A "Quintessential Connecticut" view to church at exit 50

Negative Aspects

- No "gateway" sense at Housatonic River bridge
- Exposed views to development on ridge, immediately off bridge (SB)
- Scale of exit 52 out of character with historic parkway
- Areas of open/monotonous median
- Exposed adjacent (office) development, NB at exit 52
- New freeway sign posts distracting

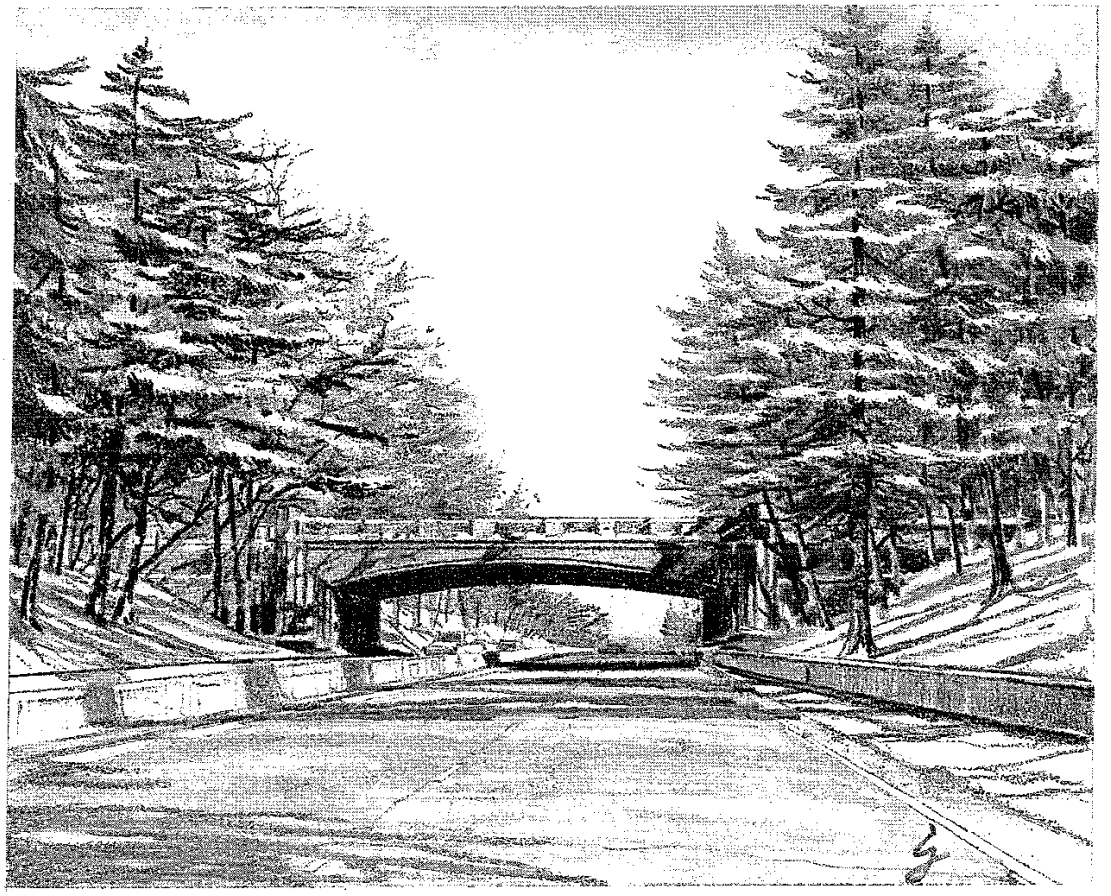
Merritt Parkway Landscape Master Plan

State of Connecticut Department of Transportation

Over-View 8

Overview of Features

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday



Section 4 *Alternative Design Treatments*

4. DESIGN PRINCIPLES AND LANDSCAPE TREATMENTS

4.1 INTRODUCTION

Of the many observations which have been made about the Merritt Parkway landscape as a result of the evaluation of its existing conditions and examining the landscape history of the Parkway, perhaps the most significant one is that the Parkway has lost its "park-like" character and is in dire need of a "haircut". Over the past two decades or so, invasive woody vegetation has supplanted the lawns and meadows; major interchanges with new limited access highways have been constructed; obsolete and unsafe entrance/exit ramps are being improved; guiderails and barriers of many differing types have been installed to overcome safety hazards whenever they have become evident; and trees have been pruned or eliminated and not replaced. As a consequence, the Parkway has somewhat of an unkempt appearance and its landscape features, spatial definition, and visual sequences are not as clear to the passing motorist as they had been in the past.

From a landscape architect's perspective, what the Parkway needs is consistency so that each of the individual elements that give the road its identity are treated uniformly throughout the 38 miles of the Parkway. The medians, the plantings at the face of bridges, entrances/exits, edges, lawns, sign placement, and ornamental vegetation all should be treated in a similar manner. The method of treatment should emulate the style and principles which were employed at the time the Parkway was constructed but need to reflect today's standards for safety at the same time.

The primary design goal of the Landscape Master Plan for the Parkway should be to re-establish the quality of the landscape as it existed at its peak approximately 30 years ago when it had a park-like quality. As noted previously in this study, it appears from 1955 aerial photographs that the plantings were approaching maturity and the lawns and meadows along the edges were fully maintained. Based on the present size of the invasive species, which were not evident in the 1955 aerial photographs, it is estimated that such growth began to be tolerated approximately 30 years ago. Interestingly, what has been identified as being invasive today was actually maintained landscape in 1955. Therefore, it is reasonable to conclude that the "peak" of the landscape occurred sometime in the late 1950's or early 1960's.

4.1.1 Design Principles

To achieve the goal of rehabilitating the Parkway's landscape to achieve that park-like feeling which existed approximately 30 years ago, the Landscape Master Plan should be guided by the following design principles:

- Reinforce and re-establish the variety and modulation of the spatial experience by contrasting the mature forest with open lawns and meadows.
- Manipulate both terminating and leading views through screening, enframing, and filtering by the addition of mass vegetation in some instances and thinning or removing overgrown vegetation in others.
- Provide additional vegetation to further enhance the vertical and horizontal alignment of the roadway and further enhance areas of overhead canopy.

- Bring the landscape closer to the Parkway edge where appropriate while recognizing the required standard of safety.
- Keep new plantings in context with the surrounding landscape character and plant communities to provide consistency across the entire right-of-way and the median.
- Provide seasonal color through the massing of plants.
- Provide for a consistent treatment for the median including plant material, grasses, barriers, and guiderails.
- Provide consistency in details, signage, and other elements contributing to the landscape.

4.1.2 Design Treatments

The problems observed during the inventory phase of the project have been placed into one of the following six groups:

- Gateways
- Service Areas
- New Interchanges
- Bridge Treatments
- Edge Treatments
- Median Treatments

Similarly, the suggested design treatment for resolving the observed problems are presented in the following pages in the same sequence, each treatment illustrating an existing typical problem, the location of that problem, and one or more solutions or recommendations to resolve the problem. Each treatment is accompanied by text and commentary defining the design issue(s), how the illustrated solution is intended to address the issue, and what technical issues need to be considered.

The design treatment concepts which are contained in this report have been prepared to illustrate the range of opportunities that are available to achieve the overall design objective for the Parkway. As part of the master planning process, many other design treatments were explored but discarded for a variety of reasons related to engineering standards, economics, and aesthetics. Each treatment should be used when the Department implements the Master Plan through detailed design and eventual construction. It should be understood that the treatments are illustrations of typical solutions. In preparing construction documents, detailed engineering refinements will be needed when applying a treatment to a specific site.

4.2 GATEWAYS

The beginning of the Merritt Parkway at each of its ends should be perceived by the motorist that the Parkway is a special place like no other road in Connecticut. The quality of these gateways should set the tone for the driving experience throughout the Parkway.

At present, both the northbound gateway at the New York state line in Greenwich and the southbound gateway the Housatonic River Bridge are poorly defined. The wrong message is sent at Exit 27 where the abundance of information signs clutter the landscape. The lack of median plantings and the motel atop the ledge outcrops in Stratford is not the character which should be portrayed.

In short, both gateway areas lack a strongly defined character particularly when compared to other sections of the Parkway. However, within the first mile or so of each gateway, there is a significant opportunity to introduce the landscape themes which are, or will be, repeated throughout the Parkway. These elements should be executed in a clear, consistent, and bold manner since the repetition of this landscape vocabulary throughout the Parkway forms the basis for its unique identity.

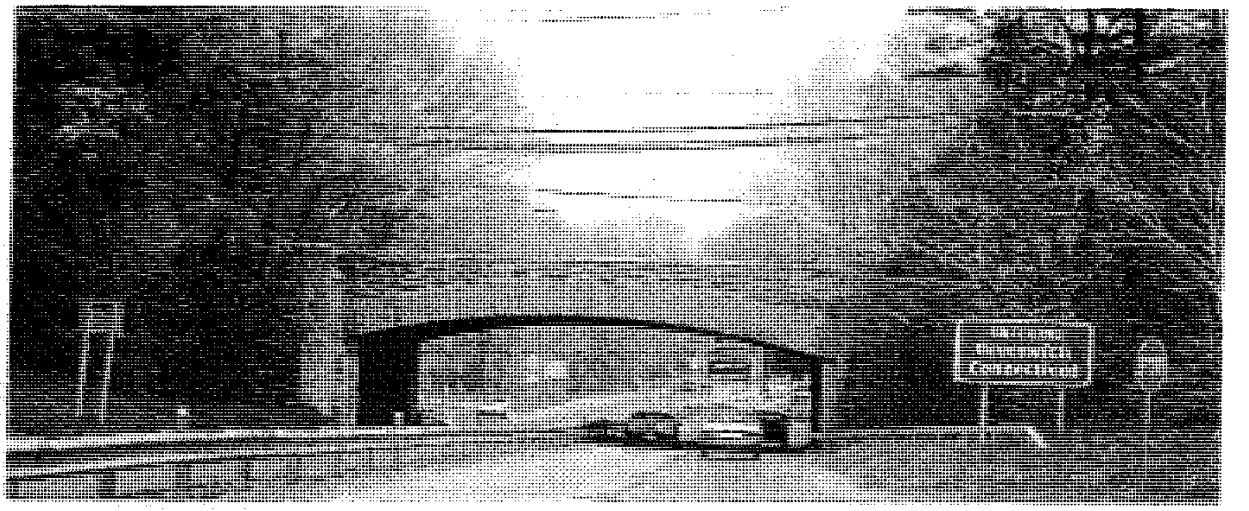
Each gateway to the Parkway has its own inherent features in need of enhancement and elements in need of correction or modification. Consistent signage and guiderail/barrier systems should be emphasized at both gateways. Mass plantings for seasonal color found historically on the Parkway should be installed at each entrance to provide a significant visual impact.

At the Northbound Gateway in Greenwich:

- Signs should be consolidated.
- Median trees should be added.
- Masses of mountain laurel should be planted along the roadside and by bridge abutments once invasive growth has been thinned or removed.

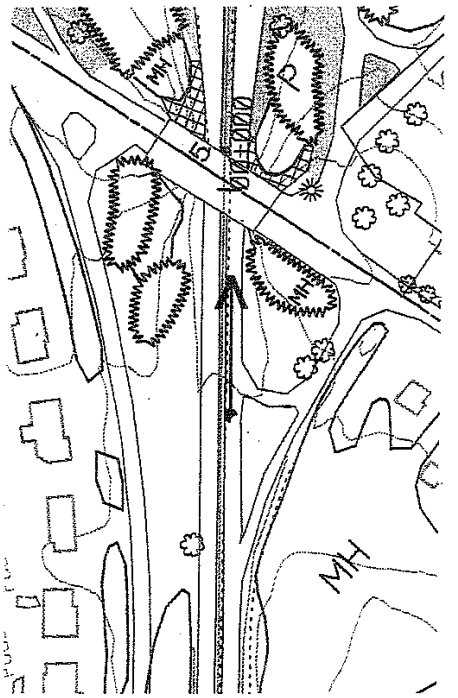
At the Southbound Gateway in Stratford:

- Vegetation needs to be brought to within 30 feet of the roadway or the edge of the roadway where there is existing guiderail.
- Invasive vegetation should be thinned or removed to reveal conifer stands.
- Median trees should be added to provide canopy.
- Rock cuts should be highlighted by the removal of invasive growth.
- Screening/buffering should be planted to mask the highly visible nearby commercial uses.



STATION 000+000

PRIOR TO ENTERING MERRITT PARKWAY, LOOKING NORTHBOUND AT KING STREET BRIDGE (EXIT 27)



Scale 1" = 200'

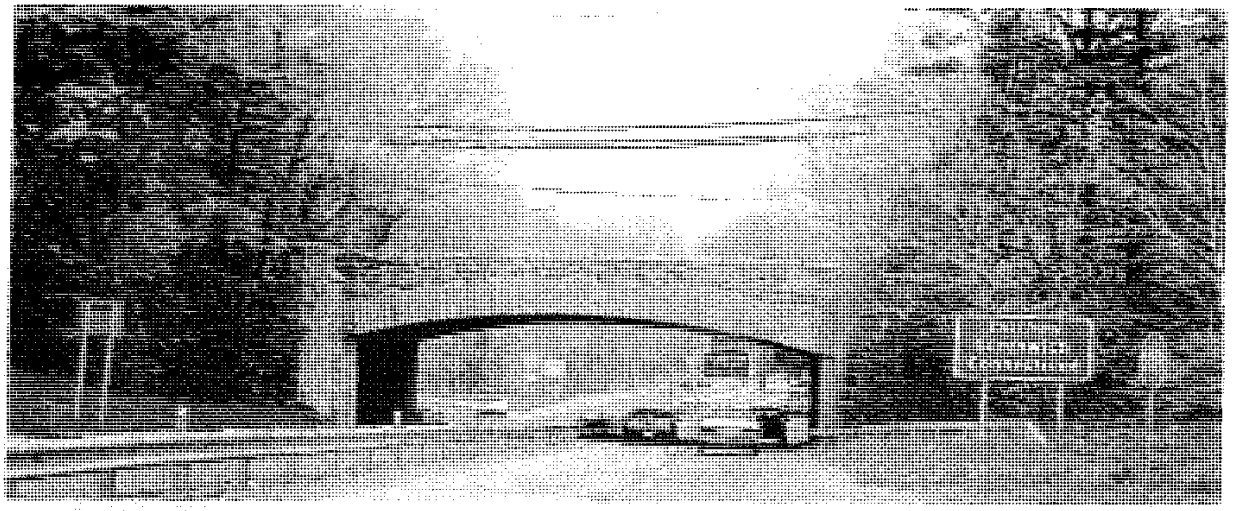
DESIGN ISSUE:

"Gateway" to Merritt Parkway - Northbound (New York State border):

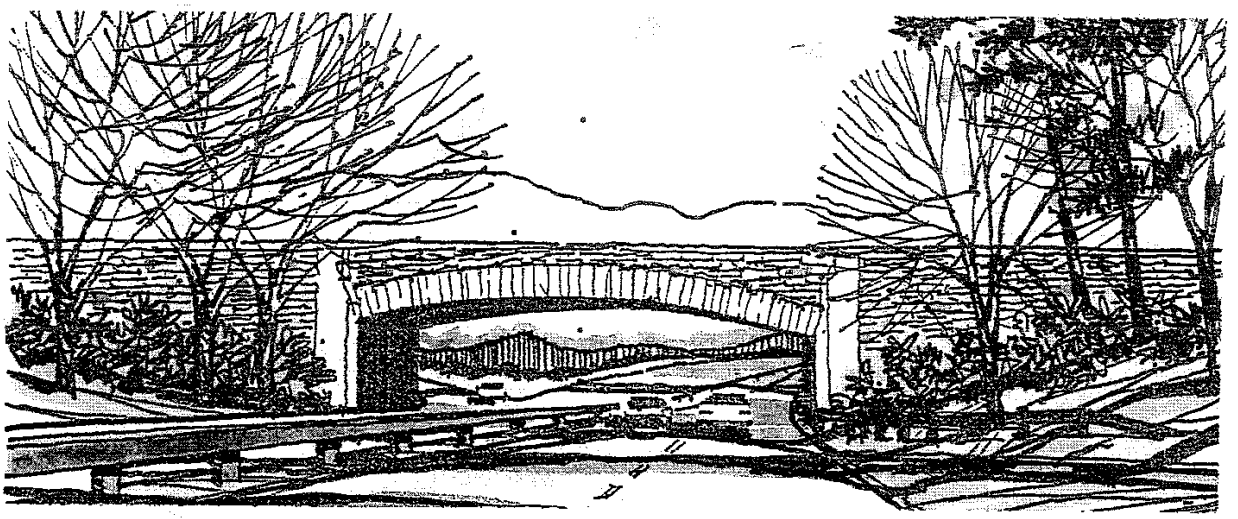
- First view opportunity approaching the Merritt Parkway
- Opportunity to enhance Parkway identity
- Invasive growth obscures view of King Street Bridge
- Signs obscure view of bridge architecture
- Signs in median past bridge visible and distracting
- Lack of seasonal color

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.2.1 1
Gateways **Northbound Entrance**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp421-1.2



EXISTING



OPPORTUNITY:

Remove invasive growth at bridge; add laurel masses at abutments; relocate distracting signage from abutment and median.

RATIONALE:

First strong identity opportunity for the Parkway. Clearing invasive growth and removing visual disruptions would enhance parkway image.

CONCERNS:

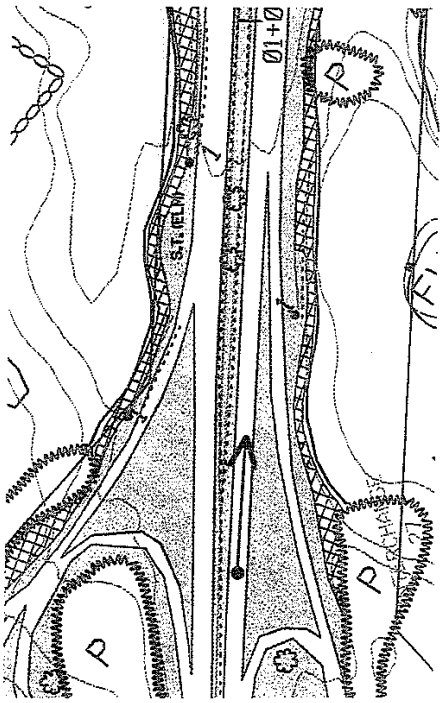
Finding alternate location for signage; keeping invasive growth down; establishing and maintaining laurel.

Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.2.1 2
Gateways **Northbound Entrance**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp421-2.2

STATION 000+350

LOOKING NORTHBOUND PAST KING STREET BRIDGE (EXIT 27)



Scale 1" = 200'

DESIGN ISSUE:

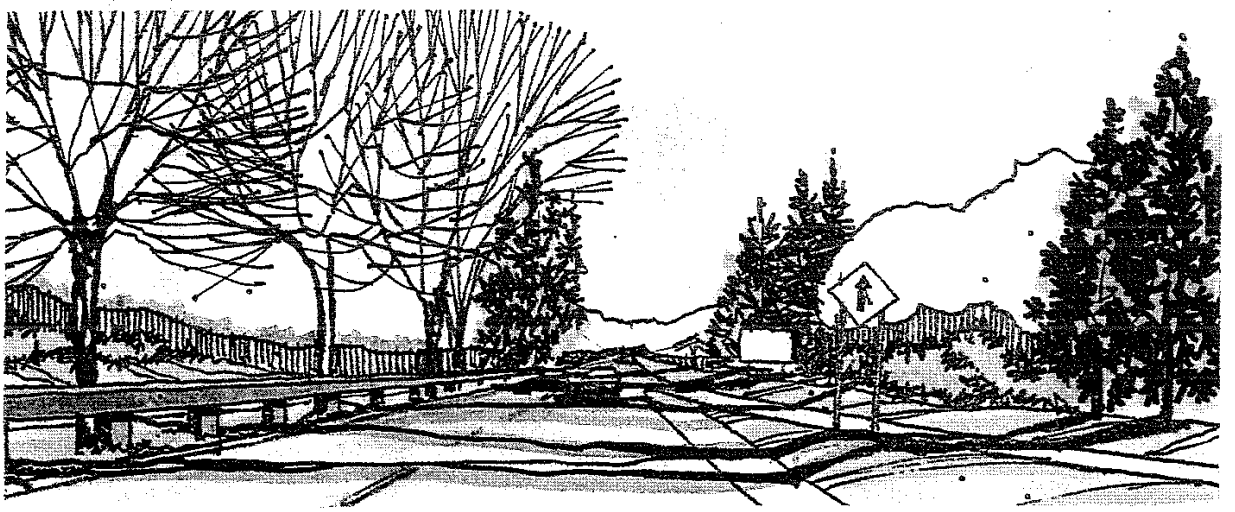
Northbound "Gateway" of Merritt Parkway:

- Poorly defined landscape edge (invasive growth at edge)
- Signage clutter
- Guiderail inconsistency
- Median surface inconsistency
- Immediate entrance to first service area and tourist information (good Parkway orientation opportunity)
- Lack of seasonal color

Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.2.1 3
Gateways **Northbound Entrance**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp421-3.2

EXISTING



OPPORTUNITY:

Introduction of Merritt Parkway landscape and its design themes; consolidate signs; addition of median trees and laurel massing for color at edge.

RATIONALE:

The gateway landscape must be a bold, well-defined Parkway character with consistent and unified details from King Street Bridge to the service area.

CONCERNS:

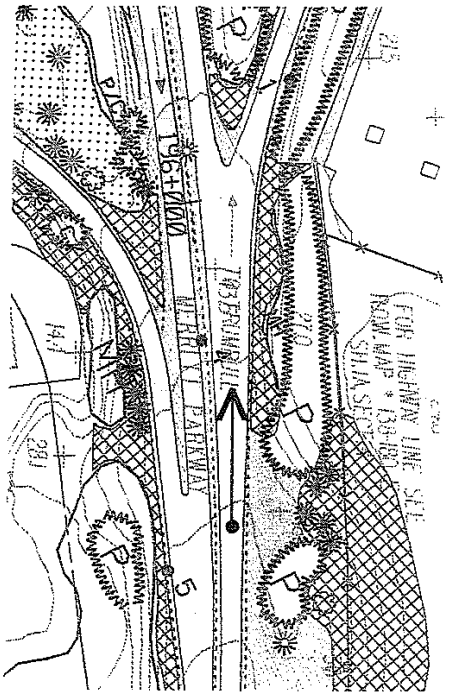
Signage must be simplified and consolidated.

Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.2.1 4
Gateways **Northbound Entrance**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp421-4.2

STATION 196+400

LOOKING SOUTHBOUND PAST HOUSATONIC RIVER BRIDGE



Scale 1" = 200'

DESIGN ISSUE:

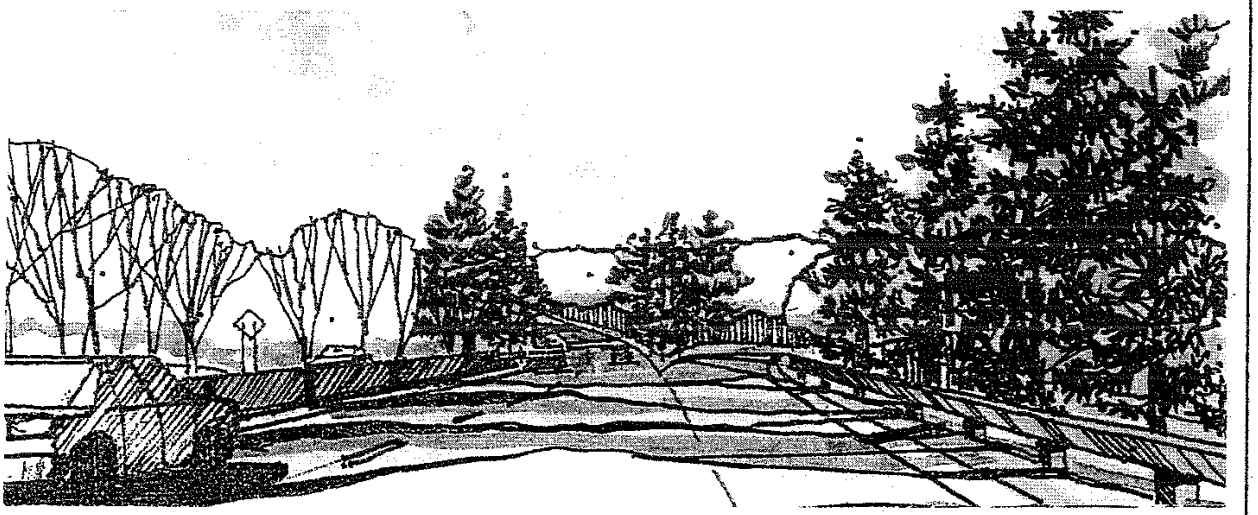
Southbound "Gateway" to Merritt Parkway at Housatonic River Bridge:

- First Parkway identity opportunity from bridge
- Poorly defined landscape character for first mile of Parkway
- Exposed views to buildings on ridge
- Inconsistent median trees and guiderail
- Wide intersection, widened pavement
- Insignificant Parkway identifying signage

Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.2.2 1
Gateways **Southbound Entrance**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp422-1.2

EXISTING



OPPORTUNITY:

Bring Parkway landscape to edge of roadway; clear invasive vegetation to reveal conifer stand at terminating view; introduce median trees closer to Parkway entrance.

RATIONALE:

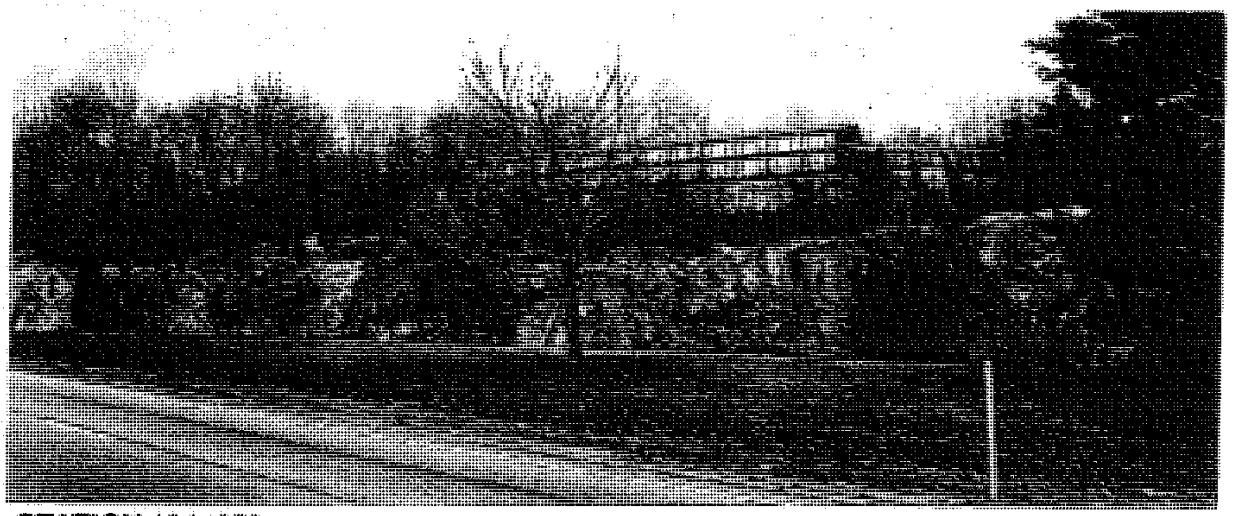
Establishes Parkway character, identity, and design themes immediately off bridge; reintroduces trees in median for consistency with landscape "peak".

CONCERNS:

Ability to maintain evergreens in median in this high traffic area (may need to use deciduous species); bringing landscape edge in closer requires additional guiderail.

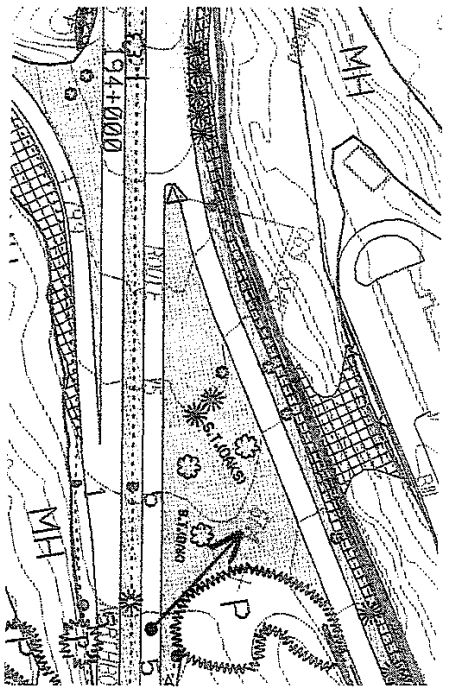
Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.2.2 2
Gateways **Southbound Entrance**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp422-2.2



STATION 194+650

LOOKING FROM SOUTHBOUND LANE TO ROCK FACE



Scale 1" = 200'

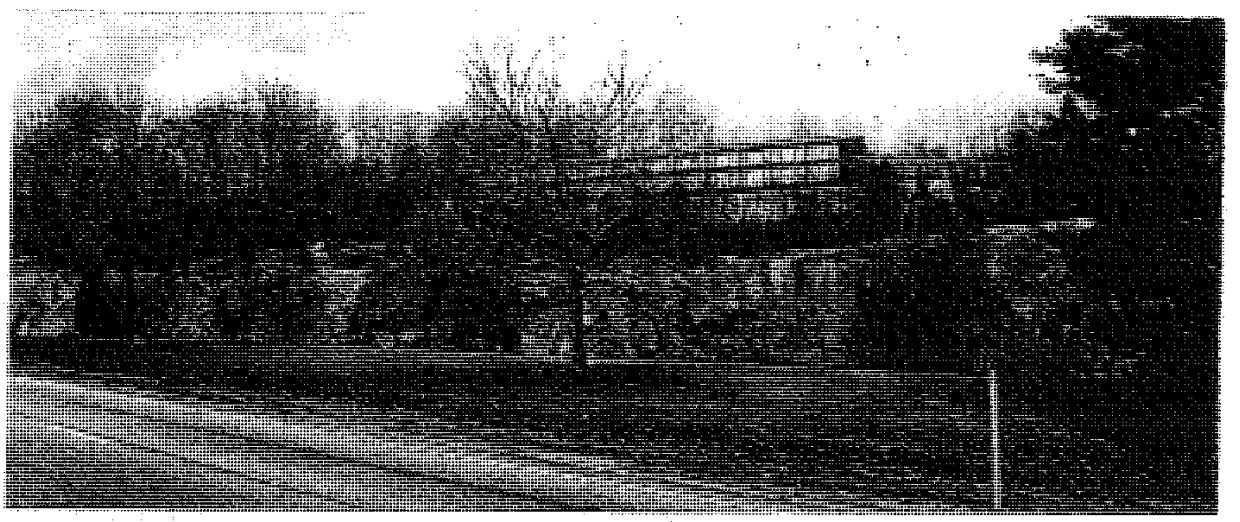
DESIGN ISSUE:

Part of southbound "Gateway" image area:

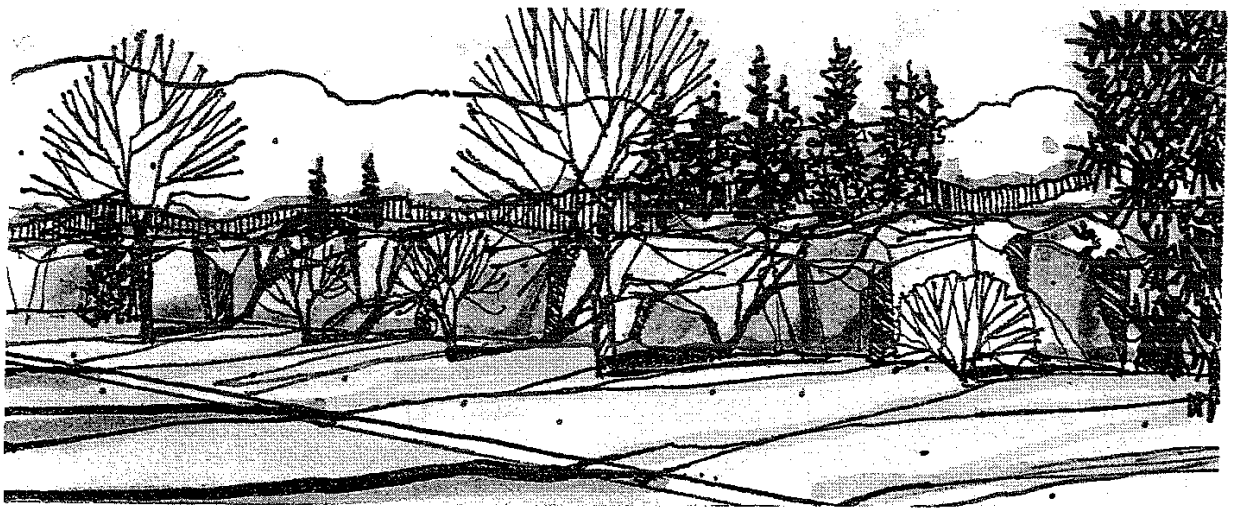
- Exposed views of development at top of rock face
- Invasive growth along top of rock cut
- Dramatic rock cut; views could be enhanced

Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.2.2 3
Gateways **Southbound Entrance**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp422-3.2



EXISTING



OPPORTUNITY:

Clear invasive vegetation along rock cut and add conifer mass at ridge to screen views; enhance park-like plantings in island.

RATIONALE:

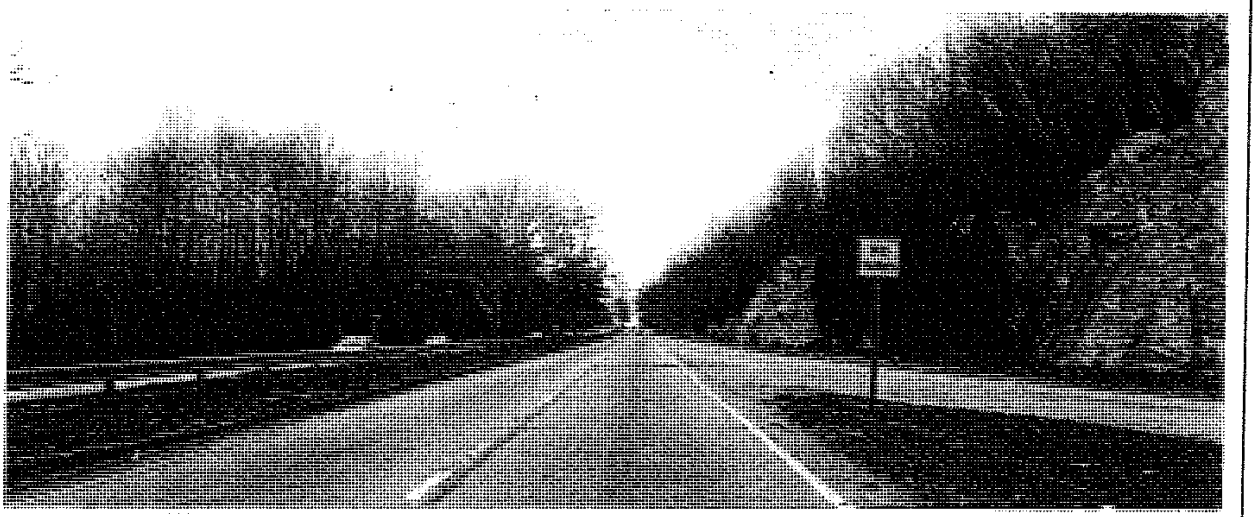
Part of "Gateway" sequence; Parkway character needs to be strengthened; enclosure before rock cut area would provide spatial contrast to the park-like opening.

CONCERNS:

Length of maturation for effective landscape screen.

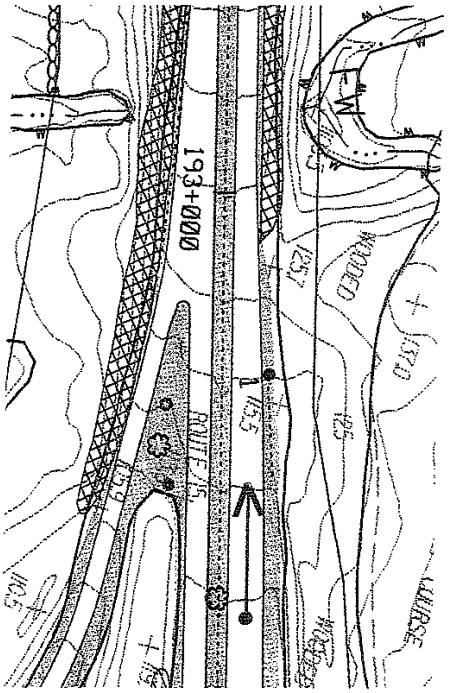
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.2.2 4
Gateways **Southbound Entrance**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp422-4.2



STATION 193+500

LOOKING SOUTHBOUND AT ENTRANCE RAMP, ROUTE 110



Scale 1" = 200'

DESIGN ISSUE:

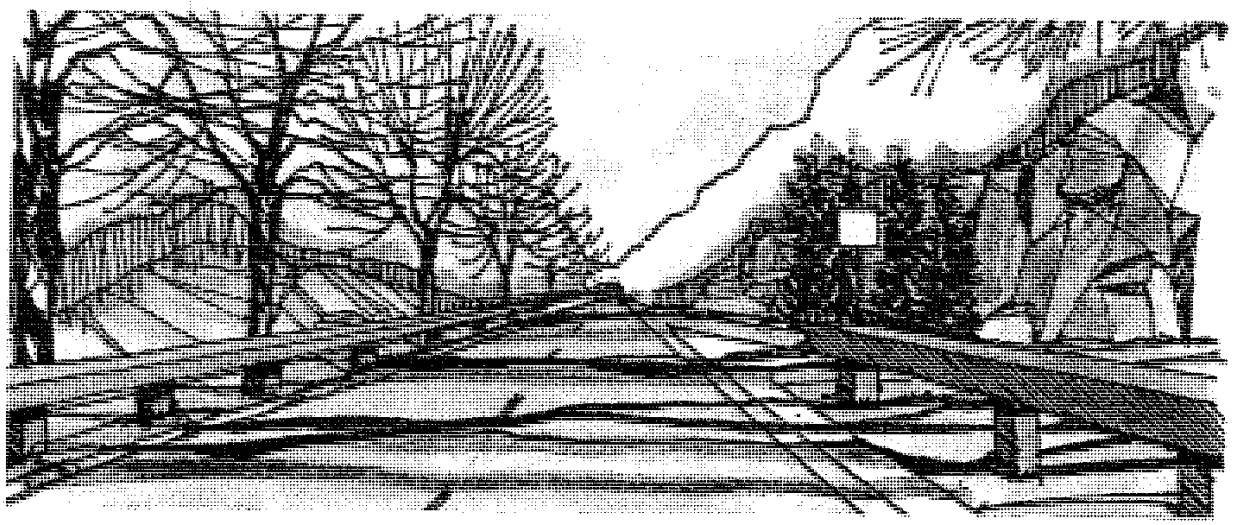
End sequence of southbound "Gateway" image area:

- Transition area from widened interchange to existing wooded enclosure of the Parkway
- Missing median trees need replacement
- Lack of seasonal color (small patches of laurel remain)
- Areas of invasive growth

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.2.2 5
Gateways **Southbound Entrance**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp422-5.2

EXISTING



OPPORTUNITY:

Add median trees; clear invasive vegetation at rock cut; add laurel mass beyond base of rock cut; install consistent guiderail system.

RATIONALE:

Replacing median trees and framing uphill views; adding strong areas of seasonal color; keeping details consistent.

CONCERNS:

Ability to establish laurel at edge of roadway; need for guiderail at median edge.

Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.2.2 6
Gateways **Southbound Entrance**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp422-6.2

4.3 SERVICE AREAS

The three pairs of service areas located in Greenwich, New Canaan, and Fairfield were not part of the original Parkway plan. They were constructed shortly after the Parkway opened and have become landmarks or points of reference for the motorist. Over the years, what once had been discrete buildings housing restrooms and a refreshment canteen with adjacent picnic areas and fuel pumps have evolved into a fuel station and "minimart" where the fuel pumps are covered by a large canopy.

The problems at each service area are essentially the same. There is inadequate separation between the main travel lane of the Parkway and the fuel pumps, and there is a conflict between the use of the access lane adjacent to the pumps and the vehicular route to the parking lot. Typically, there are large expanses of pavement beyond the pump area adjacent to the parking stalls that are underutilized which could just as easily become lawn and trees. Entrance and exits lanes tend to be abrupt requiring quick acceleration/deceleration.

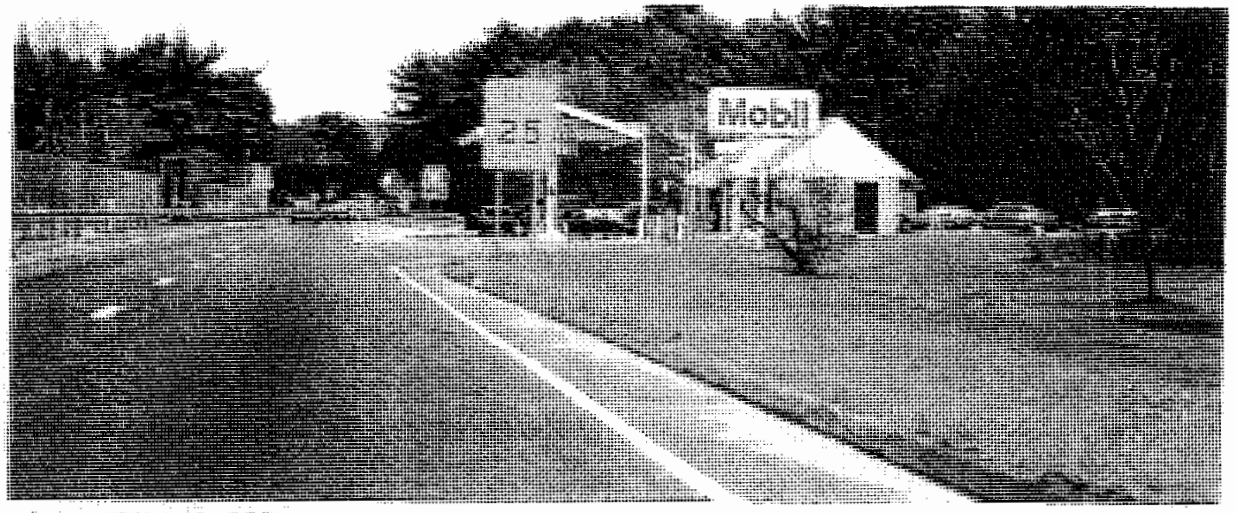
In several instances, maintenance buildings, material stockpiles, and other unsightly views can be observed to the rear of the service area. Evergreen trees which screened the adjacent land at one time have now been pruned to expose the undesirable view.

A chain link fence is located in the median to preclude pedestrians from crossing the Parkway between service areas. The fence is an element which does not exist anywhere else on the Parkway and is certainly not in keeping with a "park-like" landscape.

There is a general opportunity to increase the efficiency in the layout of parking and the internal access aisles. Entrance and exit lanes should be extended which will both improve safety and provide areas for new plantings. Additional landscape solutions are needed to prevent pedestrian crossover. Relocating the pumps to the rear of the building providing an expanse of lawn between the roadway and the building may be possible in some instances.

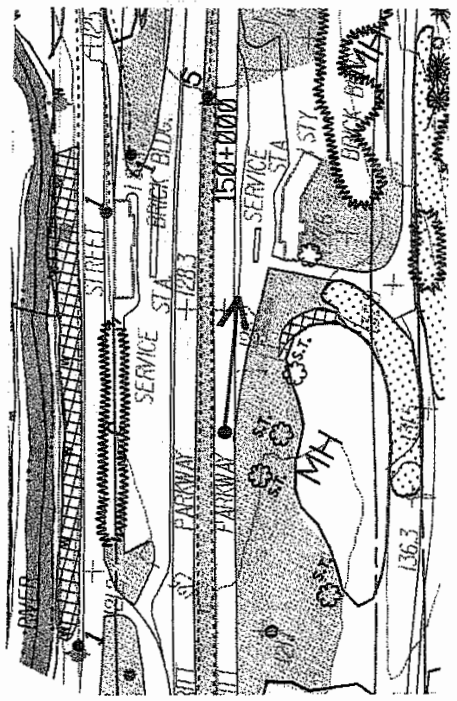
At each service area:

- A barrier wall or guiderail system should be installed to separate the travel lane from the fuel pumps and access lanes.
- The acceleration/deceleration lanes should be modified to provide a more gradual transition to the travel lane.
- Where possible, the fuel pumps should be relocated to the rear of the service area.
- Excess pavement should be removed.
- Signage should be redesigned to reflect the original design of the service areas.
- Wood post and beam guiderails should be reintroduced where needed.
- Consideration should be given to replacing area lights with period lighting fixtures.
- Existing chain link fence in median should be removed our replaced with appropriate vegetation.
- Site specific landscape plans should be prepared to provide an appropriate park-like setting for each spruce area.



STATION 149+600

FAIRFIELD SERVICE AREA EASTBOUND, LOOKING EAST



Scale 1" = 200'

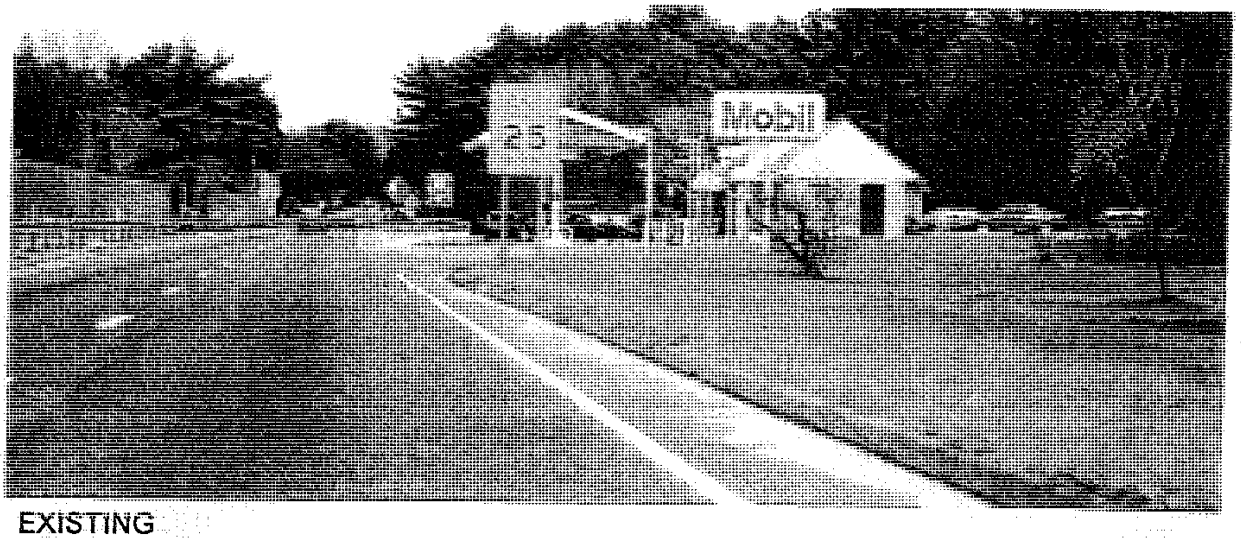
DESIGN ISSUE:

Approach lane to service areas:

- Relatively short approach lane
- Not enough separation between pump area and adjacent travel lanes

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.3.1 1
Service Areas **Approach Lanes**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp431-1.2



EXISTING

OPPORTUNITY:

Extend approach lane slightly; add "faux" stone wall guiderail/barrier system at edge.

RATIONALE:

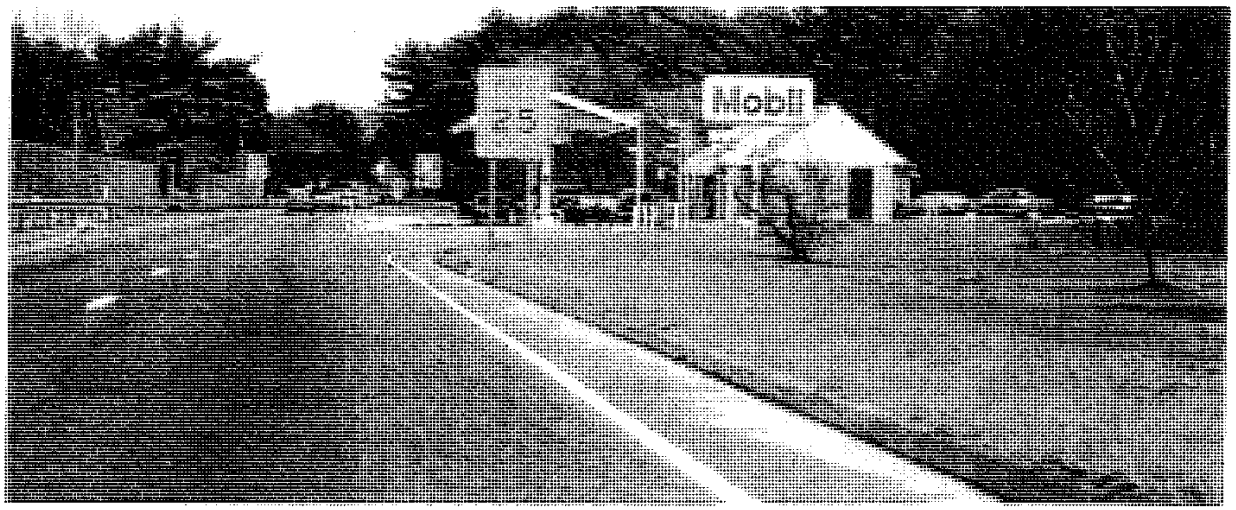
Separates approach lanes and pumping area from adjacent travel lane; minimum reconfiguration of pavement.

CONCERNS:

Guiderail used must be consistent with overall Parkway guiderail selected; safety transition needed at terminal end of barrier.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.3.1 2
Service Areas **Approach Lanes**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp431-2.2



EXISTING

OPPORTUNITY:

Realign and extend approach lane for landscape "apron" either end of pumping area; landscape and utilize guiderail.

RATIONALE:

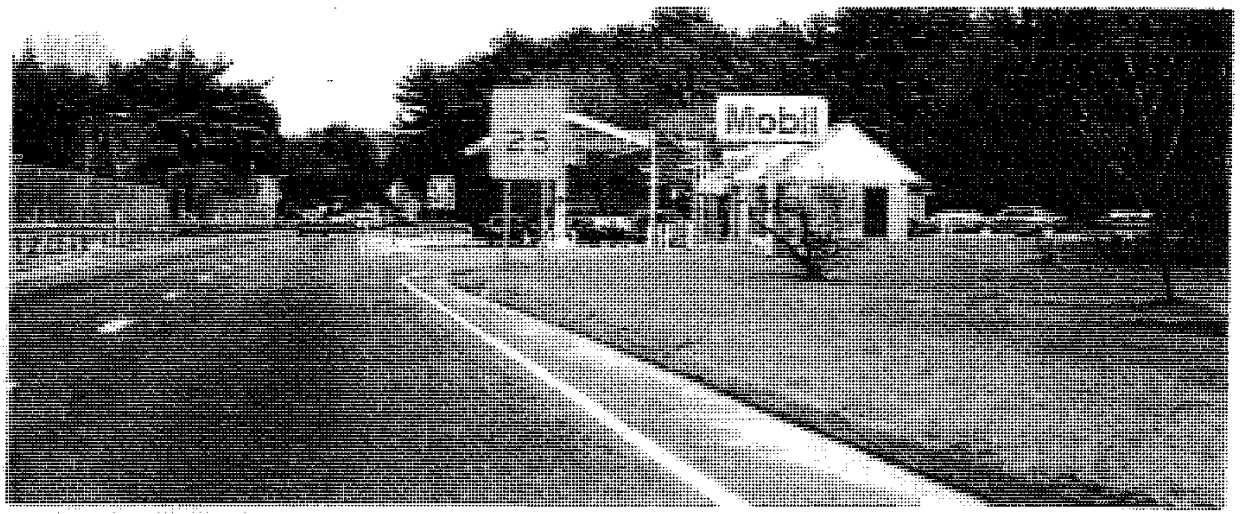
Provides both increased separation of pump area from travel lane and area of landscape continuity either side of service area.

CONCERNS:

Requires guiderail at pavement edge if trees are planted. Realignment of approach lane should have minimal or no impact on mature tree stands. Transition at terminal of guiderail needed.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.3.1 3
Service Areas **Approach Lanes**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp431-3.2



EXISTING

OPPORTUNITY:

Relocate pumps to rear of service area; create landscaped buffer between service area building and travel lane.

RATIONALE:

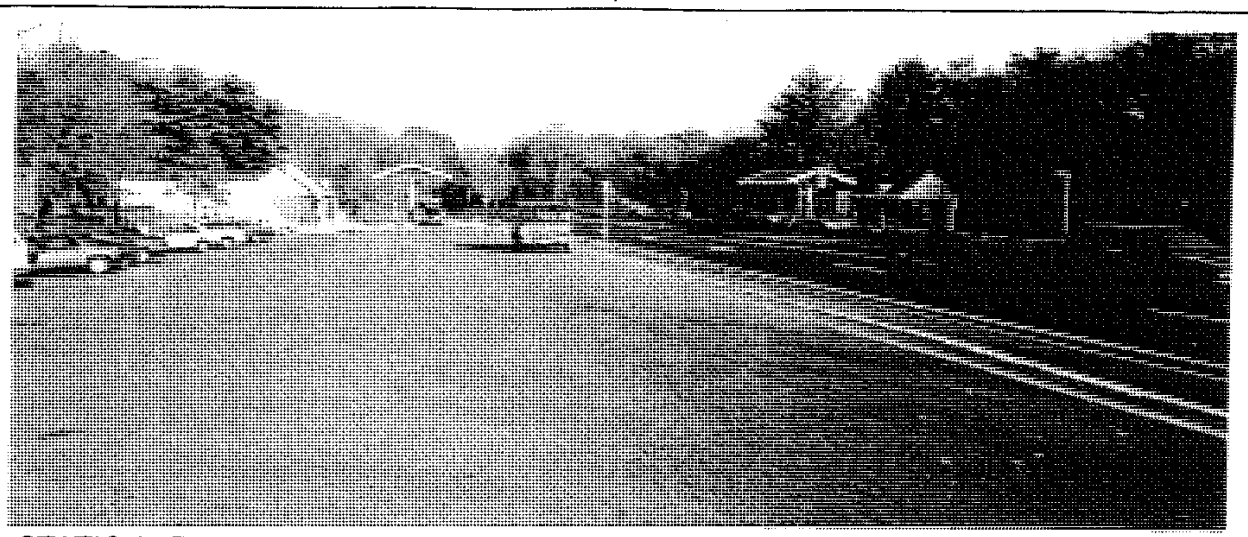
Provides greatest separation and visual/functional buffer; concept originally proposed with the introduction of service stations along the Parkway.

CONCERNS:

High costs to reconstruct; would require remodeling service area adding new front onto new pump area; major realignment of approach and exit lanes could impact mature tree stands; may not be feasible for all service areas due to property boundary.

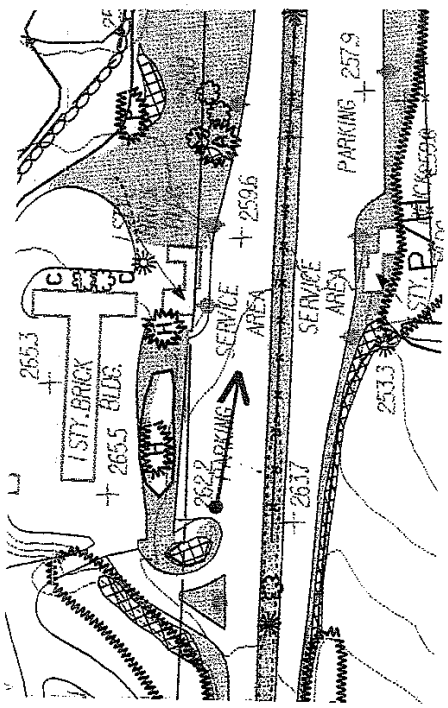
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.3.1 4
Service Areas **Approach Lanes**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp431-4.2



STATION 075+350

NEW CANAAN SERVICE AREA WESTBOUND, LOOKING EAST



Scale 1" = 200'

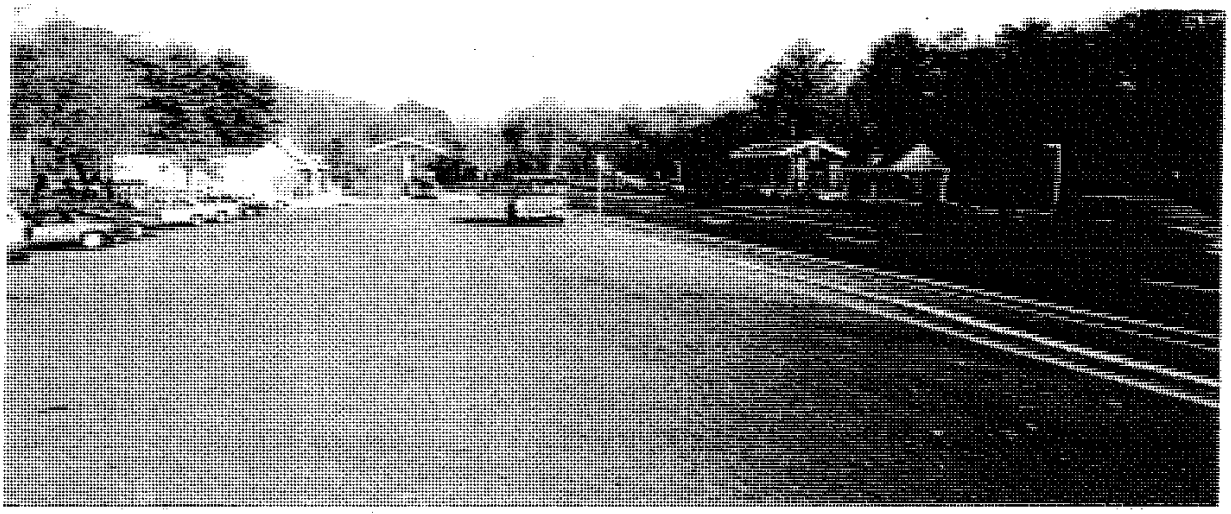
DESIGN ISSUE:

Exit lane and parking area configuration at service areas:

- Large underutilized expanse of pavement
- Inefficient parking/circulation layout
- Inadequate buffer between pump area/service lane and adjacent Parkway travel lane
- Short re-entry lanes back onto Parkway
- Frequent exposed views to rear lot parking and adjacent Parkway maintenance buildings and land use

Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.3.2 1
Service Areas **Exit Lanes/Parking Areas**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp432-1.2



EXISTING

OPPORTUNITY:

Add "faux" stone wall guiderail/barrier to edge of exit lane/parking lot.

RATIONALE:

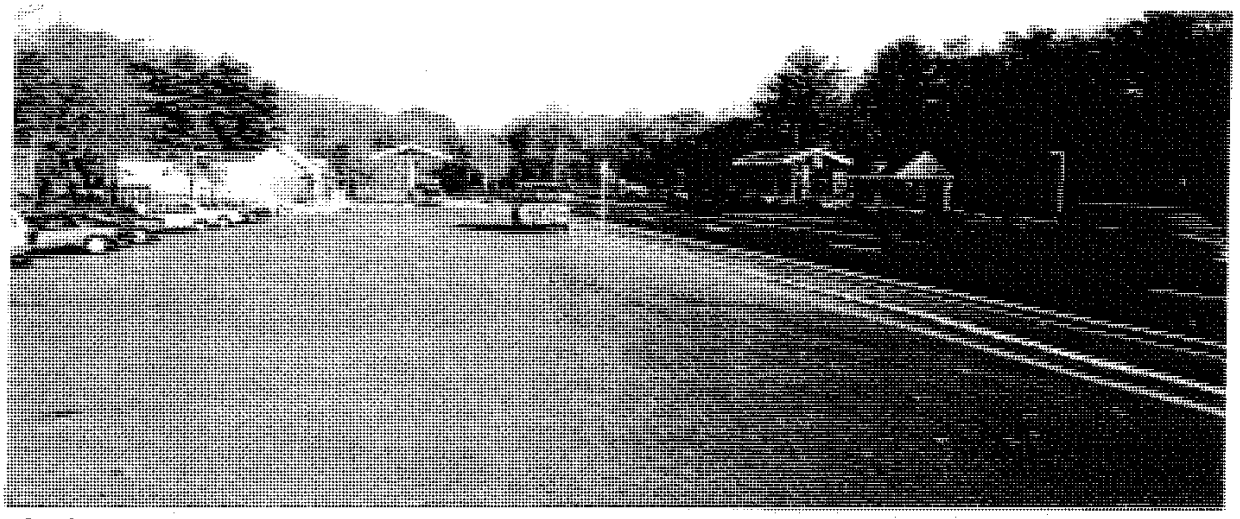
Reduces asphalt somewhat; provides functional and some visual buffer from exiting cars and parking area to travel lanes.

CONCERNS:

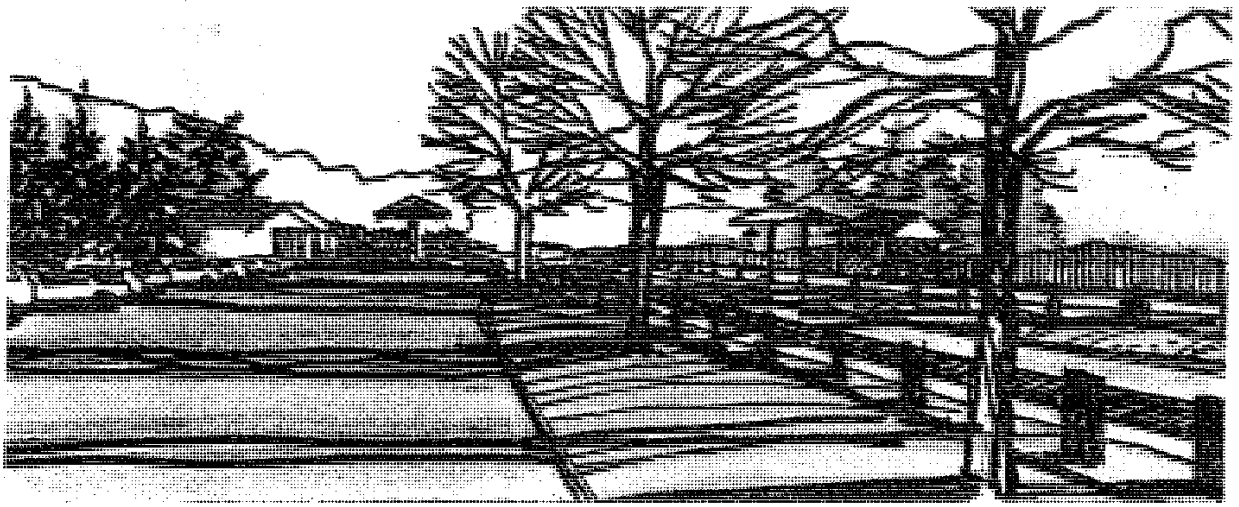
Guiderail/barrier system chosen must be consistent with overall Merritt Parkway guiderail design.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.3.2 2
Service Areas **Exit Lanes/Parking Areas**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp432-2.2



EXISTING



OPPORTUNITY:

Push parking edge back 20 feet; add landscape island past pump area along travel lane; extend exit lane; add guiderail system.

RATIONALE:

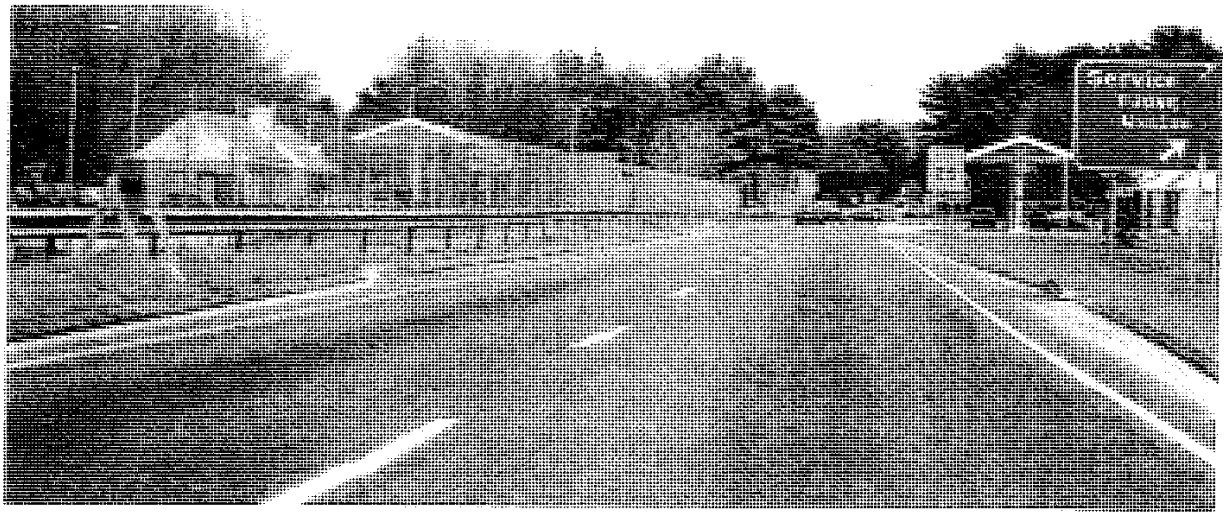
Decreases amount of asphalt; increases efficiency of circulation and lot layout; provides landscape buffer and visual continuity with rest of Parkway.

CONCERNS:

Modest increase in lawn maintenance; island would need edge guiderail.

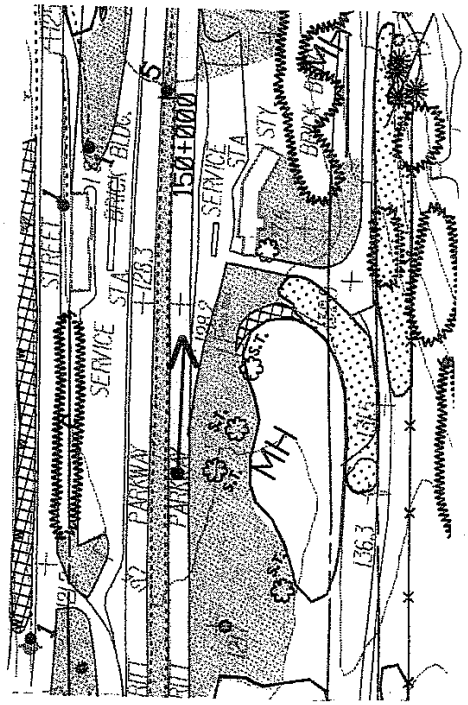
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.3.2 3
Service Areas **Exit Lanes/Parking Areas**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp432-3.2



STATION 149+500

FAIRFIELD SERVICE AREA EASTBOUND, LOOKING EAST



Scale 1" = 200'

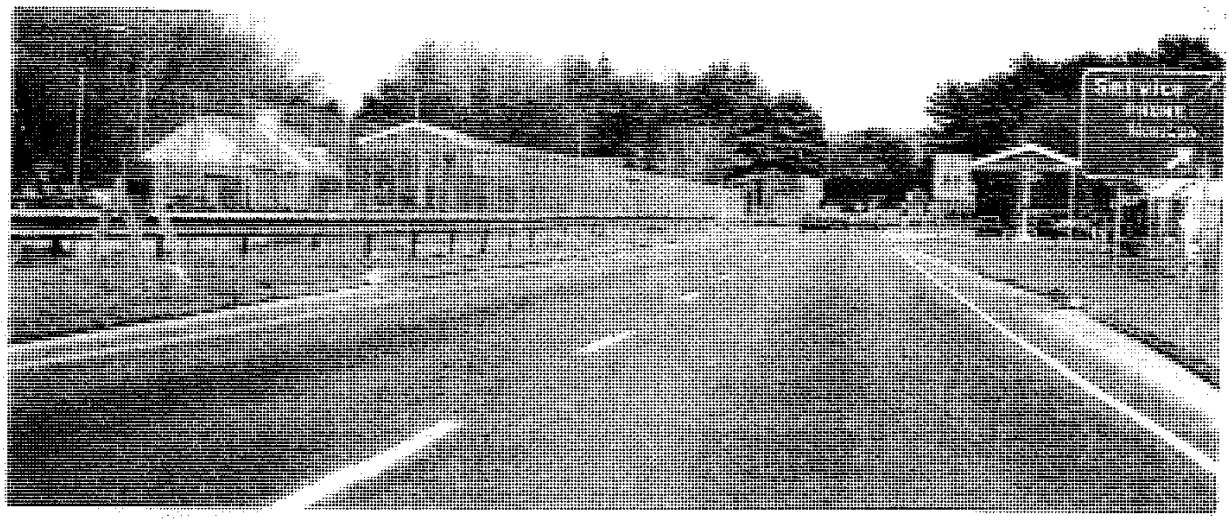
DESIGN ISSUE:

Chain link fence in median at service areas:

- In place to deter pedestrians from crossing Parkway
- Poor quality appearance
- Unique treatment along Parkway - not used anywhere else
- Precludes addition of median trees
- Ad-hoc physical solution to management and operational problem
- Metal beam guiderail equally detracts from Parkway character

Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.3.3 1
Service Areas **Median Treatment**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp433-1.2



EXISTING

OPPORTUNITY:

Remove chain link fence; plant median trees and add median guiderail; implement management change or install underground "pneumatic tube" system between stations.

RATIONALE:

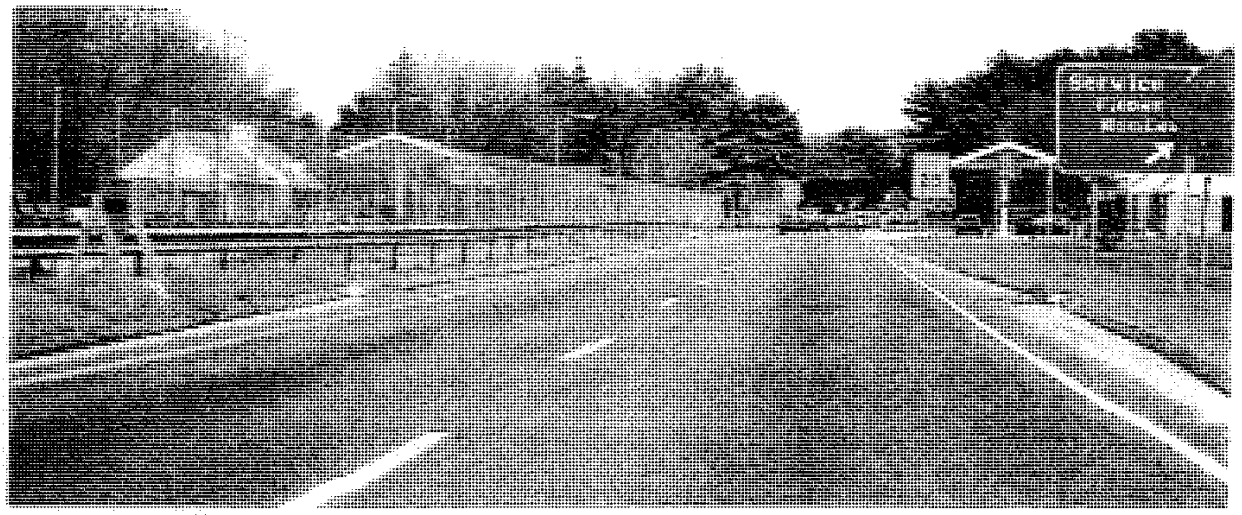
Underground "pneumatic tube" system may eliminate personnel problem of crossing between stations; median trees restore Parkway character to area.

CONCERNS:

Costs, treatment still may not deter pedestrians from crossing between stations; may also require operational or management changes to deter crossing.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.3.3 2
Service Areas **Median Treatment**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp433-3.2



EXISTING

OPPORTUNITY:

Pull guiderail to edge of median; add shrub hedge behind guiderail to screen fence (chain link fence remains).

RATIONALE:

Stronger physical deterrent to crossing between stations while providing landscape screen at fence.

CONCERNS:

Maintenance; effects of road/salt spray on hedge may give it equally unattractive appearance; inconsistent with any other median treatment along Parkway.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.3.3 3
Service Areas **Median Treatment**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp433-4.2

4.4 NEW INTERCHANGES

Two types of new interchanges can be found on the Parkway: areas of major reconstruction where the Parkway is connected to new limited access highways; and the smaller entrances/exits where safety improvements have been made recently to modify alignment and to provide acceleration or deceleration lanes. While detailed designs need to be specific for the landscape at each interchange, there should be a common approach used throughout the Parkway.

In keeping with the original design intent, the small islands should remain as open lawn areas, thus maintaining adequate sightlines. In the larger islands, plantings should be limited to deciduous canopy trees (held back from the travel lanes) with the plant palette specific to the surrounding native vegetation. Evergreen trees and shrubs can be used for traffic guidance on the outside of curves. Guiderail may be required to reduce the potential of vehicular crossover.

The three new major interchanges at Route 7, Route 8, and Route 25 requiring landscaping. Extensive plantings, both evergreen and deciduous, are required to create a park-like character similar to the rest of the Parkway. Regrading of slopes bringing the landscaped edge closer to the travelway is strongly suggested. Screening of inappropriate off-site views is called for. The landscape treatment of the medians needs to be balanced with safety and maintenance concerns.

At the reconstructed interchanges:

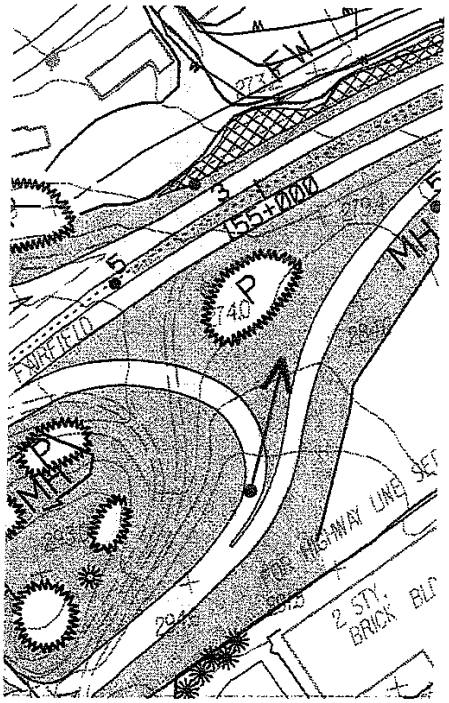
- Masses of plant materials should be extended to the roadside edges.
- Evergreen plants should be utilized on the outside of curves to emphasize leading or terminal views.
- Treelines should be cut back to improve sightlines.
- Plants in islands should be kept to a palette of trees and lawn canopy to reflect the original planting concepts.

For the new interchanges at Route 7, 8, and 25:

- Vegetation should be brought to within 30 feet of the roadway and a forest edge re-established.
- At bridge abutments, the landscape treatment should be brought down to the roadway edges.
- Slopes at bridge abutments should be regraded slightly to extend out and blend with the existing topography.
- Median trees should be added.
- Conifers should be planted to accentuate rock outcrops and to define leading curves.

STATION 154-700

EXIT 47 OFF RAMP, LOOKING NORTH ACROSS MERRITT PARKWAY



Scale 1" = 200'

DESIGN ISSUE:

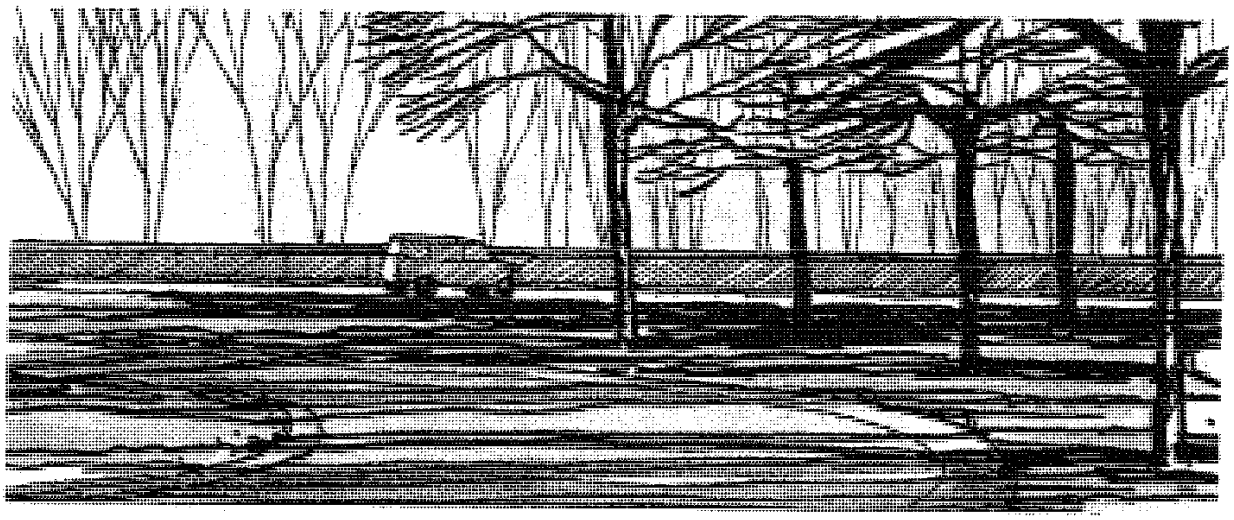
Landscape treatment at interchange islands:

- In general, interchange islands historically kept as open lawn areas
- Formal layout not in keeping with the Parkway's "naturalized" appearance
- Shrub beds will be high maintenance
- Plant material should be consistent with the immediate surroundings
- Tree heights should vary, utilizing some larger specimens

Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.4.1 1
New Interchanges **New Island Plantings**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp441-1.2

EXISTING



OPPORTUNITY:

Landscape islands should remain as lawn or lawn and trees with tree mass held back from travel lanes; plant palette to match surrounding landscape.

RATIONALE:

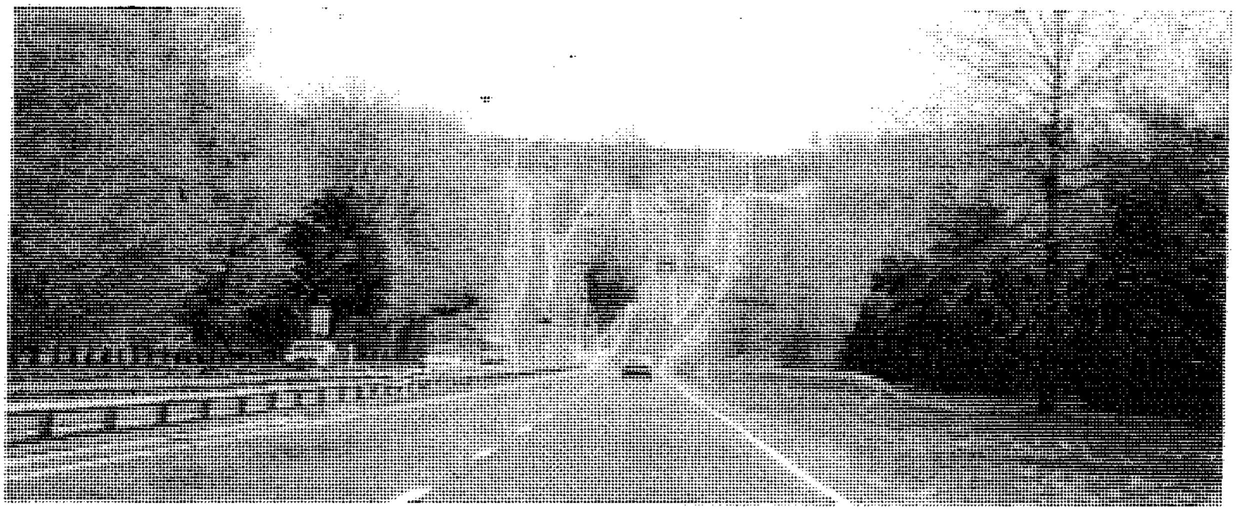
More in keeping with original design intent; easier maintenance than shrub beds; continues design principle of carrying plant community across roadway.

CONCERNS:

Treeline needs to be kept back behind sightlines required for merging and exiting traffic. Guiderail may be required in smaller islands.

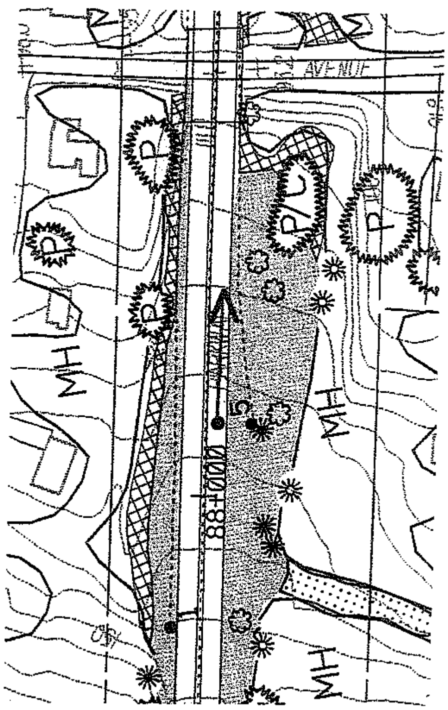
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.4.1 2
New Interchanges **New Island Plantings**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp441-2.2



STATION 087+800

LOOKING EAST TOWARDS ROUTE 7 INTERCHANGE



Scale 1" = 200'

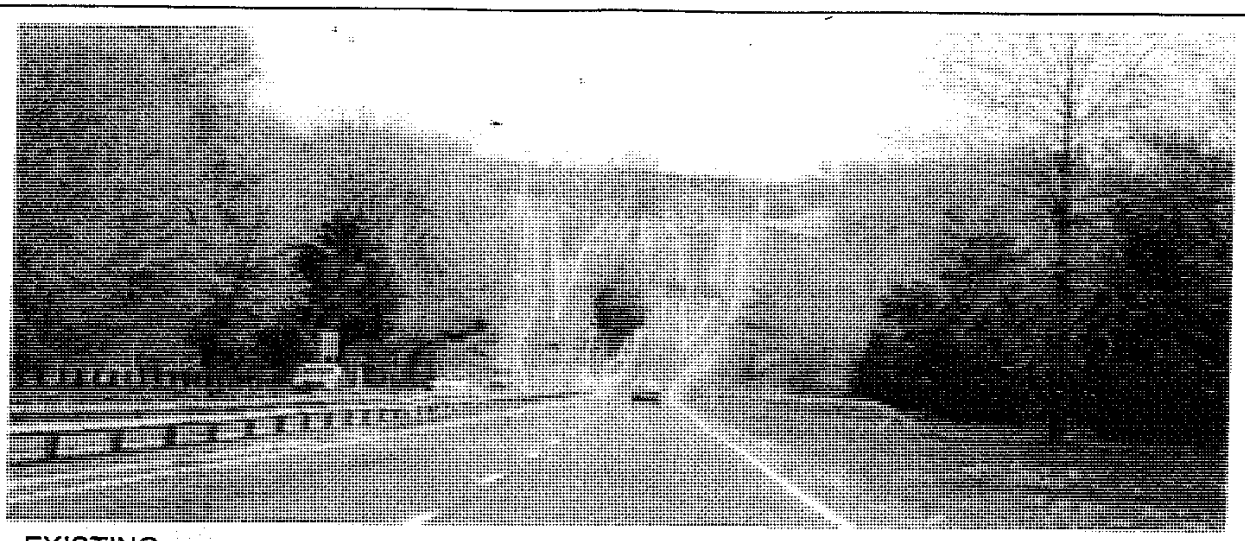
DESIGN ISSUES:

Open, unlandscaped approaches to major new interchanges:

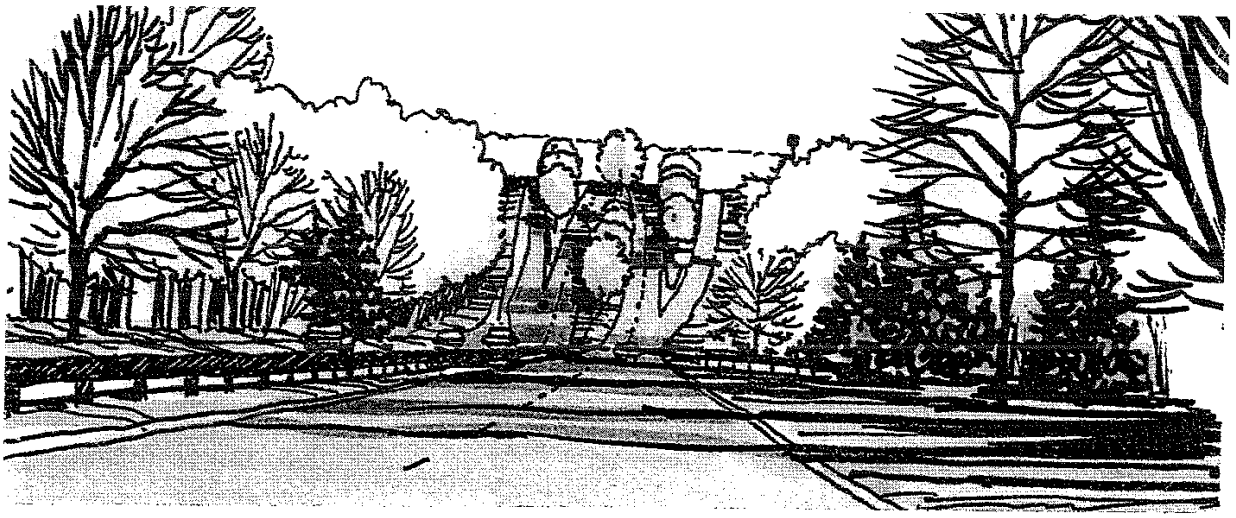
- Significant change in character from historic Parkway condition to new interchanges
- Opportunity to better enclose and enframe approach views
- Long downhill view
- Narrow median (no opportunity for median trees)

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.4.2 1
New Interchanges **Major Interchanges - Approaches**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp422-1.2



EXISTING



OPPORTUNITY:

Keep landscape edge the same (in foreground) and add median trees and trees along on/off ramps (in distance).

RATIONALE:

Reduces scale of openness; offers some sense of enclosure by keeping treeline back from road and eliminates need for more guiderail.

CONCERNS:

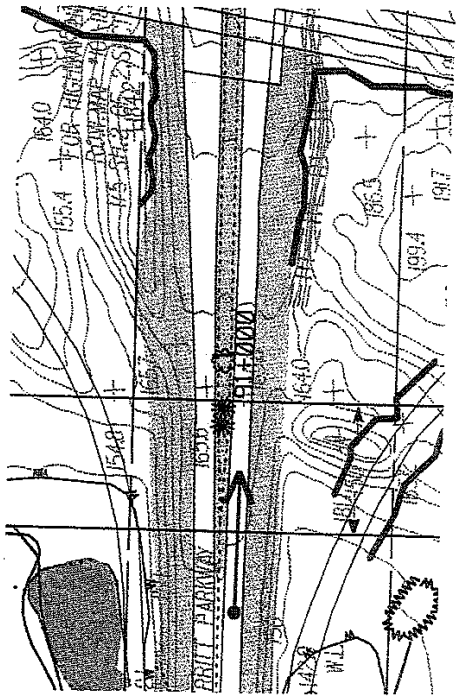
Overall scale of roadway still not consistent with general Parkway character.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.4.2 2
New Interchanges **Major Interchanges - Approaches**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp442-3.2

STATION 090+600

LOOKING EAST THROUGH ROUTE 7 INTERCHANGE



Scale 1" = 200'

DESIGN ISSUE:

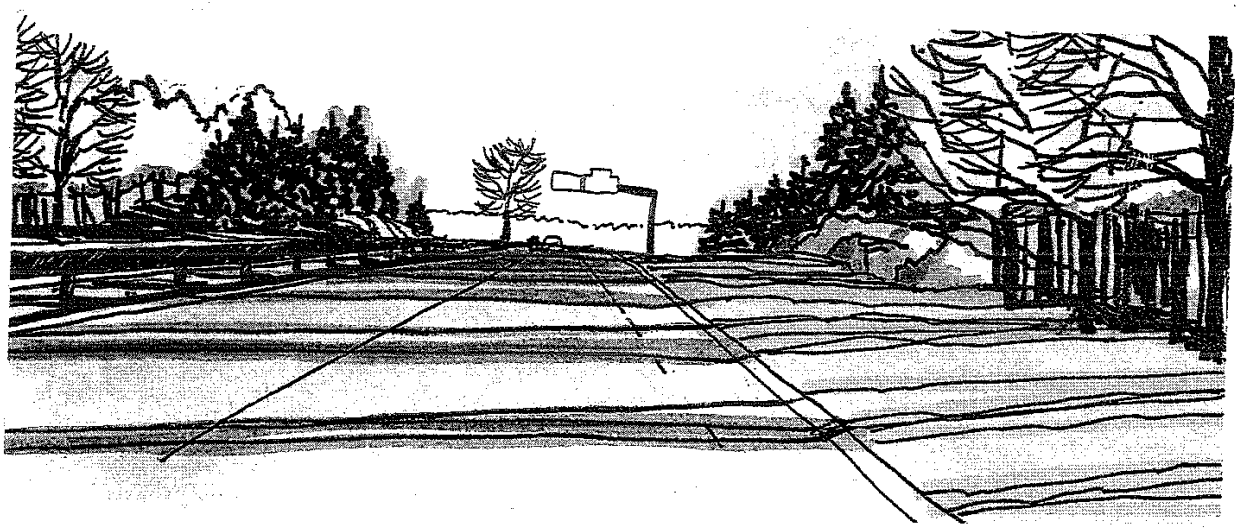
Open, unlandscaped section of the Parkway due to recent construction of interchange:

- No enclosure or spatial variety
- Open, barren landscape not consistent with Parkway history or character
- Pavement wider than other sections of Parkway
- Signage, guiderails, and lighting not consistent with Parkway
- Unnatural rock cut not consistent with historic treatment of similar conditions

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.4.3 1
New Interchanges **Major Interchange Landscape**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp443-1.2

EXISTING



OPPORTUNITY:

Re-introduce conifer stands along rock cut; re-establish deciduous woods, holding back wooded edge to 30 feet from roadway; bring lawn closer to road edge.

RATIONALE:

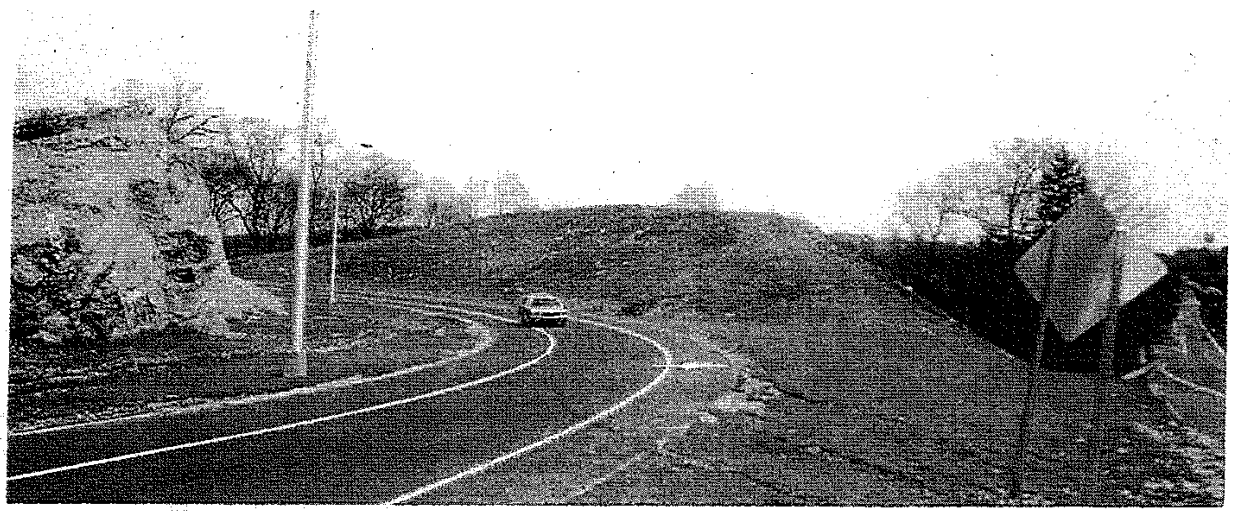
Historic context and precedent for landscape treatment, but meets current clear zone requirements eliminating need for guiderail.

CONCERNS:

Holding landscape edge back uniformly from roadway not an historic characteristic of Parkway design.

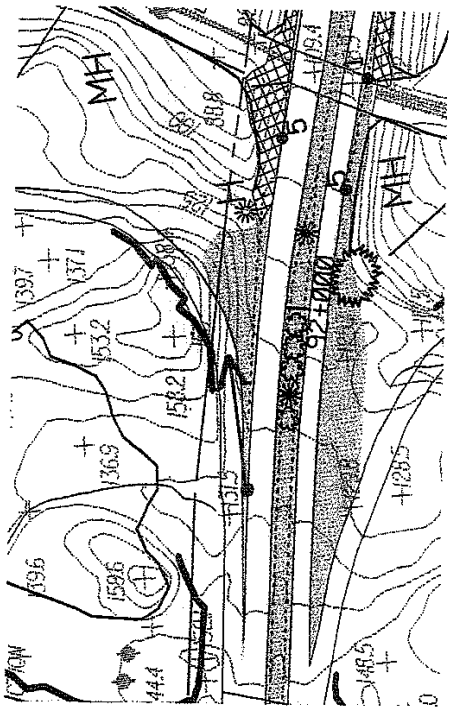
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.4.3 2
New Interchanges **Major Interchange Landscape**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp443-3.2



STATION 092+000

LOOKING NORTHEAST AT ROUTE 7 SOUTHBOUND ON RAMP



Scale 1" = 200'

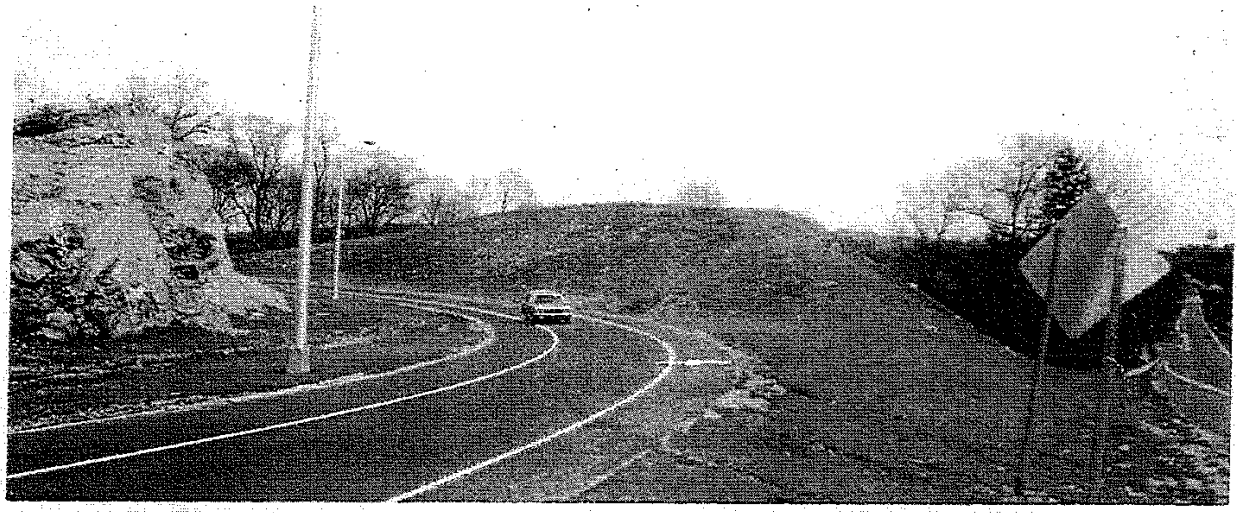
DESIGN ISSUE:

Open, unlandscaped entrance and exit ramps at major new interchanges:

- Open, barren landscape not consistent with Parkway character
- Regrading opportunities to better blend slopes into existing contours
- Opportunity to replant and enhance major rock cuts
- Opportunity to create leading views with conifer stand on curves
- New interchange lighting not consistent with Parkway character

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.4.4 1
New Interchanges **Major Interchange - Entrance/Exit Ramps**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp444-1.2



EXISTING

OPPORTUNITY:

Major landscaping opportunity: re-establish deciduous woods in area, with stands of conifers on rock cut and on leading curve of on-ramp; add guiderail at outside edge.

RATIONALE:

Brings new interchange into context with Parkway; consistent with historic context and landscape peak of area; utilizes Parkway design principles and landscape themes.

CONCERNS:

Transition from major interchanges onto Parkway, particularly in use of lighting; keep sight distances clear for merging traffic; guiderail used must be consistent with guiderail chosen for the Parkway; consider engineering standards when placing guiderail.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.4.4 2
New Interchanges **Major Interchange - Entrance/Exit Ramps**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp444-2.2

4.5 BRIDGE TREATMENTS

Much of the architectural detail which makes each Parkway bridge unique is obscured by invasive vegetation at nearly all bridges. While some attempts at removing undesirable growth have been made, this effort should be continued. Only those plant species which were originally planted or those which complement the surrounding forest should be kept. Even some of the evergreens which were part of the original planting scheme should be pruned where the bridge abutment is obscured by overgrowth.

Bridges at new interchanges need to be landscaped in a similar manner as the original bridges. Regrading in some instances is appropriate. Such design principles as placing ground cover on steep slopes and canopy trees or evergreen species at the ends of the bridge should be employed for these new structures.

In order to highlight the architectural detail of the bridges in hours of darkness, the Department may wish to install up-lighting initially on an experimental basis. Care will be required in the placement of the fixtures so as not to cause glare for the motorist.

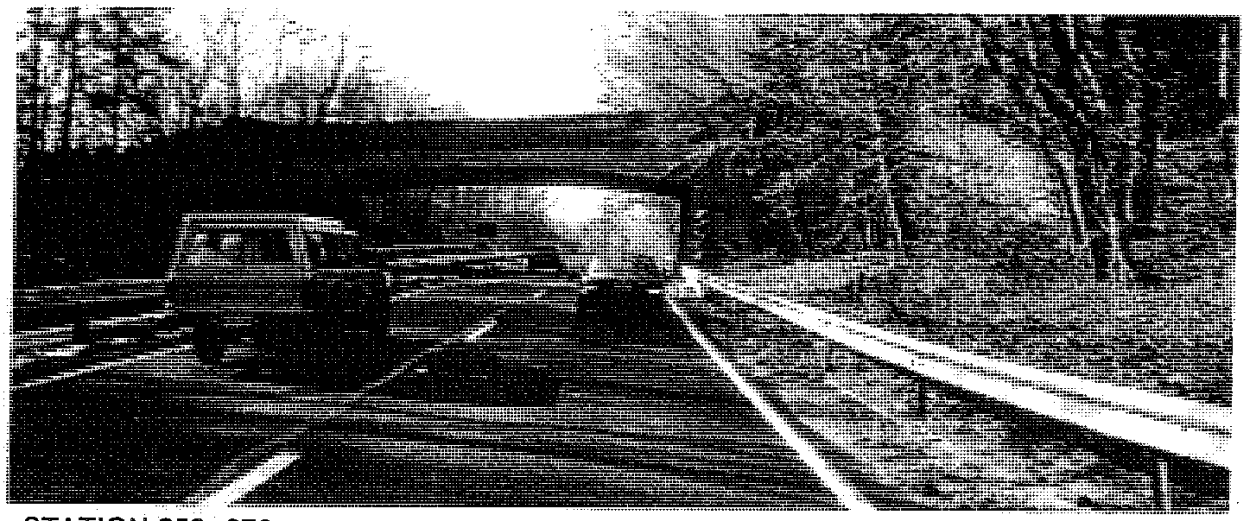
The architecture of the new bridges could be modified to better reflect the basic design principles of the original bridges. The same level of ornamentation displayed by the original structures would not necessarily be appropriate for the new ones.

The following specific actions should be undertaken at the original bridges:

- Clear invasive vegetation at all bridge abutments.
- Re-establish the plant material which was typically used in the original design.
- Ground cover should be utilized where embankments are difficult to maintain.
- Signs which obscure bridge facades should be relocated.

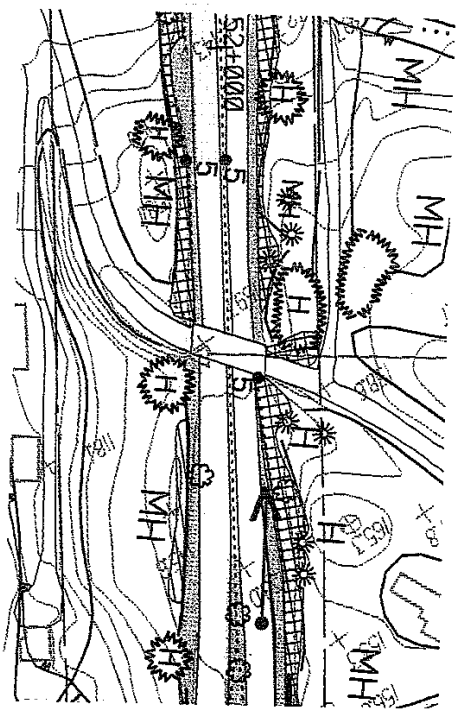
For bridges at new interchanges:

- Introduce vegetation to enframe bridge openings and to create park-like appearance.
- Regrade slopes adjacent to the bridges by extending slopes out from the abutments.
- Introduce a consistent guiderail/barrier system at each bridge approach.
- Select appropriate unobtrusive barrier/guiderail system that protects bridge abutments and transitions back into the slope at all bridges where existing conditions permit.



STATION 052+670

LOOKING SOUTH TO WIRE MILL BRIDGE



Scale 1" = 200'

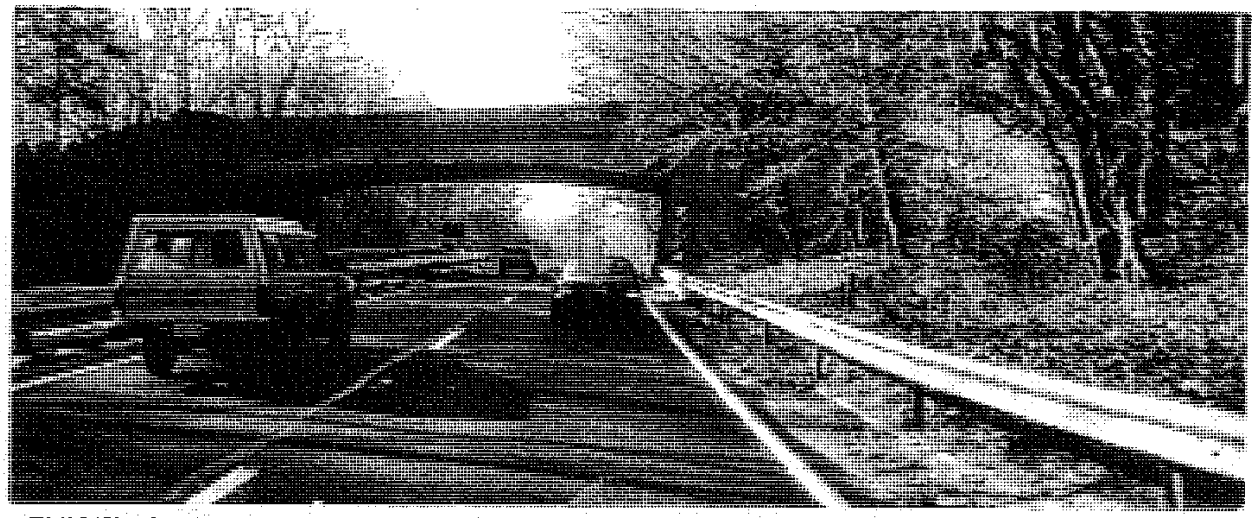
DESIGN ISSUE:

Invasive growth at bridge abutments:

- Invasive growth obscures unique bridge architecture and curved wing walls
- May need to prune up or re-establish original planting concept at abutment

Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.5.1 1
Bridge Treatments **Vegetation Removal**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp451-1.2



EXISTING

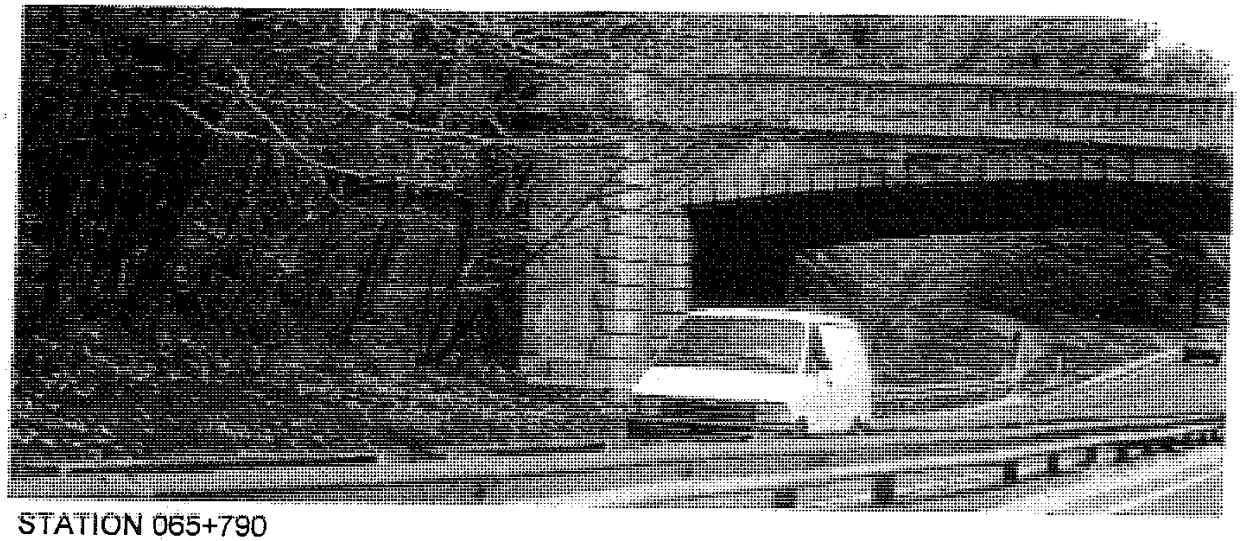
OPPORTUNITY:
Clear invasive growth at bridge abutments.

RATIONALE:
Reveals and enhances views to unique bridge architecture.

CONCERNS:
Ongoing maintenance; slope stabilization in areas of steep slope.

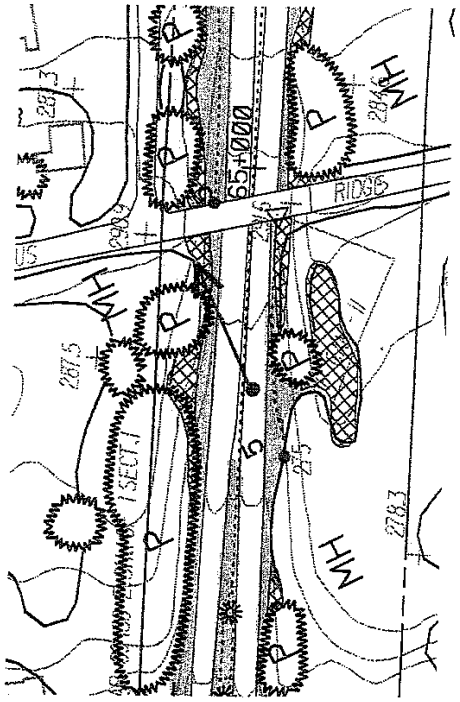
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.5.1 2
Bridge Treatments **Vegetation Removal**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp451-2.2



STATION 065+790

LOOKING NORTH TO PONUS ROAD BRIDGE ABUTMENT



Scale 1" = 200'

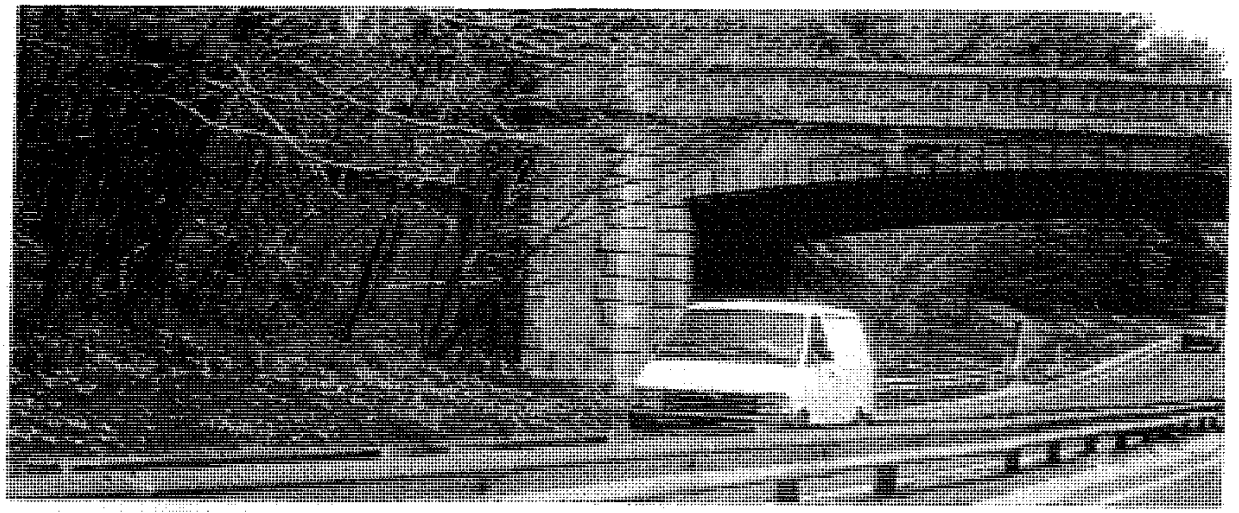
DESIGN ISSUE:

Invasive growth at bridge abutments:

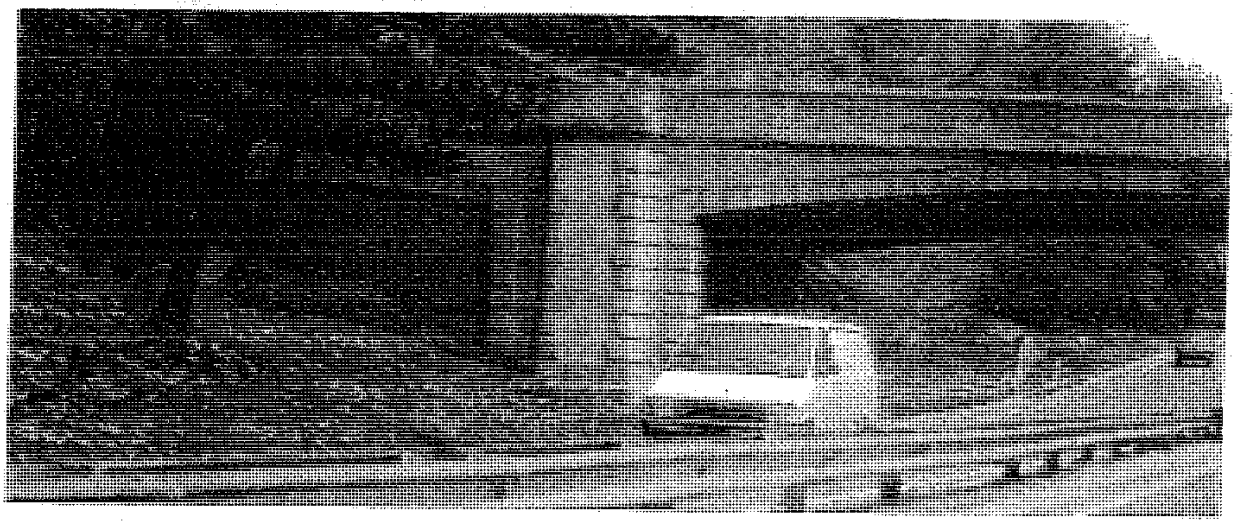
- Invasive growth obscures bridge architecture and original plantings
- May need to re-establish original planting concepts at bridges

Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.5.1 3
Bridge Treatments **Vegetation Removal**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp451-3.2



EXISTING



OPPORTUNITY:

Clear invasive growth at abutment and re-establish original bridge plantings.

RATIONALE:

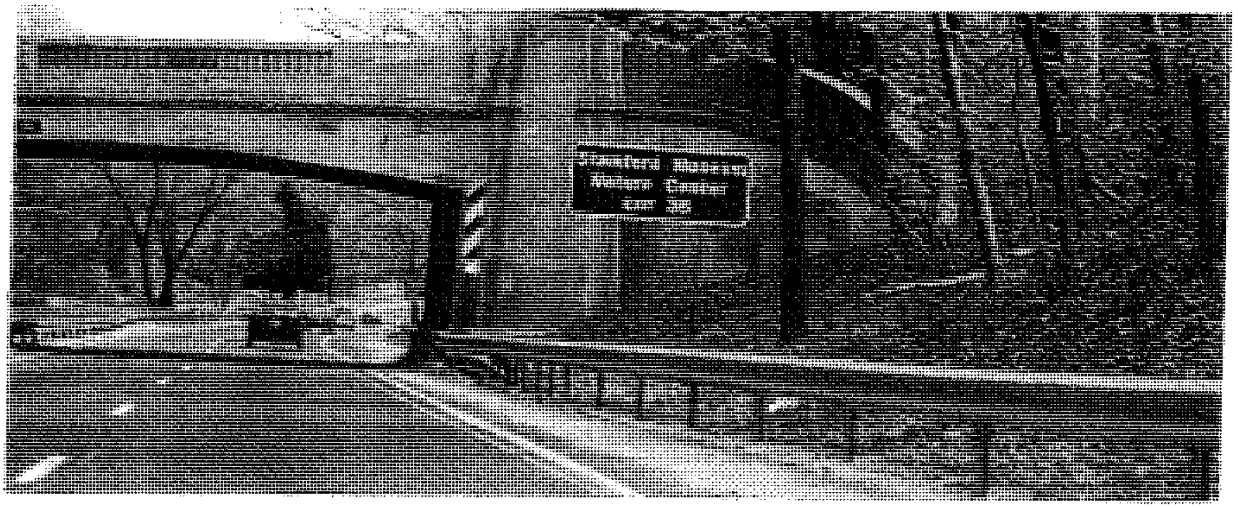
Enhances views to bridge architecture and evergreen vegetation frame at bridge.

CONCERNS:

Slope stabilization in areas of steep slope; quality of original plant material once invasive growth removed; ongoing maintenance to keep invasive species under control.

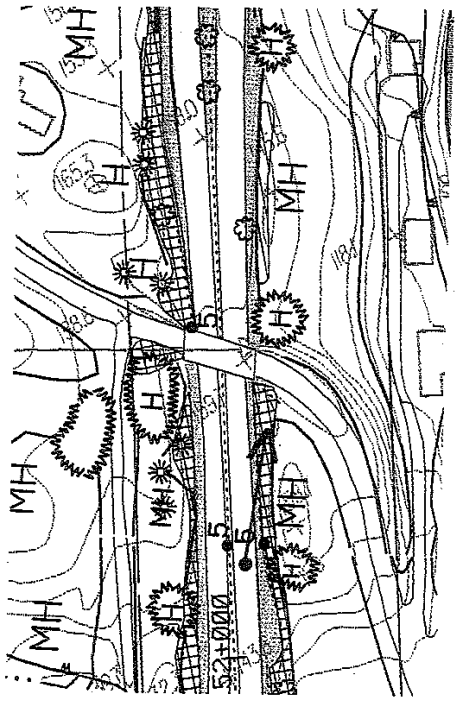
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.5.1 4
Bridge Treatments **Vegetation Removal**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp451-4.2



STATION 052+080

LOOKING NORTH TO WIRE MILL ROAD BRIDGE ABUTMENT



Scale 1" = 200'

DESIGN ISSUE:

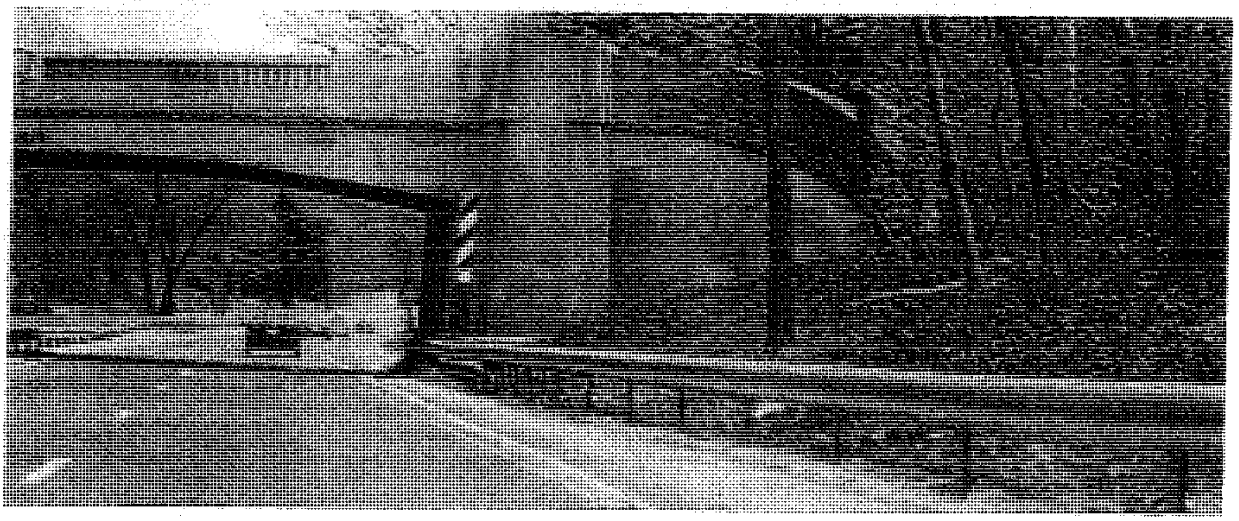
Visually obtrusive sign at bridge abutment:

- Sign obscures bridge architectural details
- Location of information signs need to be treated uniformly throughout Parkway

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.5.2 1
Bridge Treatments **Sign Removal**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp452-1.2

EXISTING



OPPORTUNITY:

Remove visually obtrusive sign and clear invasive growth at abutments.

RATIONALE:

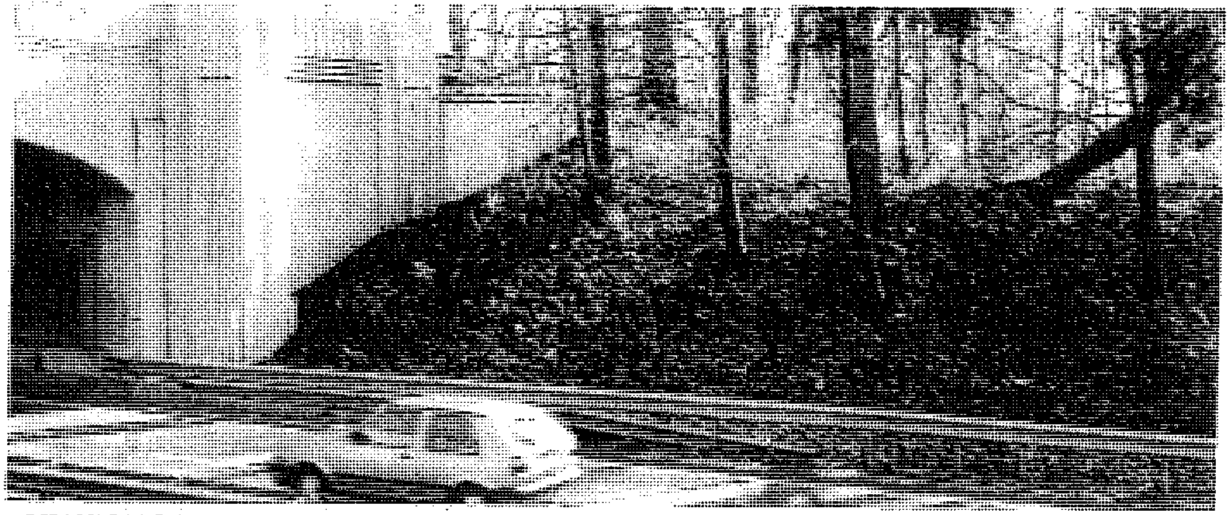
Non-essential location for this type of sign (i.e. sign better located after bridge); overall enhancement of unique bridge architecture.

CONCERNS:

New sign location needs adequate sight distance prior to exit.

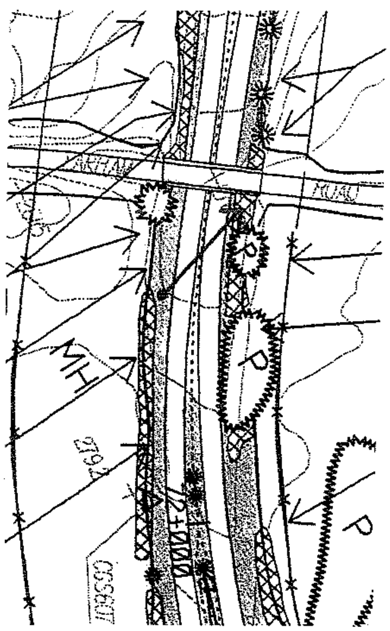
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.5.2 2
Bridge Treatments **Sign Removal**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp452-2.2



STATION 71+850

LOOKING NORTH AT BRIDGE ABUTMENT, LAPHAM AVENUE BRIDGE (SOUTHBOUND)



Scale 1" = 200'

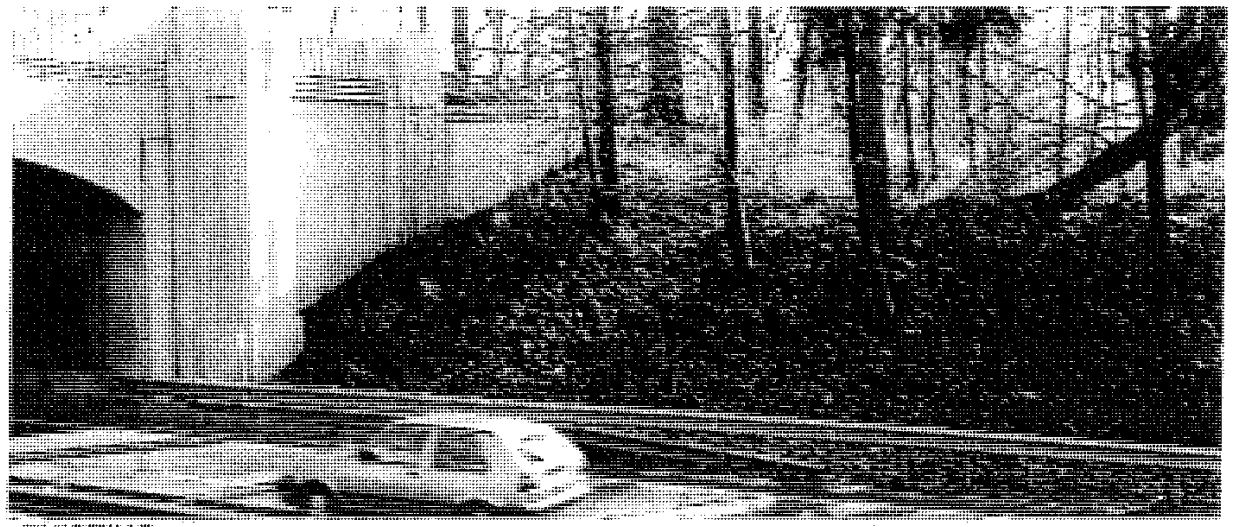
DESIGN ISSUE:

Inconsistent barrier/guiderail design at existing bridge abutments:

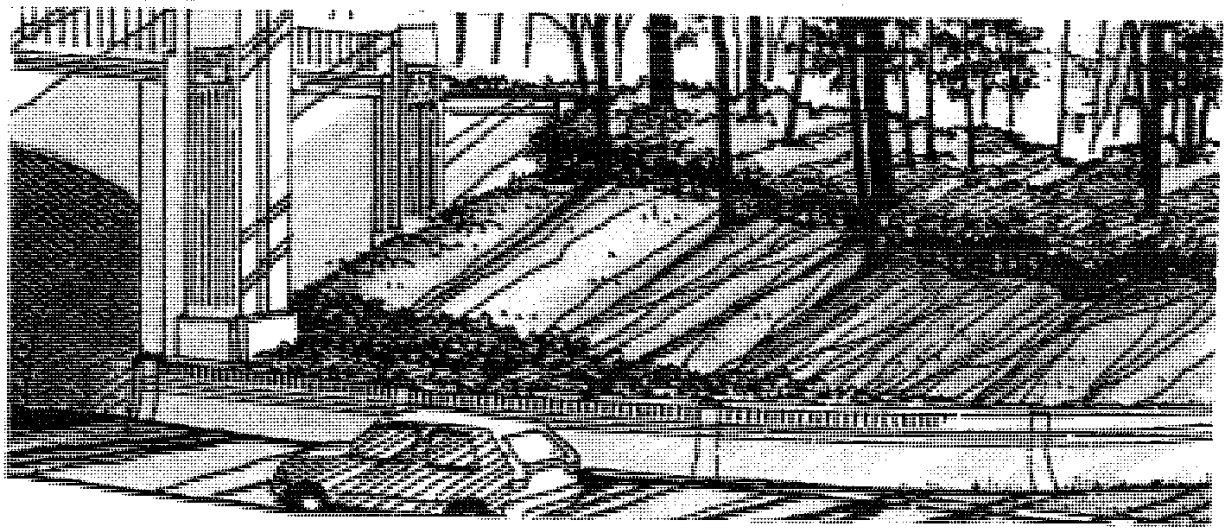
- New permanent barriers installed at some bridges, metal beam rail at others
- Need landscape treatment/slope stabilization plantings once invasive vegetation is removed from abutment
- Opportunity to extend bridge architectural design into adjoining edge barrier system (through detailing, coloration, and texture)

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.5.3 1
Bridge Treatments **Bridge Abutment Treatment**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp453-6.2



EXISTING



OPPORTUNITY:

Unified bridge abutment treatment with customized permanent barrier at edge of roadway; low ground cover on slope; taller ornamental shrub mass at top of slope.

RATIONALE:

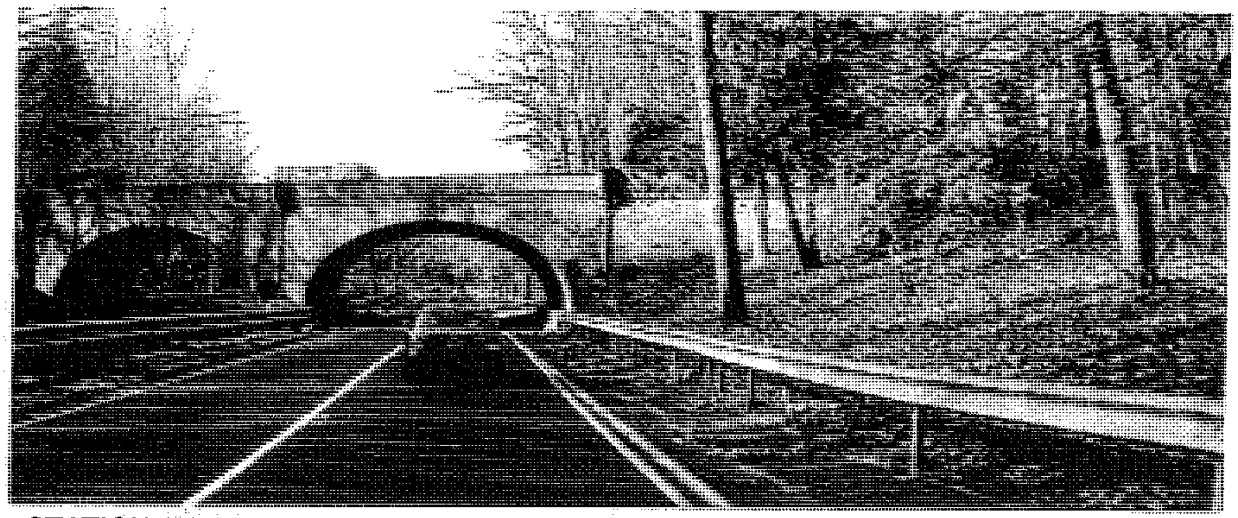
Stabilizes slope edge; provides uniform edge treatment and protection at abutments; easier to maintain.

CONCERNS:

Barrier detailing must be unique to each bridge; long-term costs to implement for all bridges; design must meet all safety requirements; ongoing maintenance to keep invasive growth down.

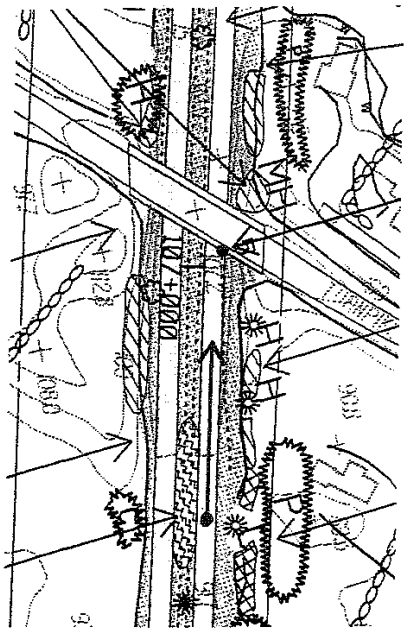
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.5.3 2
Bridge Treatments **Bridge Abutment Treatment**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp453-8.2



STATION 107+150

LOOKING SOUTHBOUND TO NEWTOWN TURNPIKE BRIDGE



Scale 1" = 200'

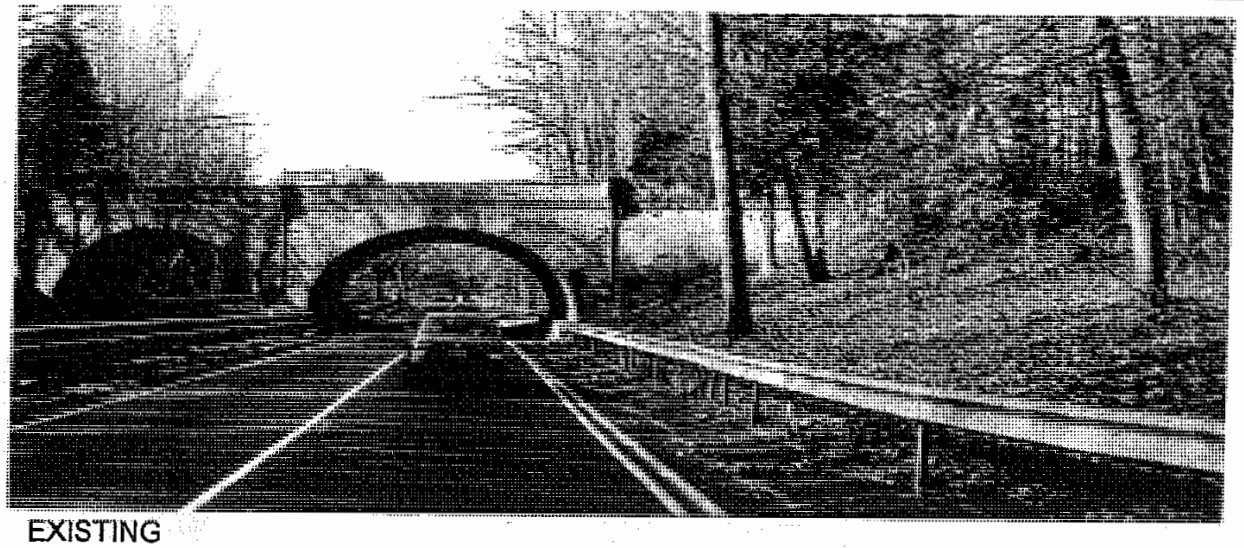
DESIGN ISSUE:

End treatment for proposed barrier at bridge abutment:

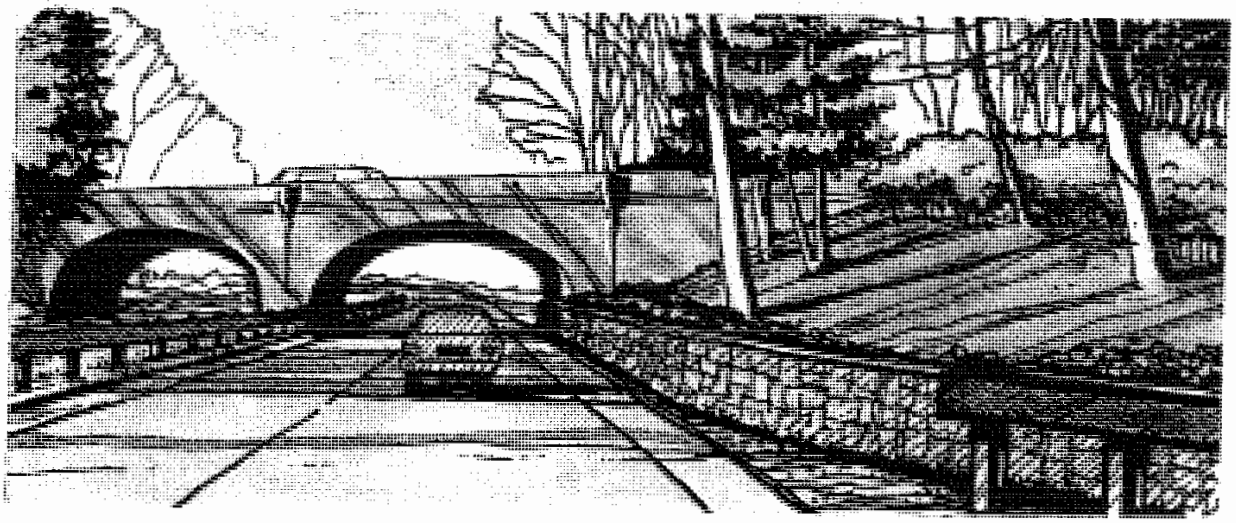
- Must minimize length of proposed barrier system while meeting all traffic safety standards
- Opportunity to tie barrier back into slope where conditions permit
- Opportunity to transition to steel-backed wood beam guiderail dependent on site conditions

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.5.3 3
Bridge Treatments **Bridge Abutment Treatment**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp453-7.2



EXISTING



OPPORTUNITY:

Tie back bridge abutment barrier to steel-backed wood beam guiderail (guiderail to overlap and bolt to barrier, barrier to taper into ground).

RATIONALE:

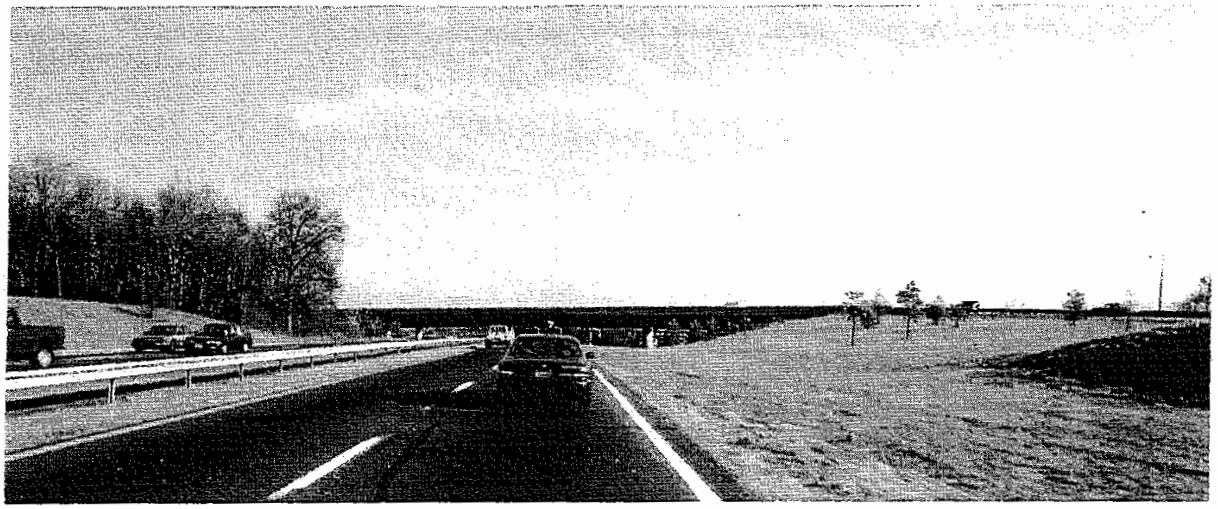
Enhances safety at abutment and adjacent landscape planting; provides consistent design transition from one guiderail/barrier system to another.

CONCERNS:

Final design(s) must meet all safety requirements for the Parkway.

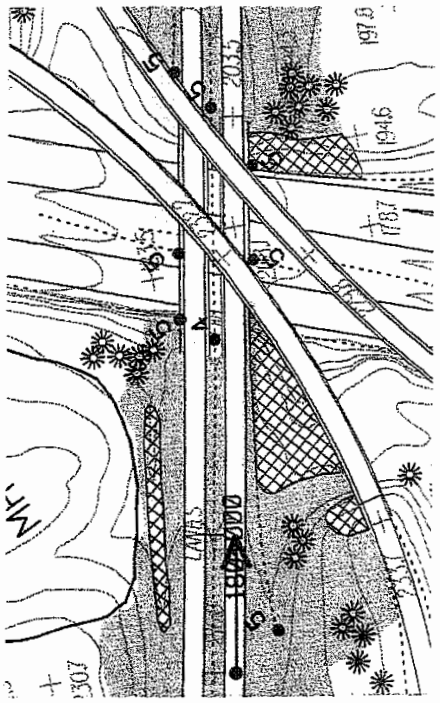
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.5.3 4
Bridge Treatments **Bridge Abutment Treatment**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp453-9.2



STATION 179+850

LOOKING NORTHBOUND AT NEW BRIDGE AND INTERCHANGE, EXIT 52, ROUTE 8



Scale 1" = 200'

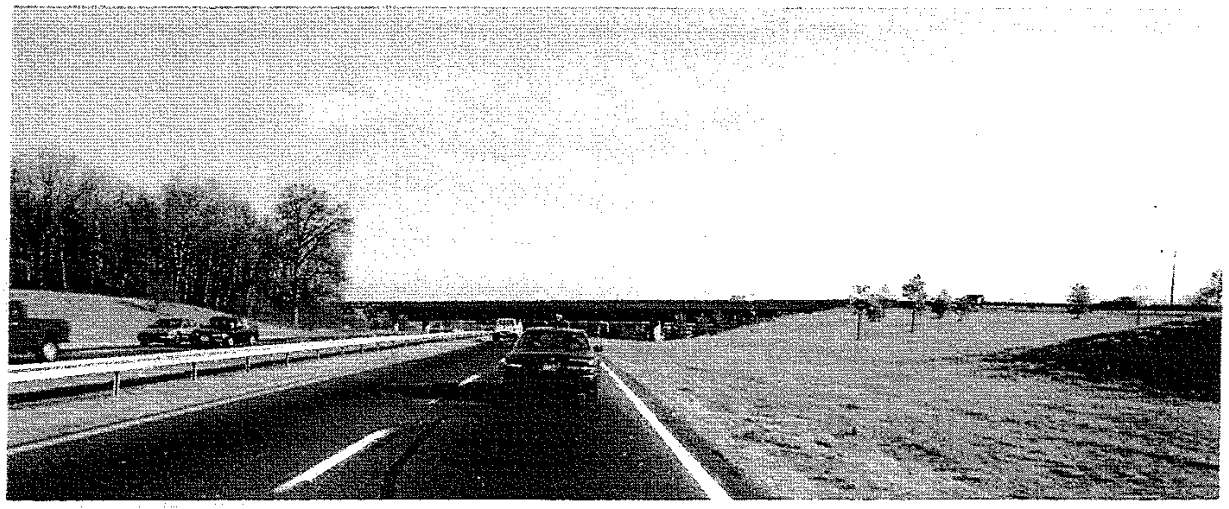
DESIGN ISSUE:

Open, unlandscaped bridge approach, major new interchange:

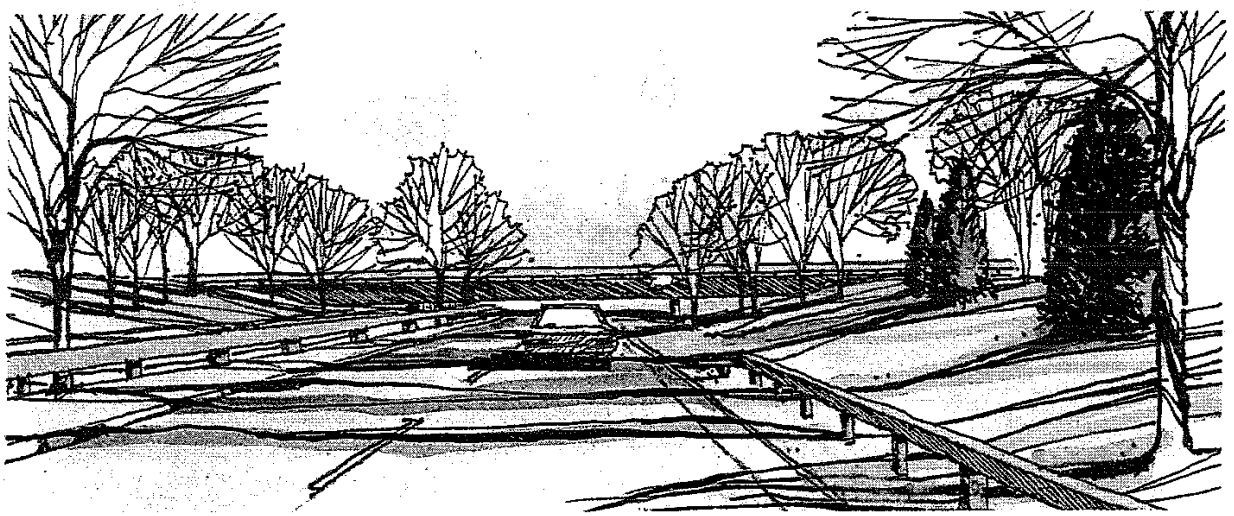
- Landscape character too open and over-scaled
- No variety of spatial enclosure similar to other areas of the Parkway
- Opportunity to enhance/frame approaches to bridge
- Wide, unplanted median
- Need guiderail system consistent with rest of Parkway

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.5.4 1
Bridge Treatments **Vegetation Addition at New Bridges**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp453-10.2



EXISTING



OPPORTUNITY:

Landscape to enclose bridge approach; opportunity for "park-like" pockets and median trees.

RATIONALE:

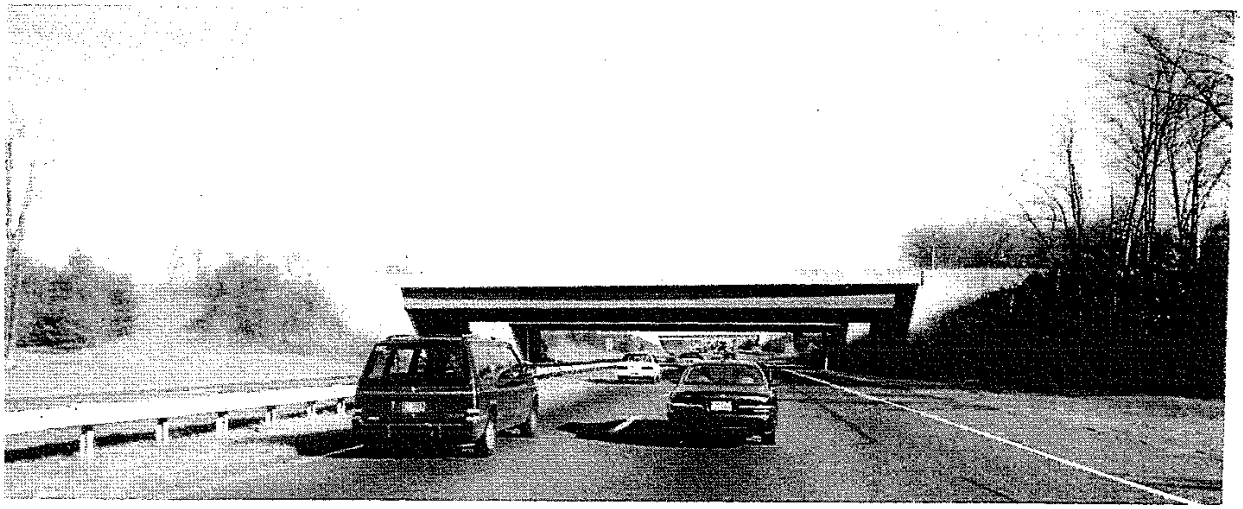
Historically a more enclosed, wooded setting; bridge approaches and abutments were landscaped to frame views on all other Merritt bridges; rolling landscape lends itself to park-like application.

CONCERNS:

Will need some additional sections of guiderail for areas where landscape encroaches on the edge of roadway.

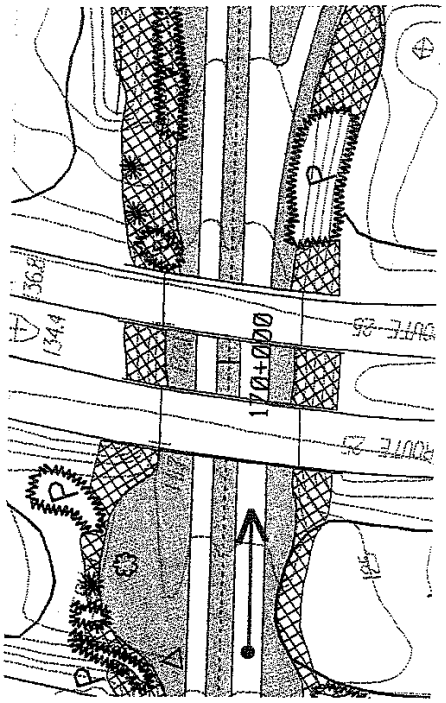
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.5.4 2
Bridge Treatments **Vegetation Addition at New Bridges**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp453-20.2



STATION 169+650

LOOKING NORTHBOUND AT NEW BRIDGES, EXIT 50, ROUTE 25



Scale 1" = 200'

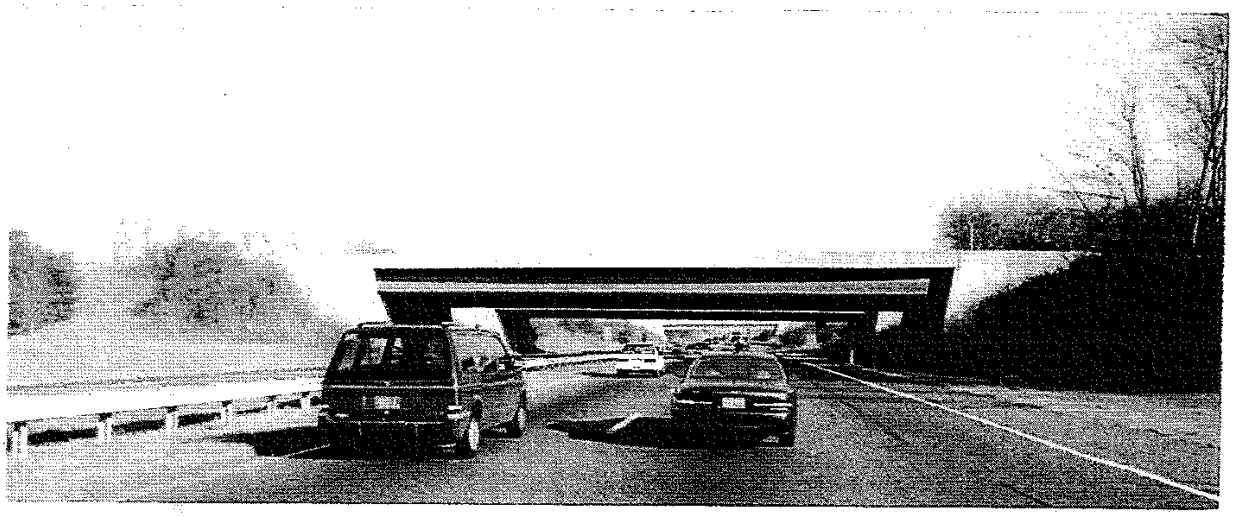
DESIGN ISSUE:

Relatively open and unframed bridge abutments of major new interchanges:

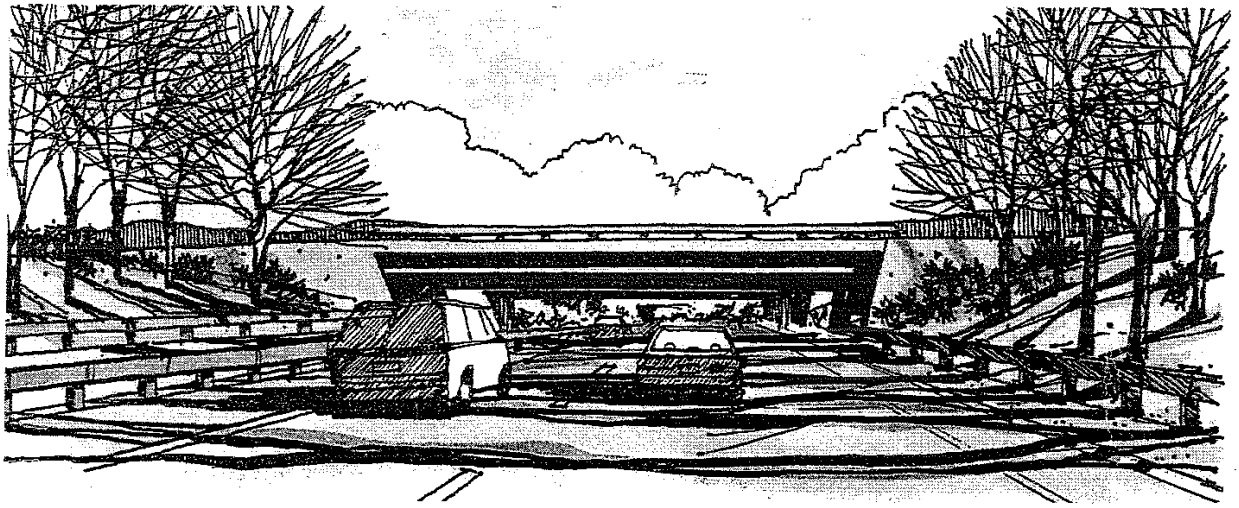
- New landscaping at bridge abutments out of character with other Parkway bridge landscapes
- Typical standard highway slopes at abutment not in keeping with Parkway's original grading principles and techniques
- Lack of bridge detailing out of character with Parkway
- Wide, unplanted median
- Invasive growth at abutments
- Need guiderail system consistent with rest of Parkway

Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.5.4 3
Bridge Treatments **Vegetation Addition at New Bridges**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp453-30.2



EXISTING



OPPORTUNITY:

Add modest but decorative railing along bridge parapet; regrade and extend slope out from abutments; bring trees/landscape edge closer to roadway; add consistent guiderails.

RATIONALE:

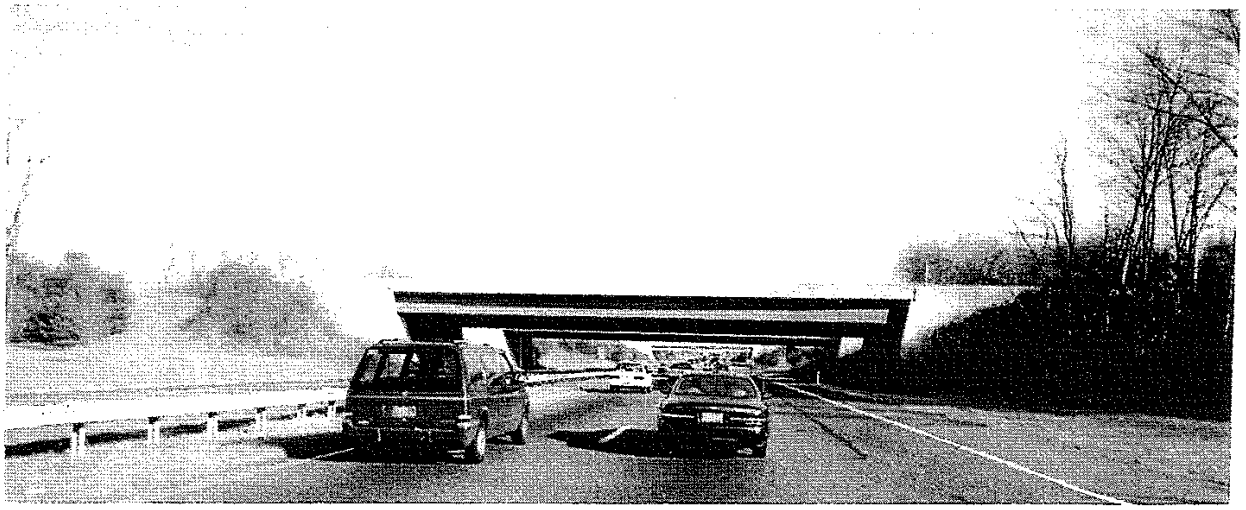
Enclosure enhancing bridge views. Although bridges are of contemporary design, original Parkway grading and landscaping concepts can be applied to harmonize new interchanges with the rest of the Parkway.

CONCERNS:

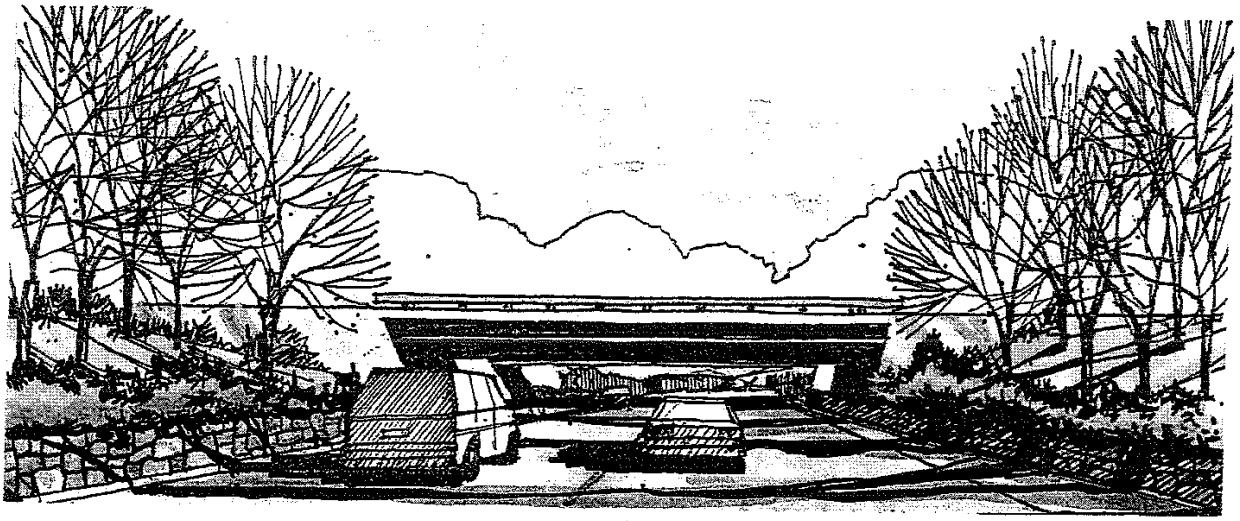
Maturation time for plant material and maintenance; additional guiderail needed for enclosure.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.5.4 **4**
Bridge Treatments **Vegetation Addition at New Bridges**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp453-40.2



EXISTING



OPPORTUNITY:

Regrade and extend slope out from abutments; bring trees/landscape closer to pavement edge; permanent barrier with planted shrubs as guiderail system.

RATIONALE:

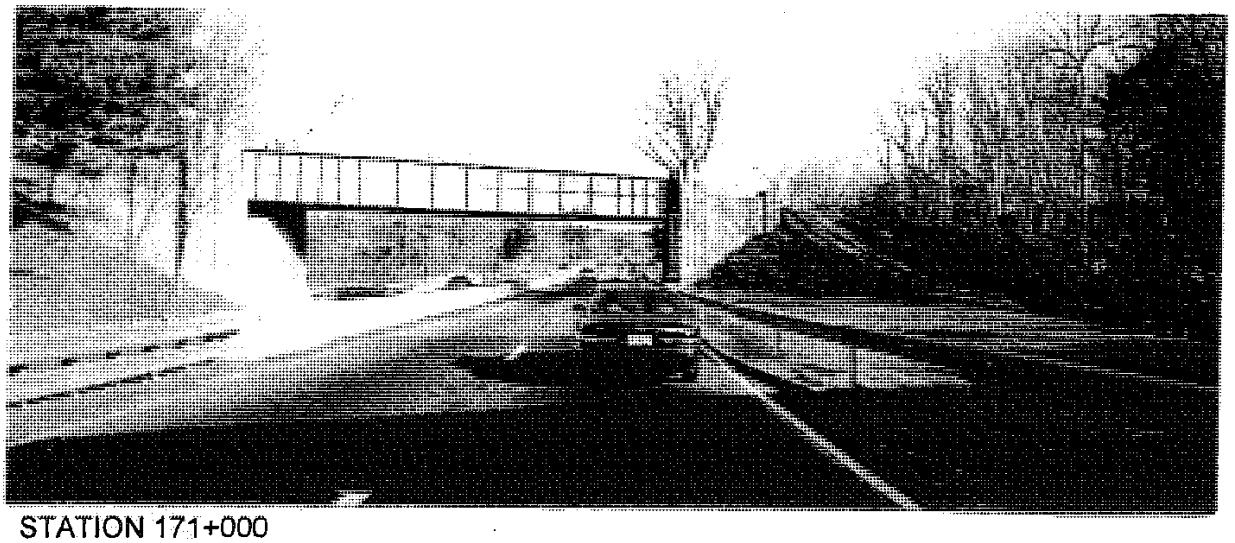
Alternative design concept using architectural design expression of bridge and extending it out with barriers/planters in median and at pavement edge.

CONCERNS:

Must ensure a consistent guiderail/barrier design for entire Parkway; shrub bed maintenance.

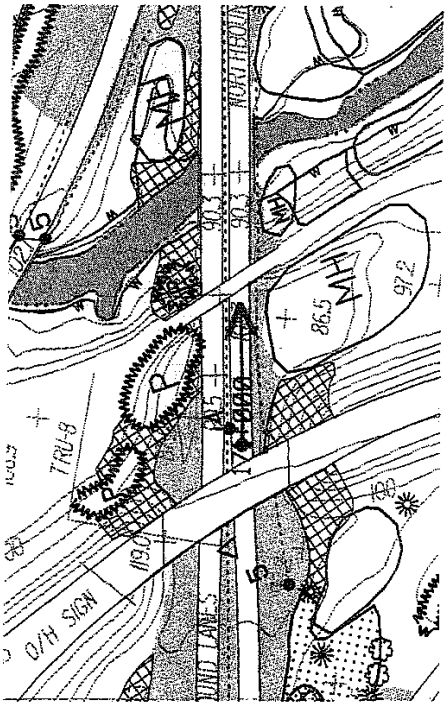
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.5.4 5
Bridge Treatments **Vegetation Addition at New Bridges**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp453-50.2



STATION 171+000

NORTHBOUND LOOKING AT OLD RAILROAD BRIDGE, NEAR EXIT 49



Scale 1" = 200'

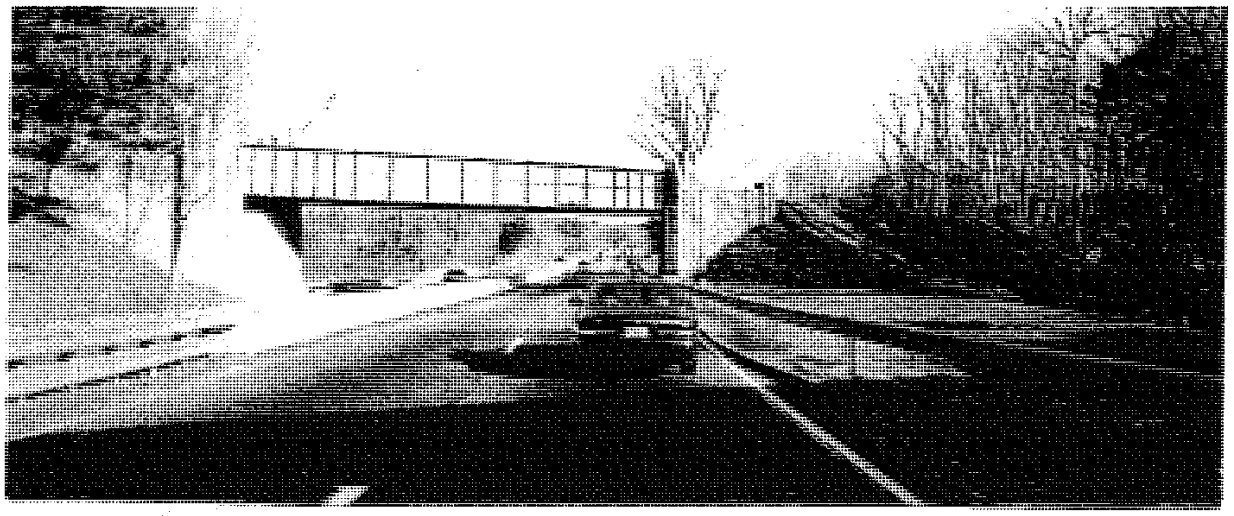
DESIGN ISSUE:

Former railroad bridge in area of major new interchange:

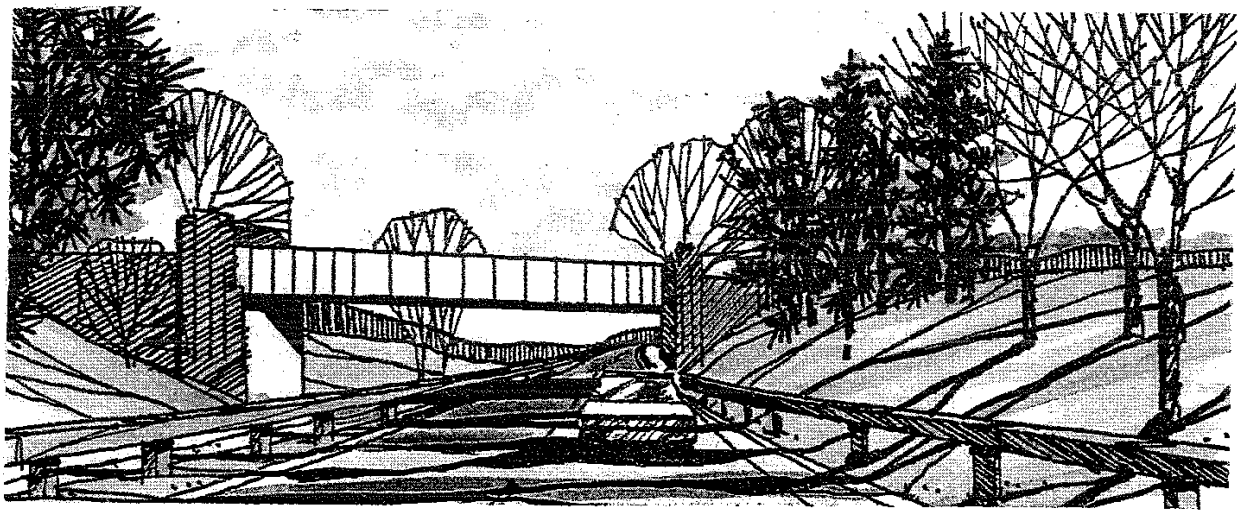
- Railroad line and tracks abandoned; bridge not currently in use
- Surrounding landscape and grading altered with construction of new interchange
- Uniform slope at abutments not in keeping with earlier grading principles
- Scale and design of bridge abutments consistent with original bridge architecture but contrasts with new interchange bridge designs
- Inconsistent guiderail systems

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.5.5 1
Bridge Treatments **Vegetation Addition and Regrading**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp454-10.2



EXISTING



OPPORTUNITY:

Regrade and extend slope at abutment; bring landscape edge closer to road; utilize consistent guiderail system.

RATIONALE:

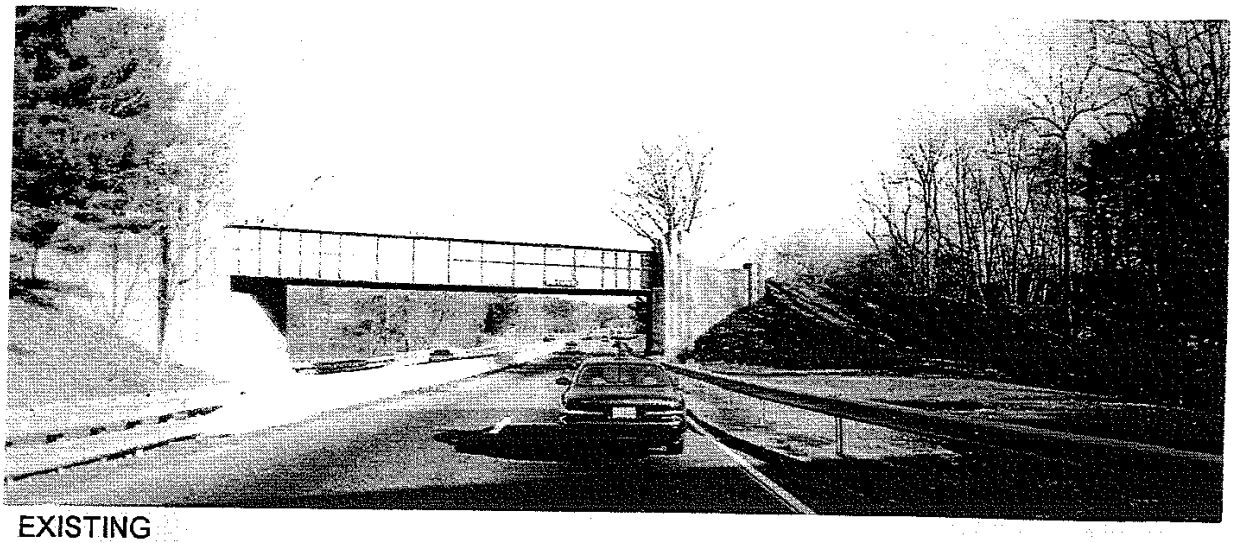
Frames view of bridge; keeps landscape and character visually consistent with rest of Parkway.

CONCERNS:

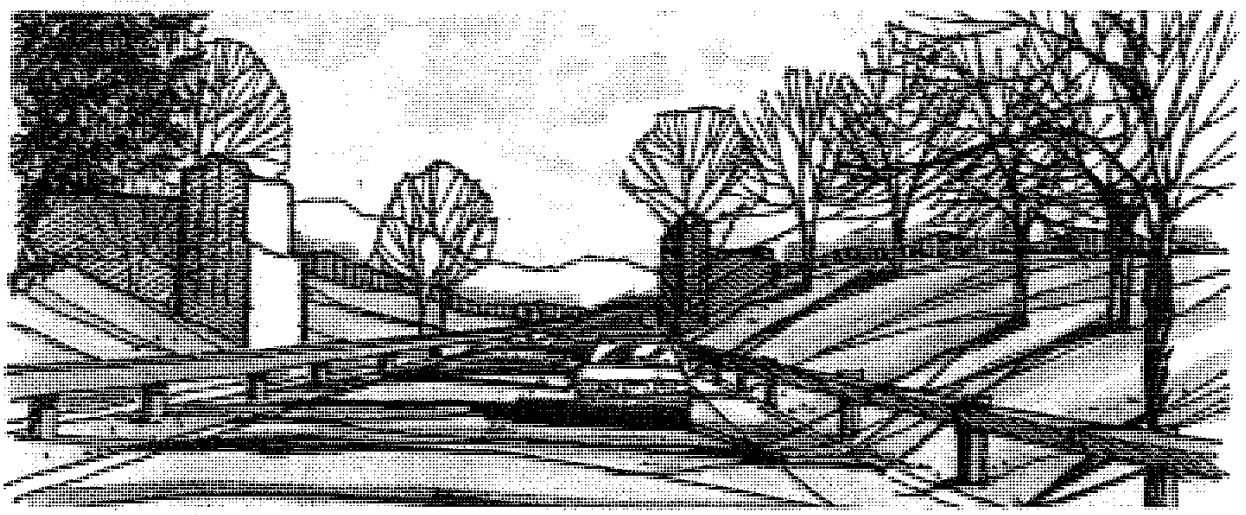
Final design of guiderail system must meet all safety requirements.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.5.5 2
Bridge Treatments **Vegetation Additions and Regrading**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp454-20.2



EXISTING



OPPORTUNITY:

Remove unused bridge span; regrade and landscape abutments; utilize consistent guiderail/barrier.

RATIONALE:

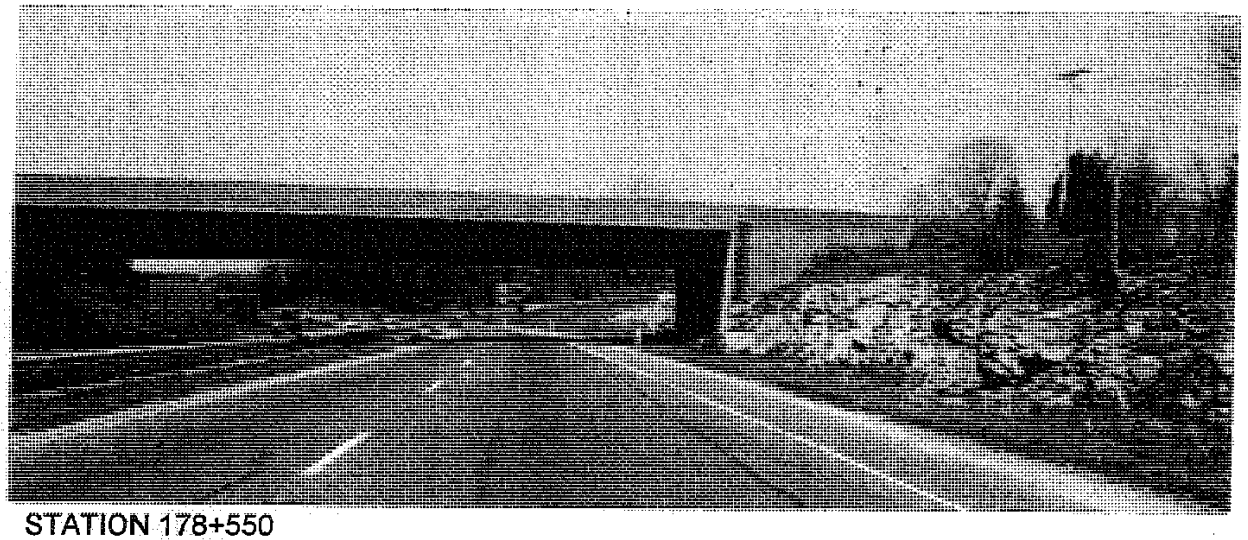
Opens up views to Parkway; abutments remain to frame view.

CONCERNS:

Cost of removal; need to determine any potential long range reuse of bridge.

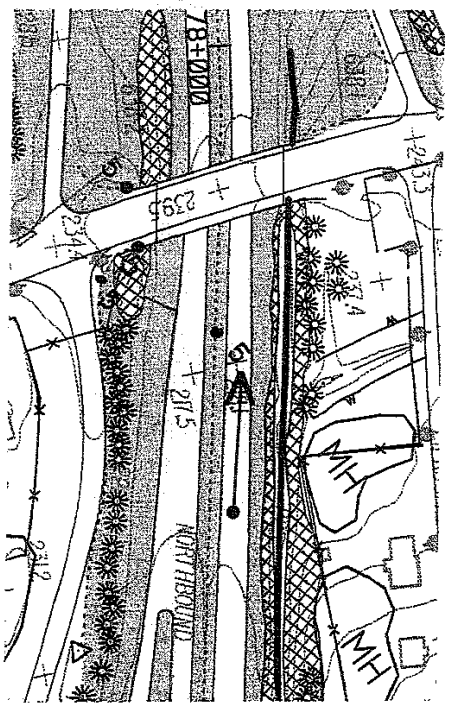
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.5.5 3
Bridge Treatments **Vegetation Additions and Regrading**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp454-30.2



STATION 178+550

LOOKING SOUTHBOUND AT NICHOLS AVENUE BRIDGE, EXIT 52, ROUTE 8



Scale 1" = 200'

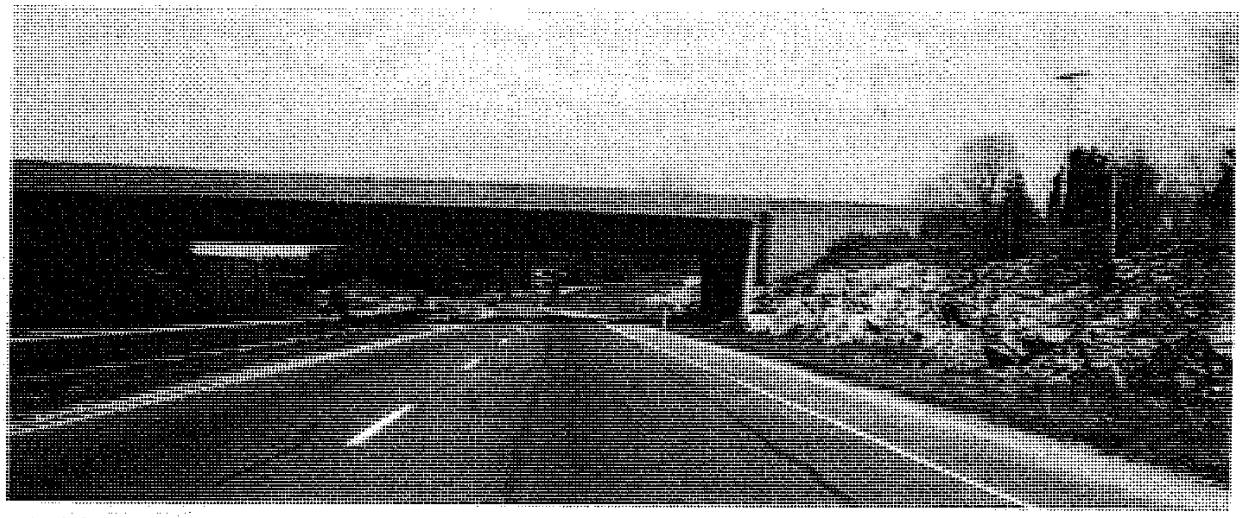
DESIGN ISSUE:

Inappropriate bridge ornamentation, major new interchange:

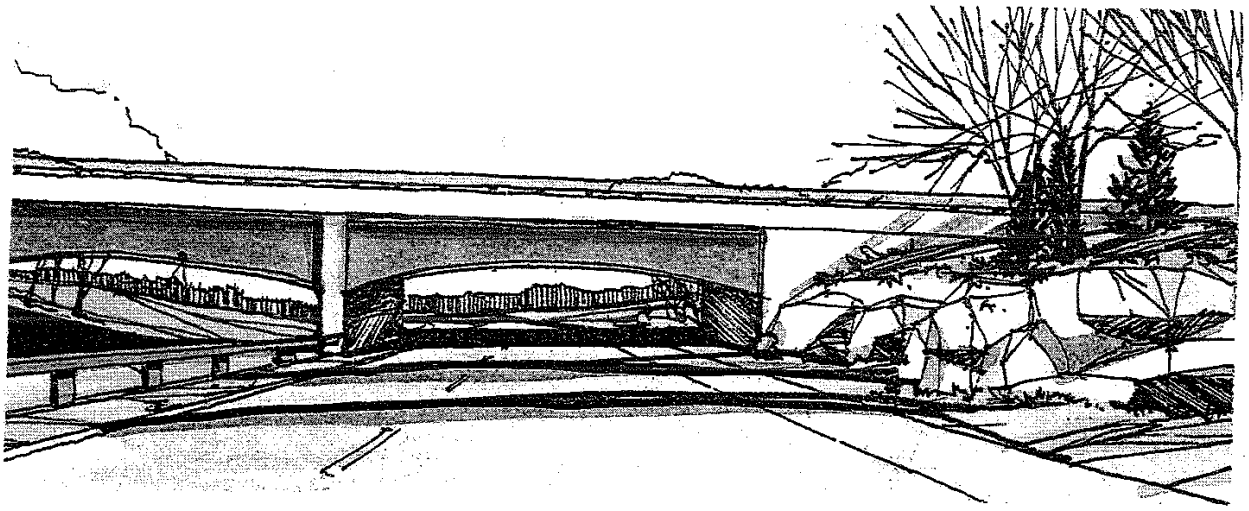
- Original metalwork panel out of scale, character and proportion to new bridge design
- Lack of architectural detailing out of character with historic bridge architecture of the Parkway
- Invasive growth at abutments
- Wide, unplanted median
- Opportunity to enhance and plant rock cut

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.5.6 1
Bridge Treatments **Architectural Detailing - New Bridges**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp455-10.2



EXISTING



OPPORTUNITY:

Enhance bridge architecture with additional detailing and addition of center bridge pier; landscape edge brought closer to roadway and rock face.

RATIONALE:

Original bridges were highly detailed and double-vaulted in areas of wide median; architectural detailing can be added that is still compatible with contemporary bridge design; landscape edge close to road consistent with overall Parkway character.

CONCERNS:

Detailing must have design integrity with contemporary style of bridge architecture; center bridge pier requires median guiderails.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.5.6 2
Bridge Treatments **Architectural Detailing - New Bridges**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp455-20.2

4.6 EDGE TREATMENTS

At noted previously in this report, much of the Parkway's character is created by its variety of spatial sequences. The contrast of open lawns and meadows against the woodlands and rock outcrops close to the roadway contributes significantly to that variety. Whether by design or simply the fact that the Parkway was constructed through farmland, extensive amounts of open land was evident in early photographs and, to a lesser extent, in the 1955 aerial photographs.

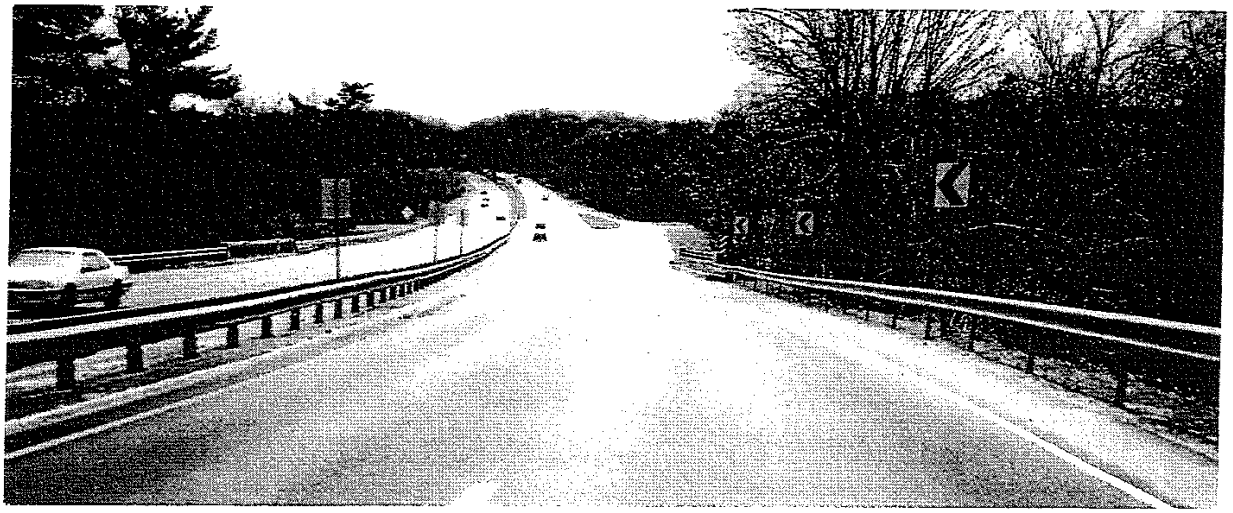
Since the 1960's with the increase of invasive vegetation, the spatial variety has been diminished. In nearly all instances where invasive growth has been identified as part of the Inventory of Existing Conditions, the invasive growth has occurred in the past 25 to 30 years. The forested edge now encroaches on the road, blocking bridge facades, eliminating places for vehicles to pull off in the event of an emergency, and causing the need to install guiderail where the "clear zone" has been violated.

Invasive vegetation should be removed in order to re-establish the lawn and meadow regime and the historic spatial variety. Views of water features, stone walls, and similar elements which are now obscured will be exposed once again by such a clearing and thinning program. Similarly, removal of vegetation increases the opportunity for grassed pull-offs. However, caution needs to be exercised in instances where wholesale clearing would create undesirable views to adjacent land uses which did not exist in the time when the Parkway was built. The privacy of nearby homes should be respected. Finally, mature species among the weed species should be retained.

In contrast to the removal of invasive vegetation, extensive plantings are called for in areas of major Parkway alteration. What are now large expanses of meadow grasses as equally monotonous as extensive woodlands. New plantings should be installed close to the road to create a meandering edge which the Parkway exhibited at its peak 30 years ago.

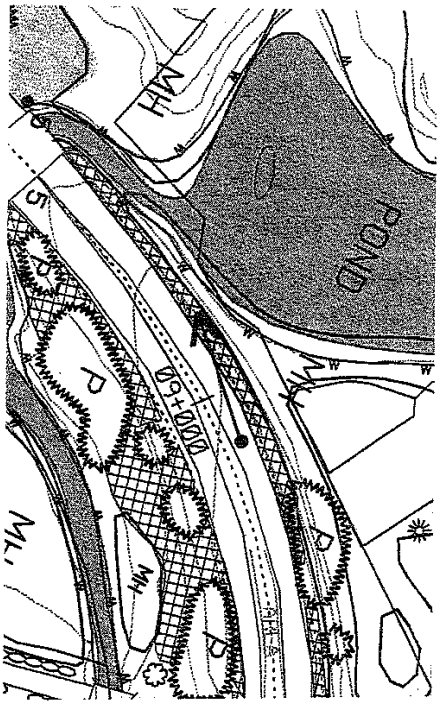
Specific actions include the following:

- Maintain a consistent pavement width by introducing lawn where roadway has been unnecessarily widened.
- Invasive vegetation should be removed or thinned to open views especially to lakes, ponds, stone walls, specimen trees, rock outcrop, and long views.
- Add evergreens to accentuate horizontal Parkway curves in road and to provide terminal views where appropriate.
- Accentuate specimen trees by clearing underbrush and reintroducing lawn.
- Reinforce forest edge with high quality deciduous, specimen trees and shrub masses which add seasonal color.
- Utilize conifers, shrub masses, and grading to screen undesirable off-site views.
- Maintain a consistent guiderail system along the Parkway where possible. Unnecessary guiderail should be removed without compromising safety. Minor regrading is appropriate to facilitate guiderail removal.
- Re-institute "Adopt-A-Ramp" program and similar community beautification efforts. However, design of improvements must be consistent with the Master Plan.



STATION 009+000

OLD TOLLGATE PLAZA AREA, LOOKING SOUTHBOUND



Scale 1" = 200'

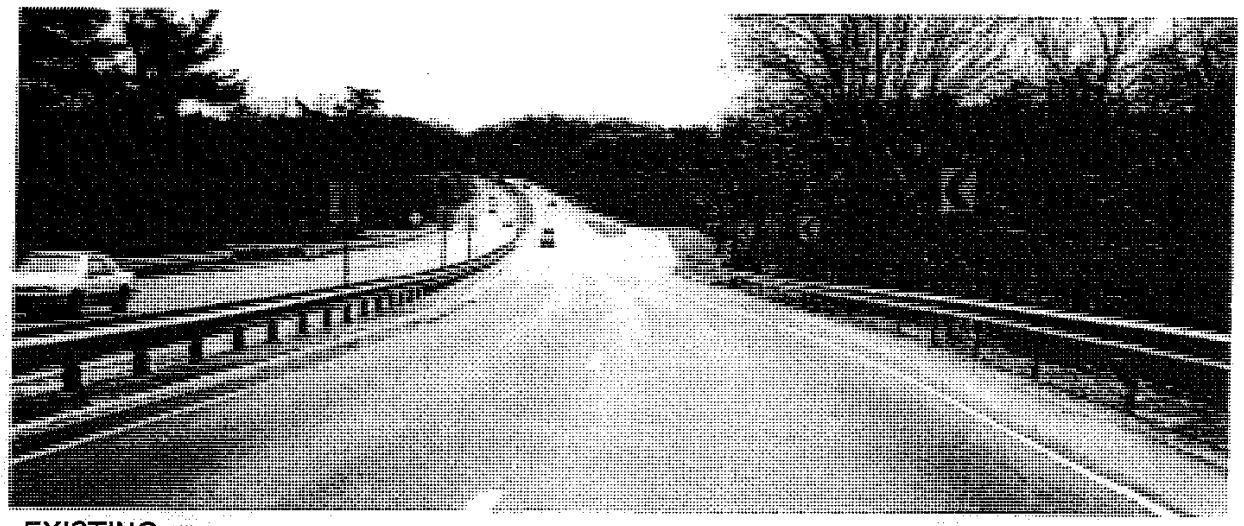
DESIGN ISSUE:

Redesign of former Tollgate Plaza area:

- Area too open; vegetation edge held back; few or no median trees
- Excessively wide pavement area
- Views to pond/watercourse obscured by invasive species
- Maintain access to Department of Transportation garage
- Opportunity to open and enhance Parkway and off-site views

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.6.1 1
Edge Treatments **Old Tollgate Plaza Area (Southbound)**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp461-1.2



EXISTING

OPPORTUNITY:

Redesign access lane to maintenance facility and add lawn area at edge. Clear invasive growth at roadway edge to open up views to ponds. Add median trees (in distance).

RATIONALE:

Decreases wide pavement areas and restores scale and proportion of the Parkway. Enhances Parkway and off-site views.

CONCERNS:

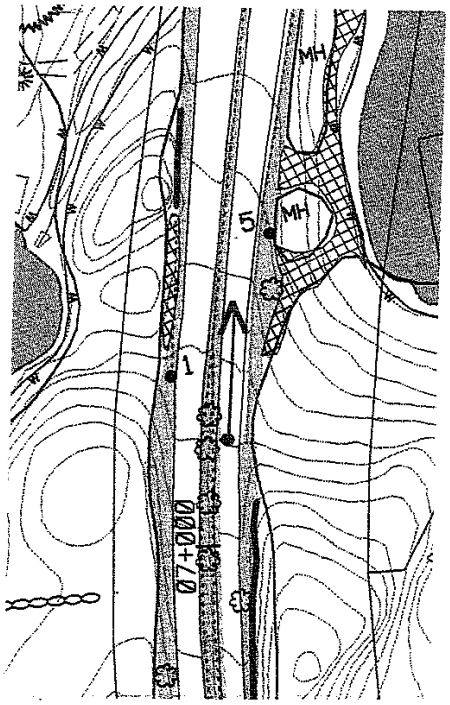
Increased lawn maintenance with addition of new turf areas. Need to field verify potential pond views during final design.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.6.1 2
Edge Treatments **Old Tollgate Plaza Area (Southbound)**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp461-2.2

STATION 007+100

OLD TOLLGATE PLAZA, LOOKING EAST



Scale 1" = 200'

DESIGN ISSUE:

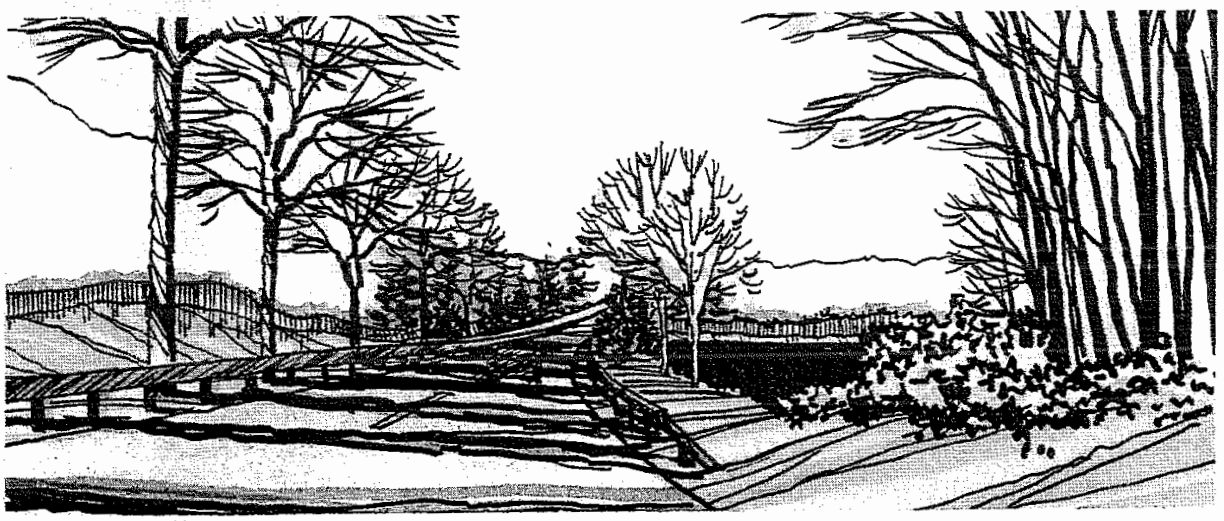
Redesign of former Tollgate Plaza area:

- Plaza area too open; vegetation edge held back; few or no median trees
- Excessively wide pavement area
- Edge heavy with invasive growth obscuring views to Tollgate Pond
- Opportunity to open and enhance views

Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.6.1 3
Edge Treatments **Old Tollgate Pond (Northbound)**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp461-3.2

EXISTING



OPPORTUNITY:

Clear invasive at roadway edge. Add median trees and a few specimen trees at edge of pond.

RATIONALE:

Opens up views to Tollgate Pond; median trees help frame long view and extend enclosure to former Tollgate Plaza area. Edge trees create "park-like" setting.

CONCERNS:

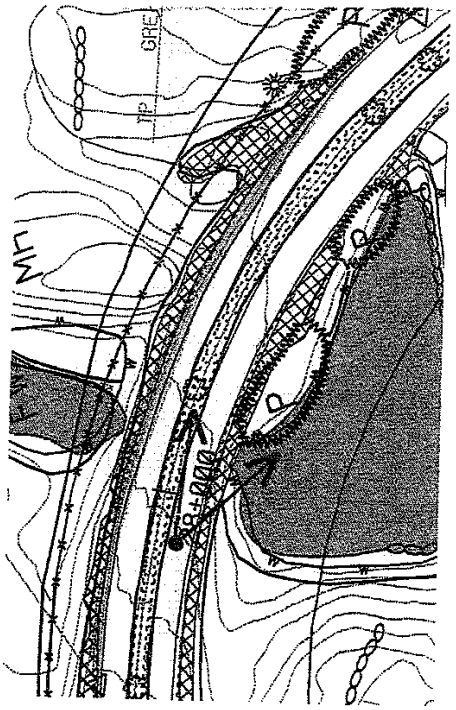
Need to continue median guiderail. "Park-like" edge trees may require additional edge guiderail.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.6.1 4
Edge Treatments **Old Tollgate Pond (Northbound)**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp461-4.2

STATION 028+000

LOOKING NORTHBOUND AT PUTNAM LAKE



Scale 1" = 200'

DESIGN ISSUE:

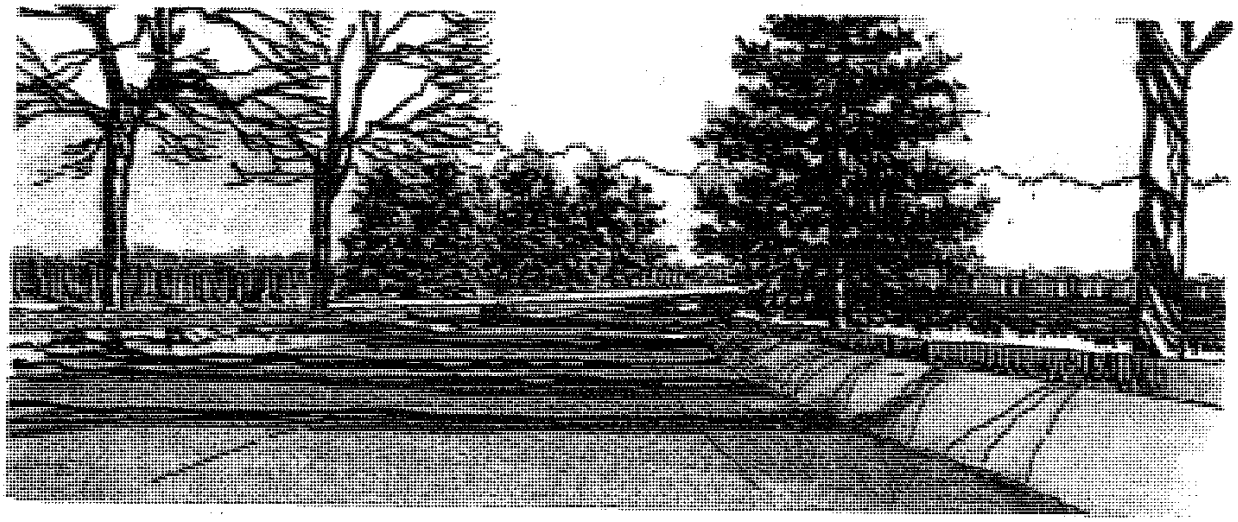
Invasive growth and obscured views:

- Invasive growth at roadway edge blocks views to Putnam Lake
- Opportunity to also enhance "leading view" with evergreen stand on outside (opposite) curve of road

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.6.2 1
Edge Treatments **Opening Views - Putnam Lake**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp462-1.2

EXISTING



OPPORTUNITY:

Clear invasive growth at lake edge. Prune lower branches of existing pines. Add evergreens on opposite curve of roadway. Add deciduous median trees.

RATIONALE:

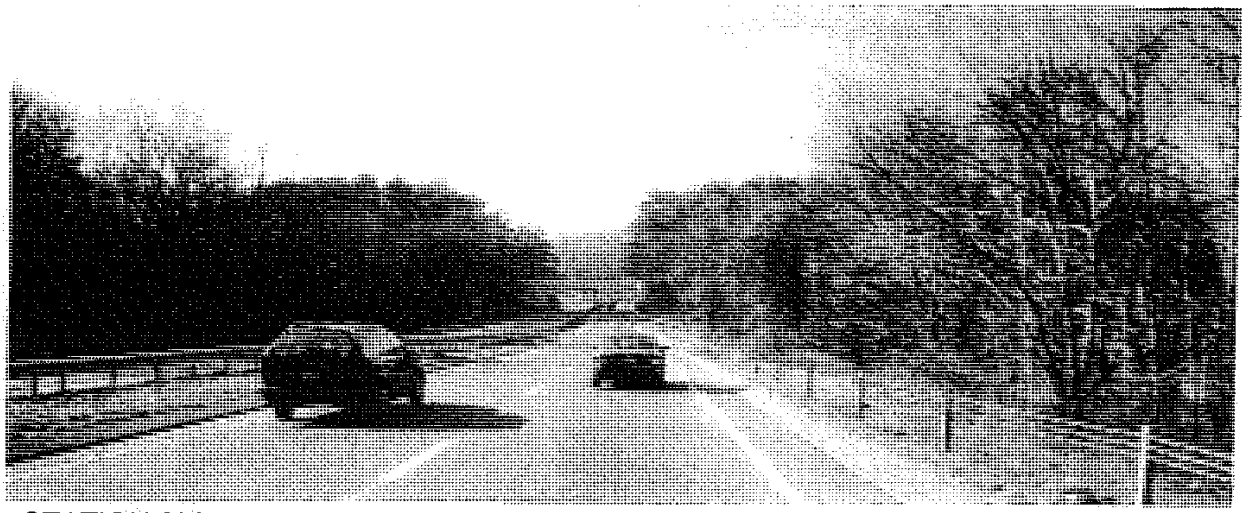
Enhances off-site views to major water feature. Median trees help frame view. Evergreens on leading curve reinforces Parkway design element.

CONCERNS:

Continual maintenance of edge to keep views open and to maintain quality of existing plant material once invasive vegetation is cleared.

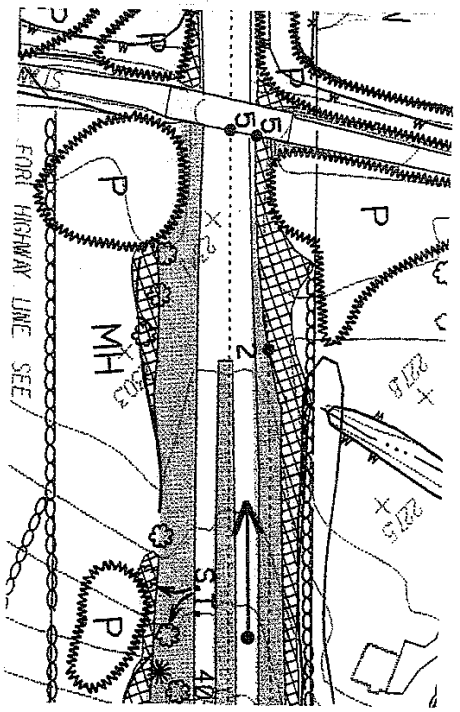
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.6.2 2
Edge Treatments **Opening Views - Putnam Lake**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp462-2.2



STATION 039+950

LOOKING SOUTH TOWARDS STANWICH ROAD BRIDGE



Scale 1" = 200'

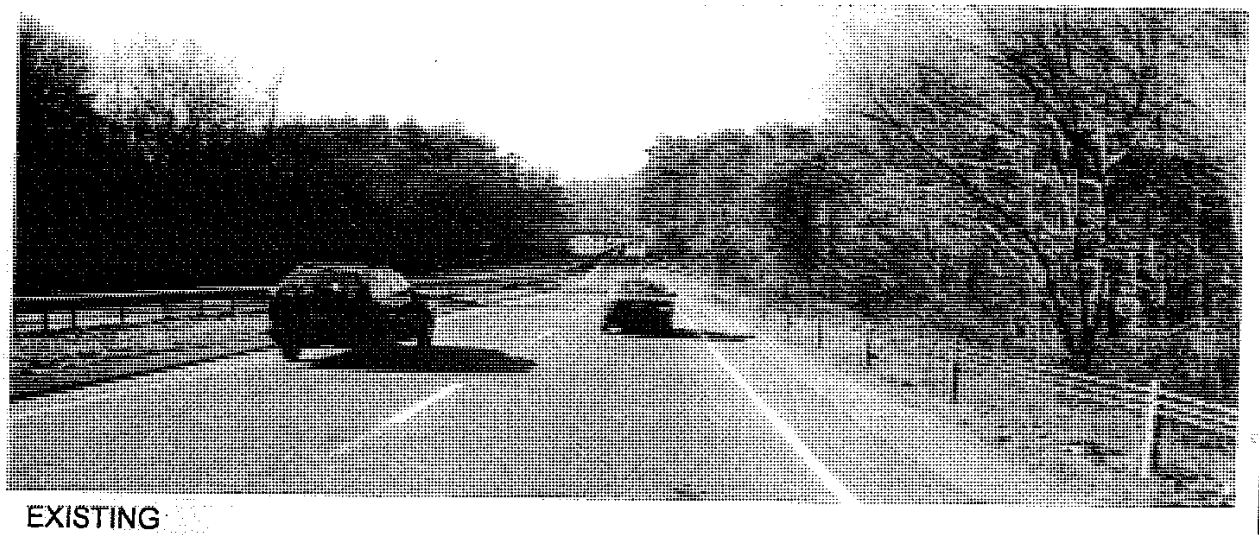
DESIGN ISSUE:

Clear invasive at edge:

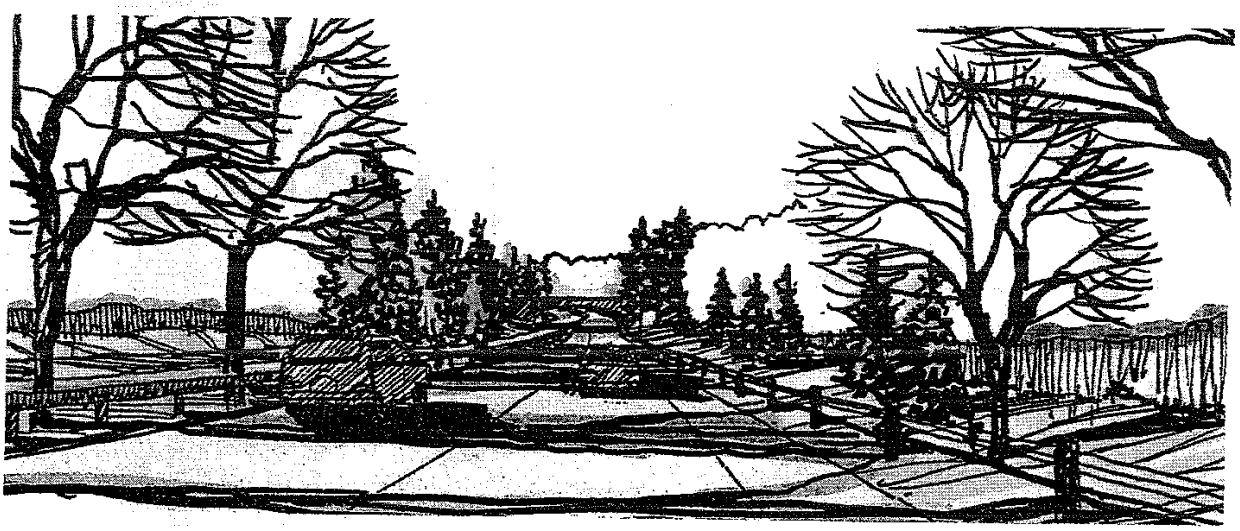
- Open lawn and old meadows taken over by undesirable species
- Full plant succession will occur if invasive vegetation is permitted to remain
- Vegetation tends to enclose the Parkway taking away "park-like" quality
- Variety of spatial experience diminished by presence of invasive species

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.6.3 1
Edge Treatment **Clear Invasive At Edge**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp463-1.2



EXISTING



OPPORTUNITY:

Clear invasive species at edge. Pull back woods at edge. Re-establish lawn; add specimen trees at edge; add median trees.

RATIONALE:

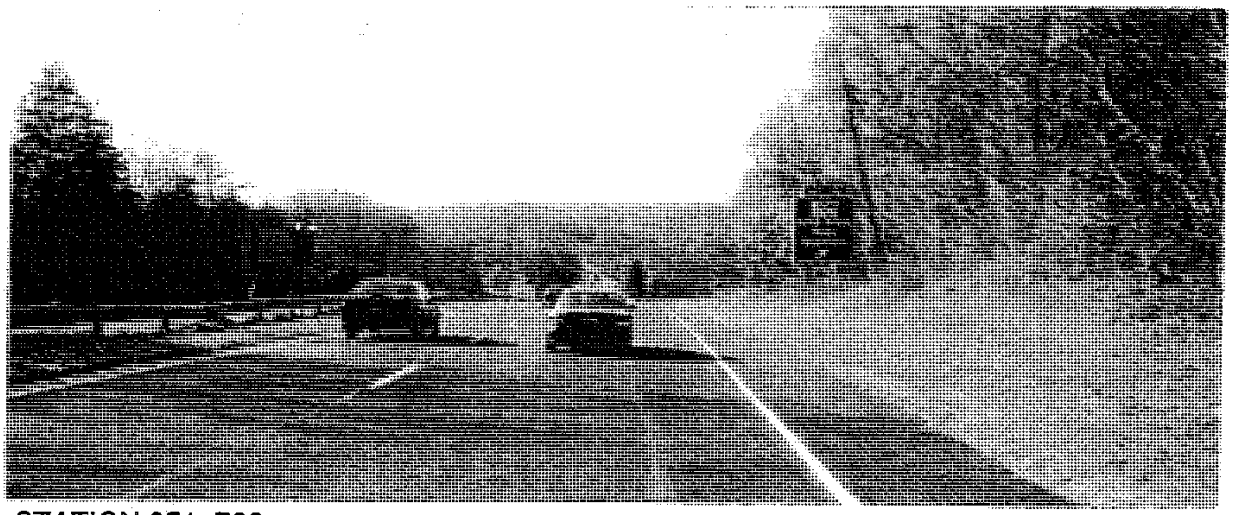
Opportunity to clear invasive species and re-establish edge at "landscape peak"; enhances and creates "park-like" setting; better approach and framed view to bridge.

CONCERNS:

Increased maintenance of new lawn area. Additional sections of guiderail needed to protect trees. Existing guiderail system to remain temporarily.

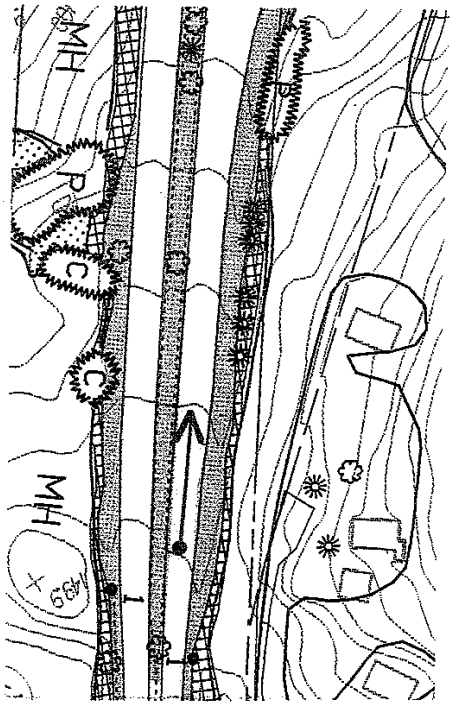
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.6.3 2
Edge Treatments **Clear Invasive At Edge**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp463-2.2



STATION 051+700

SOUTHBOUND TOWARDS EXIT 34



Scale 1" = 200'

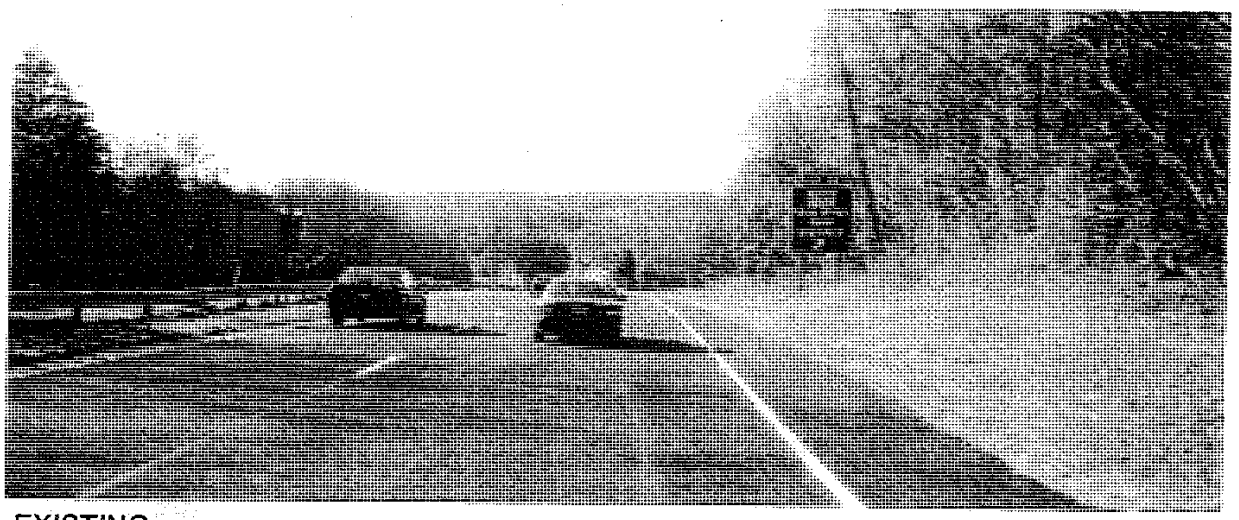
DESIGN ISSUE:

Enhance "park-like" areas:

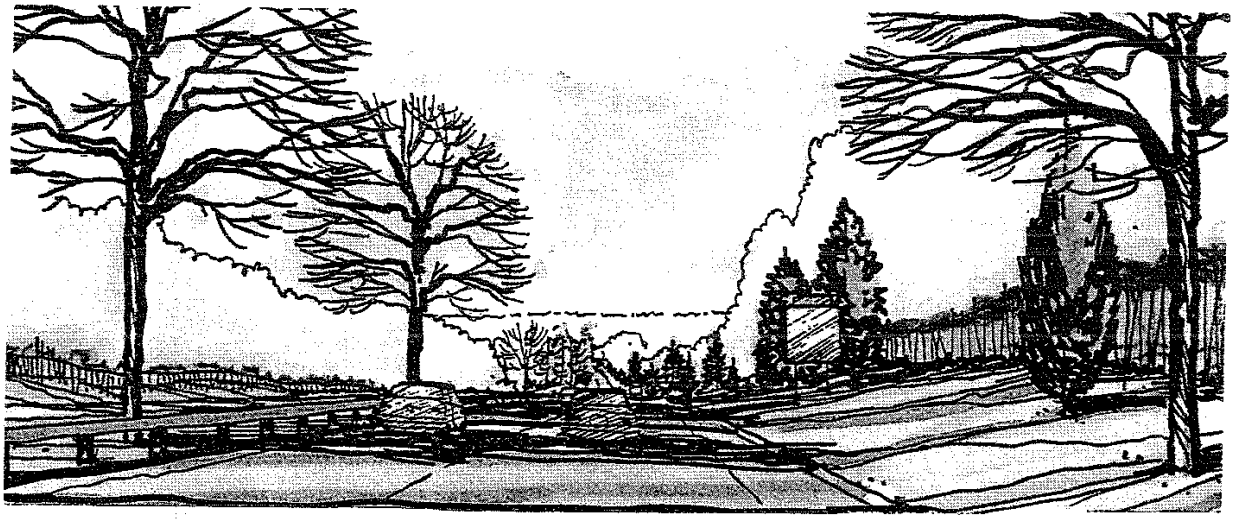
- Area too open and monotonous/uniform
- Poorly defined landscape edge
- Missed opportunity to frame/enhance long view
- Plant material used must be in context of specific site conditions

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.6.4 1
Edge Treatments **Enhance "Park-Like" Setting**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp464-1.2



EXISTING



OPPORTUNITY:

Enhance "park-like" setting by clearing invasive vegetation, pulling back and defining wooded edge; add individual and small groups of trees and occasional median trees.

RATIONALE:

Re-establishes edge at "landscape peak" breaking monotony of long open sections without full enclosure; better frames long view; reinforces "park-like" character.

CONCERNS:

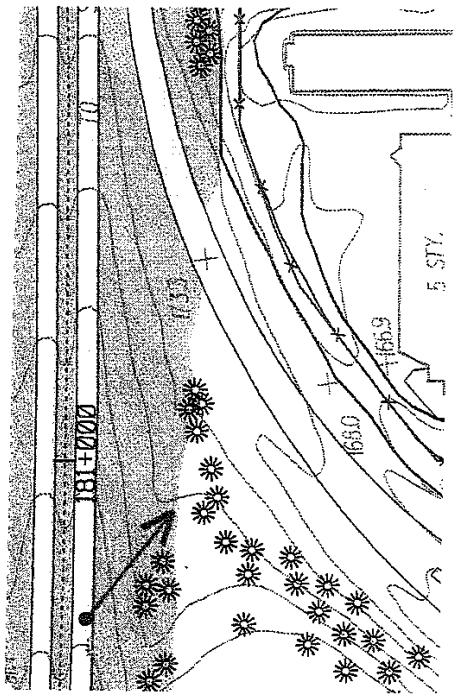
Plant material must be in context with surrounding site conditions; requires guiderail placed at edge of median and possible additional guiderail sections at outer edge.

Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.6.4 2
Edge Treatments **Enhance "Park-Like" Setting**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp464-2.2

STATION 180+800

LOOKING NORTHBOUND AT EXIT 52, ROUTE 8



Scale 1" = 200'

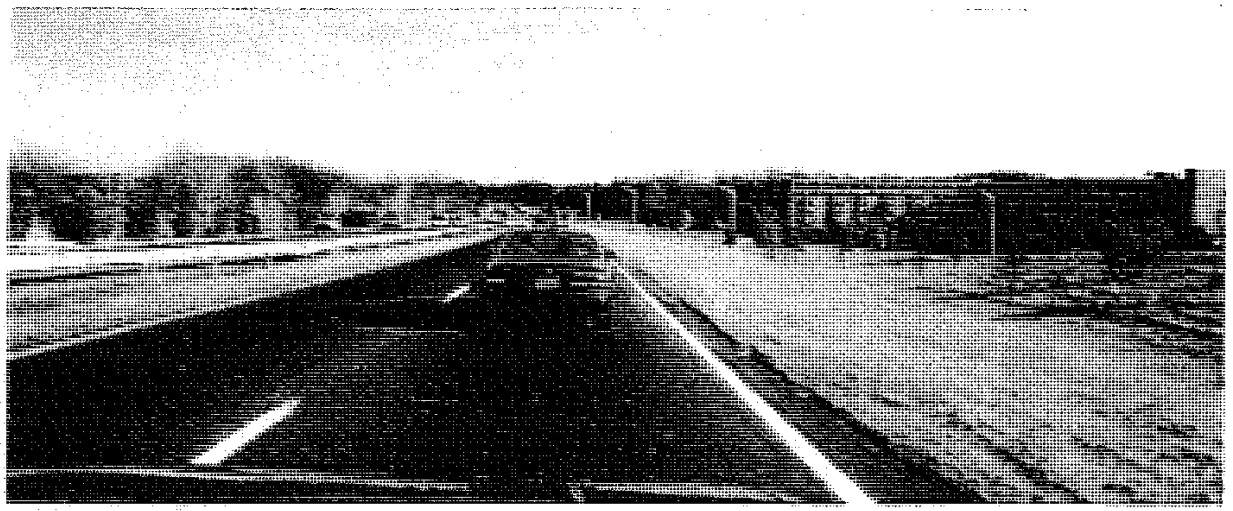
DESIGN ISSUE:

Open areas needing enclosure and screening:

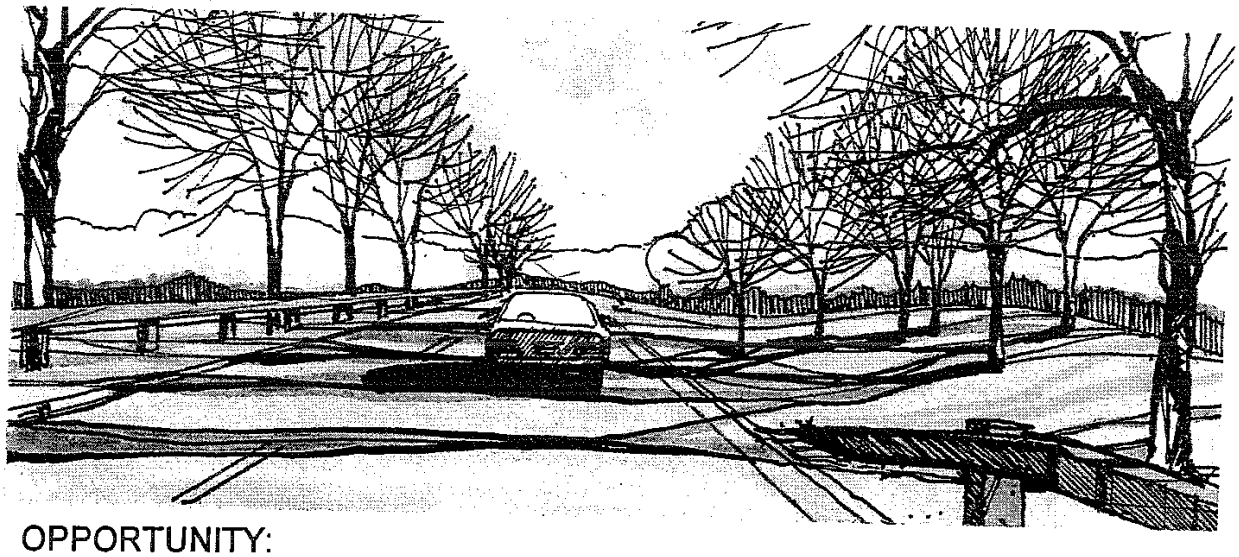
- New construction never fully relandscaped to previous character of Parkway
- Openness out of context with balance of Parkway condition
- Regrading needed to help screen off-site views
- Significant amount of lawn for maintenance
- Landscape with plant material appropriate to site conditions

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.6.5 1
Edge Treatments **Enclosure and Screening**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp465-1.2



EXISTING



OPPORTUNITY:

Enclose areas of recent alterations through regrading and reforestation. Add median trees for enclosure.

RATIONALE:

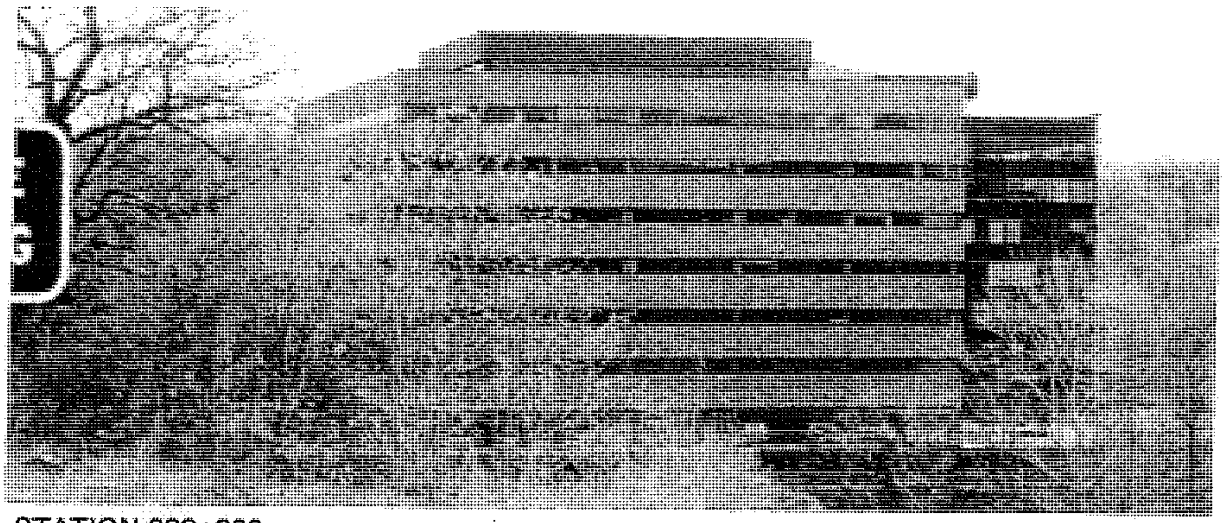
Compatible with rest of Parkway character and historic context; screens non-Parkway off-site views.

CONCERNS:

Length of time for new plantings to mature; may require some additional sections of guiderail to permit landscape to be closer to edge.

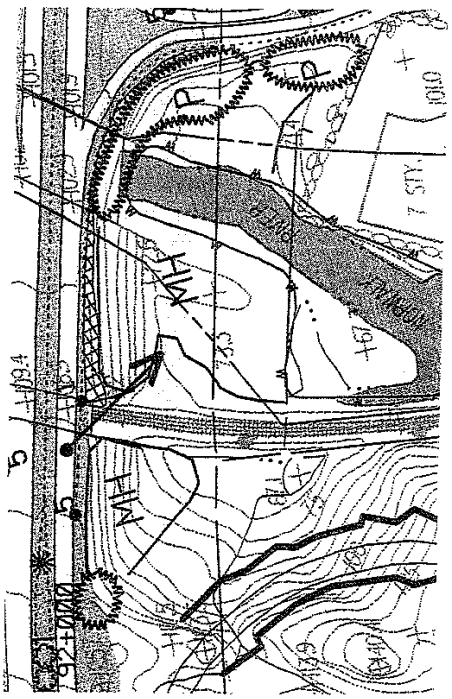
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.6.5 2
Edge Treatments **Enclosure and Screening**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp465-2.2



STATION 092+200

OFF-SITE VIEWS ADJACENT TO ROUTE 7 (NORTHBOUND)



Scale 1" = 200'

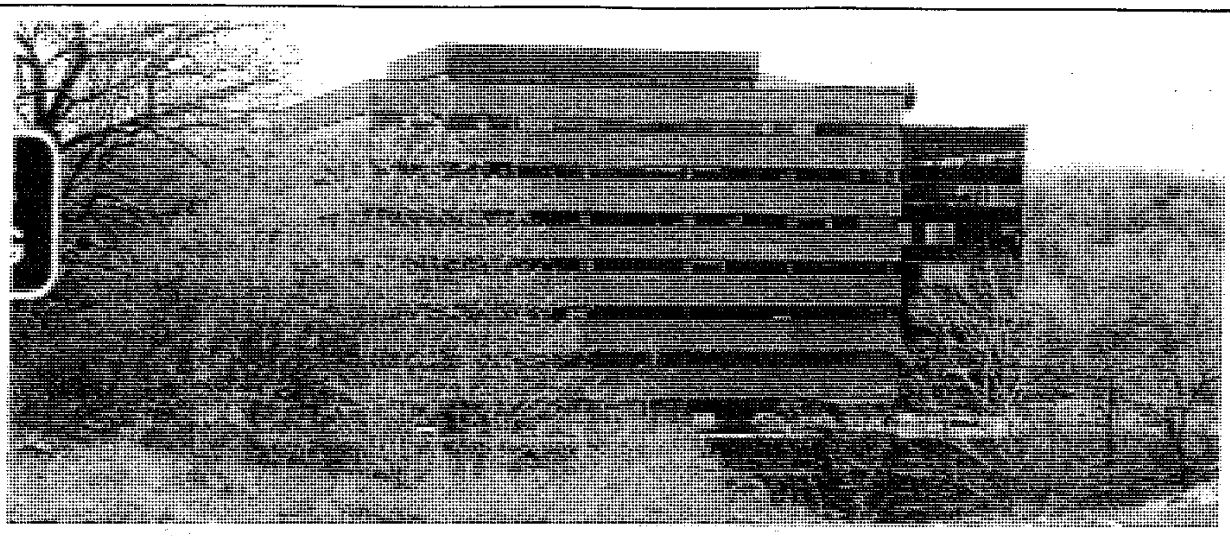
DESIGN ISSUE:

Screen off-site views:

- Areas of invasive/scrub growth
- Exposed views to adjacent development
- Regrading opportunity in conjunction with landscape screen to help conceal undesirable views
- Landscape with plant material appropriate to site and historic context
- Stagger plantings for informal layout

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.6.6 1
Edge Treatments **Screening Off-Site Views**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp466-1.2



EXISTING

OPPORTUNITY:

Raise grade and add deciduous/coniferous vegetation along face of slope.

RATIONALE:

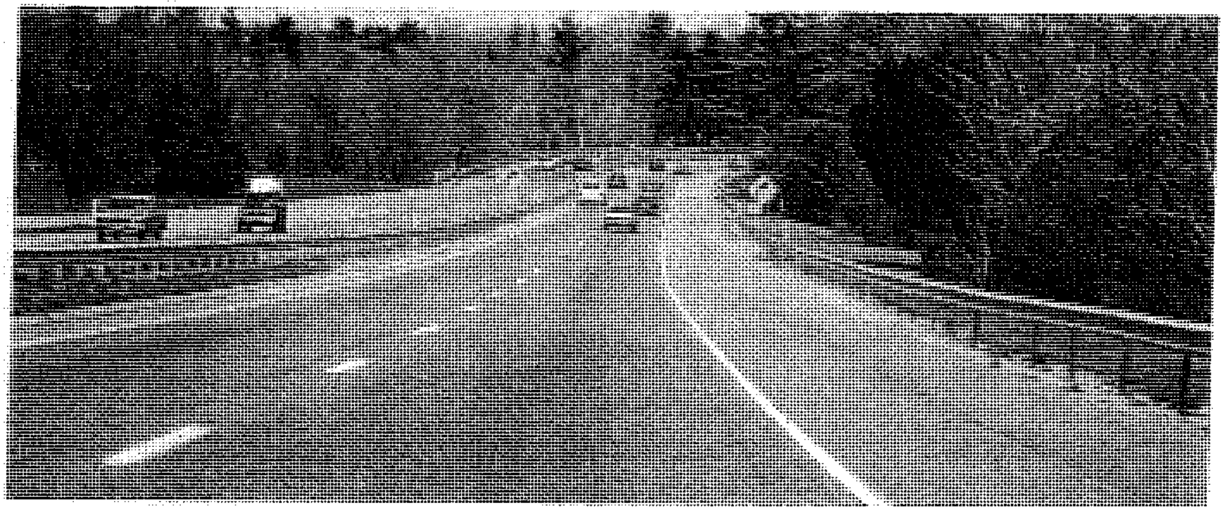
Grading will help conceal views as plant material matures; plant layout must adhere to staggered layout down face of slope to edge of roadway for more naturalized appearance.

CONCERNS:

Length of time for maturation; may need additional guiderail at edge if planting area is too narrow.

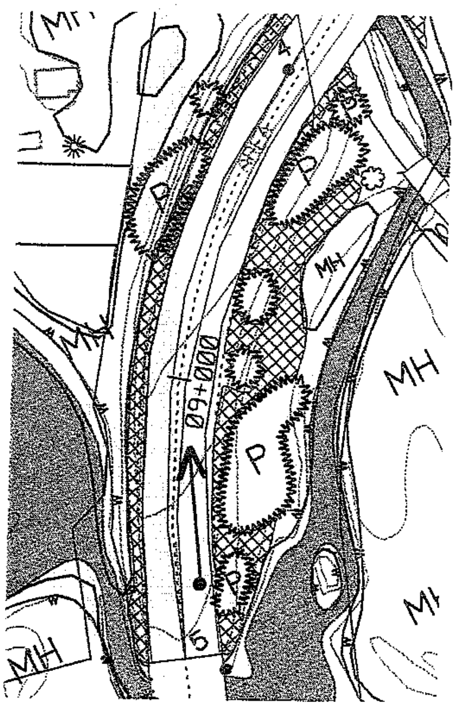
Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.6.6 2
Edge Treatments **Screening Off-Site Views**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp466-2.2



STATION 008+750

LOOKING EAST PAST FORMER TOLL PLAZA



Scale 1" = 200'

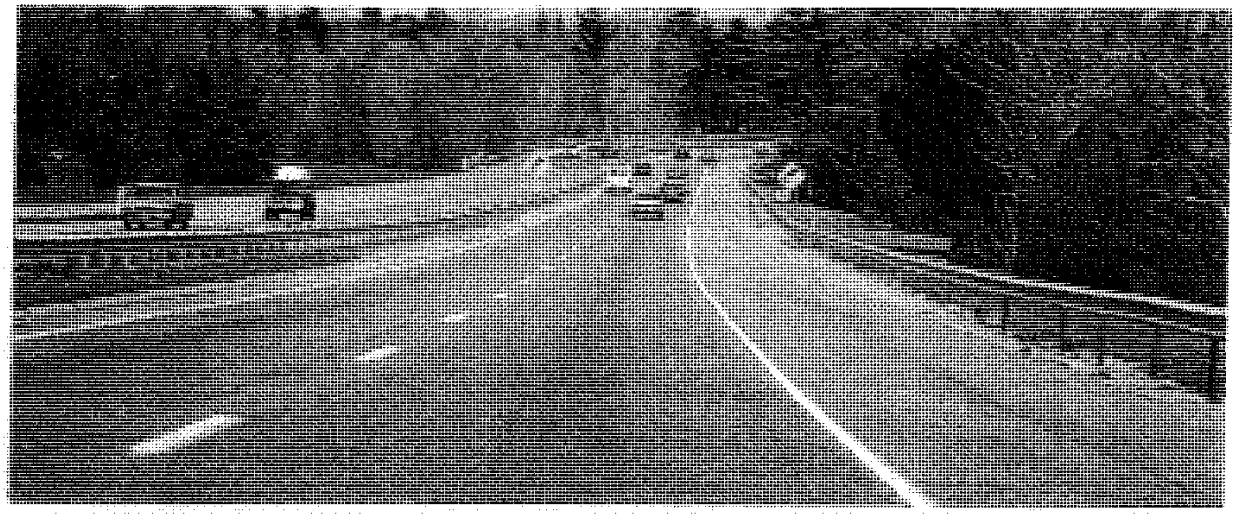
DESIGN ISSUE:

Areas of widened pavement:

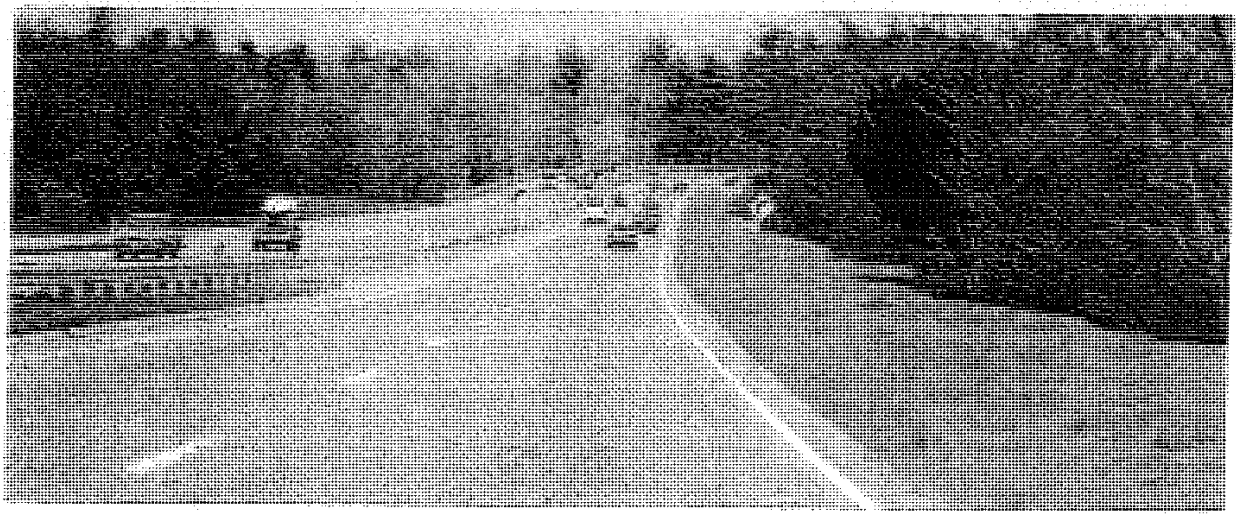
- There is a general need for pull-off opportunities along the Parkway
- Long stretches of widened pavement at the roadway edge is not consistent with either the original lane width or the Parkway character

Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.6.7 1
Edge Treatments **Safety/Pull-Off Conditions**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp467-1.2



EXISTING



OPPORTUNITY:

Replace widened pavement with lawn, remove edge guiderail.

RATIONALE:

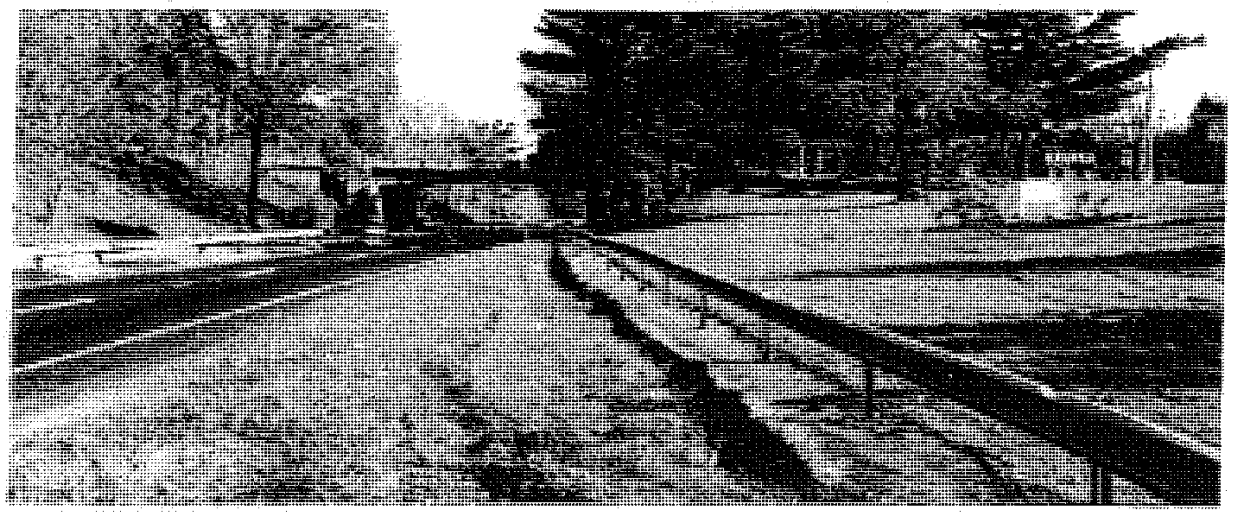
Level and open lawn area adjacent to road provides similar opportunity for pull-off, but more compatible with Parkway character. Guiderail could be removed where vegetation is kept back 30 feet from road edge.

CONCERNS:

Minimum increase in the amount of lawn to maintain.

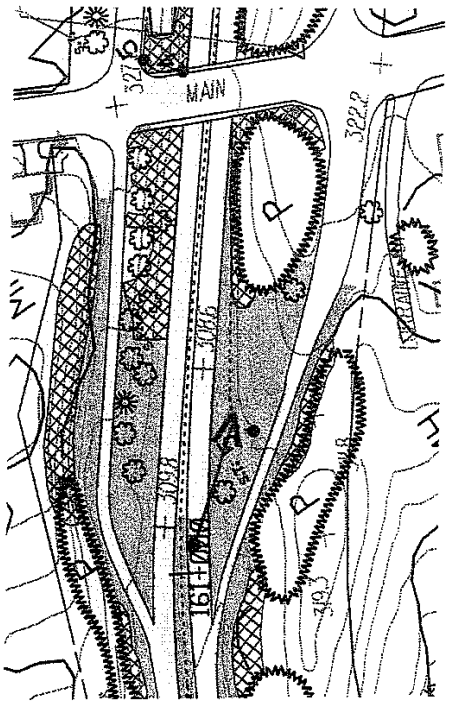
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.6.7 2
Edge Treatments **Safety/Pull-Off Conditions**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp467-2.2



STATION 161+150

MAIN STREET BRIDGE, LOOKING EAST



Scale 1" = 200'

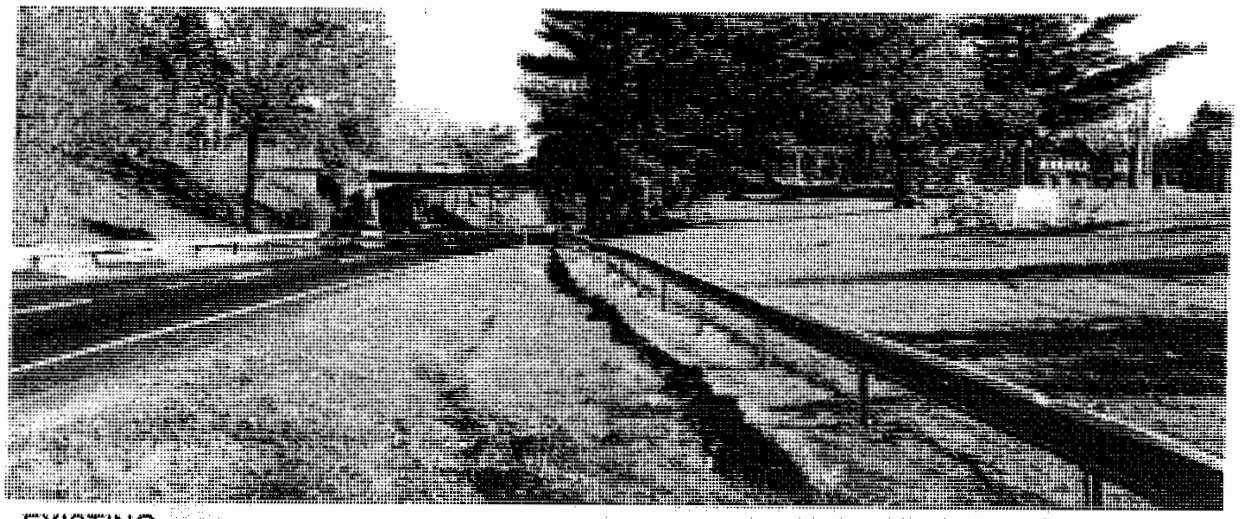
DESIGN ISSUE:

Miscellaneous details at edge of Parkway:

- Inconsistent guiderail systems
- Possibility to remove sections of edge guiderail in areas of open landscape
- Community signs out of scale and not consistent with Parkway character

Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.6.8 1
Edge Treatments **Edge Details**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp468-1.2



EXISTING

OPPORTUNITY:

Removal of miscellaneous roadside elements where not needed; re-establish lawn areas.

RATIONALE:

Remove edge details where not warranted (open grass areas) and remove inappropriate signage from main Parkway route.

CONCERNS:

Need to identify more appropriate community sign locations in final plan. Establish an "adopt-a-ramp" program for maintenance of local interchanges.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.6.8 2
Edge Treatments **Edge Details**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp468-2.2

4.7 MEDIAN TREATMENTS

The most difficult challenge in the preparation of the Landscape Master Plan for the Parkway is selecting treatment for the median. While the problem is clear, the alternative solutions of balancing safety and aesthetics are not so evident. Given the varied dimension of the median, the vegetation, and the approach to bridges, several treatment combinations are likely. Whatever the treatment, such engineering details as deflection and terminal ends of guiderail and barrier systems must be included when selecting the median protection system.

The width of the median dictates the type of guiderail and barrier system. At one end of the spectrum, concrete barriers afford the greatest amount of safety in the narrowest space while a wood post and beam system, historically and visually appropriate for the Parkway requires a greater median width.

Vegetation in the median affects the overall visual quality of the Parkway. When the Parkway was built, there was an abundance of trees and shrubs in the median. Since then, many trees have been removed; some for safety reasons while others simply have not survived the harsh roadside environment. While it is extremely desirable to replace lost vegetation and to add canopy trees, new trees can only be planted where the median has sufficient width, at least 10-12 feet wide when protected only by guiderail. When protected by a barrier, trees can be installed in a narrower median, although such a system would increase maintenance.

Maintenance of the median vegetation is extremely difficult due to the irregular guiderail pattern (the "boats") and the safety needs of the personnel responsible for maintenance. When grass is located outside the guiderail, lane closure is required during the mowing process. When selecting new vegetation, consideration must be given to the location of the material and to the level of care required. Low maintenance grasses and the use of growth retardants may be used in lieu of the planting of ground cover or standard turf grasses and the installation of mulch. Shrub plantings are less desirable due to the increase in maintenance and intolerance to the roadway pollution.

The last significant median issue concerns the surface of the concrete barrier. Consideration should be given substituting a texture for the smooth "Jersey" barrier. A "Connecticut" barrier which reflects the stonewalls of the region or is a stylized version of the Parkway bridges would be a unifying element throughout the Parkway.

The primary objective for treating the median is to develop a unified guiderail/barrier system having a standardized location in relation to the edge of pavement. Toward that end, the following measures are appropriate treatments.

- Install a steel-backed wood beam guiderail system along both sides of the median where the median is at least five feet wide. This same guiderail should be used throughout the Parkway.

- The guiderail should be placed so that the posts are approximately two feet from the pavement edge in instances where curbing is not utilized. If curbing is to be used, then the face of the guiderail should be set at the back of the curb.

- The area between the guiderail post and edge of pavement should be paved with a material such as a unit paver or textured concrete in order to reduce maintenance.

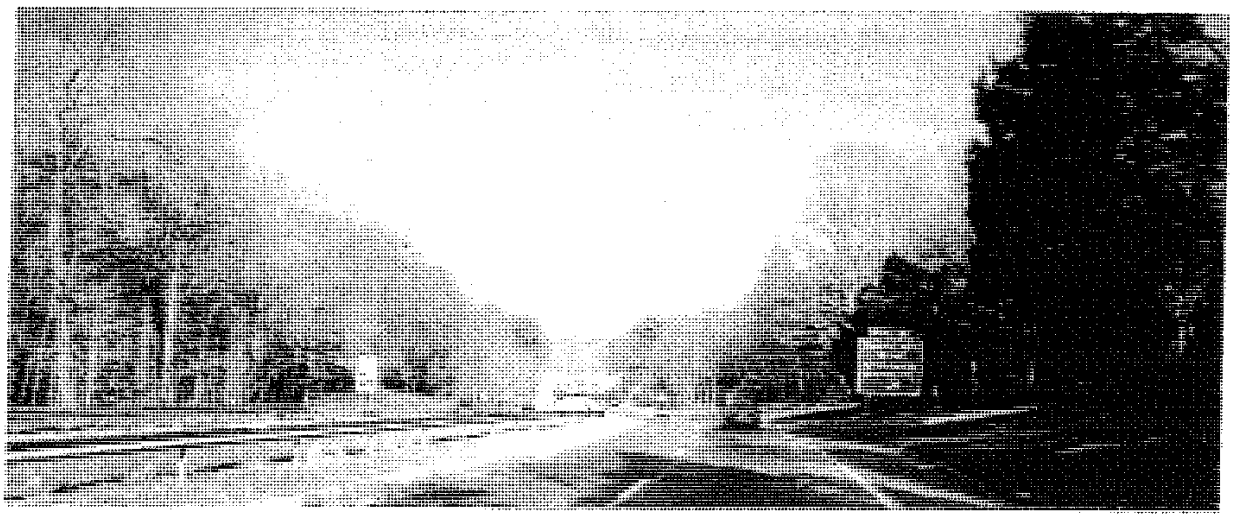
- A median barrier should be installed under all single-span bridges and extended to a point where the median becomes sufficiently wide to accommodate the guiderail system.

- The ground plane should be planted with cool-weather grasses (e.g. fescues) to minimize maintenance. Consideration should be given to using growth retardents on well-established lawn areas to further reduce maintenance.

- Where vegetation is deemed to be desirable in the median, the selected species should be compatible with the existing vegetation on each side of the Parkway.

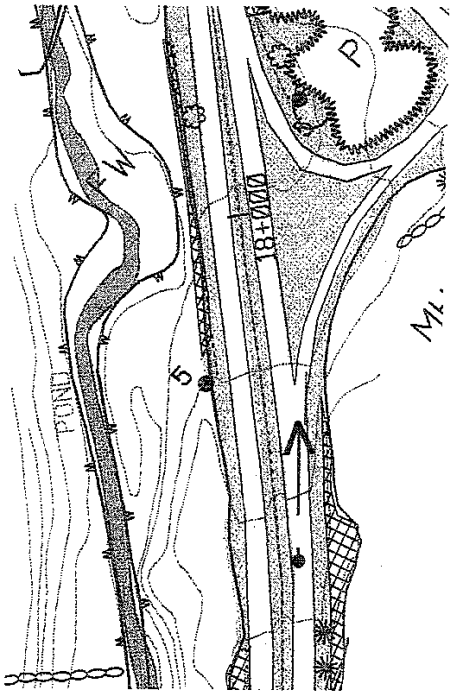
- Hardy, low-maintenance herbaceous plant material should be installed where the median width becomes too narrow for trees to be planted or where mowing machines cannot be efficiently utilized, particularly in transition areas adjacent to barriers.

o31mp4.2



STATION 017+800

ROUND HILL ROAD LOOKING EAST



Scale 1" = 200'

DESIGN ISSUE:

Reduction of median trees; long open sections of median:

- Median trees have been removed and never replaced
- Long open sections of median lack variety of spatial sequence
- Use of trees in median consistent with original planting scheme for Parkway
- Plant type must be compatible with nearby plant community
- New median trees require new guiderail at edge of pavement

Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.7.1 1
Median Treatments **Vegetation - Tree Addition/Framing Views**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp471-1.2

EXISTING

OPPORTUNITY:

Add trees to median where there is adequate width.

RATIONALE:

Bridge approach needs framing. Median trees break up the monotony of long stretches of open areas, reinforcing design identity of the Parkway.

CONCERNS:

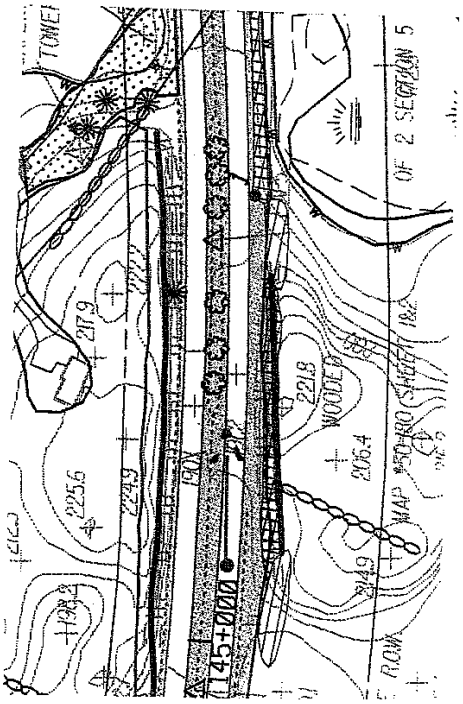
Requires new guiderail at edge of median; increase in maintenance between guiderail.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.7.1 2
Median Treatment **Vegetation - Tree Addition/Framing Views**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp471-2.2

STATION 145+000

LOOKING EAST



Scale 1" = 200'

DESIGN ISSUES:

Reduction of median trees:

- Median trees removed and never replanted
- Need median trees to complete and enhance areas of enclosure
- Plant palette must be consistent with nearby plant community, i.e. carry the same vegetation across the roadway, including the medians

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.7.1 3
Median Treatments **Vegetation - Enclosure**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp471-3.2

EXISTING

OPPORTUNITY:

Add median trees to finish enclosure where there is sufficient width.

RATIONALE:

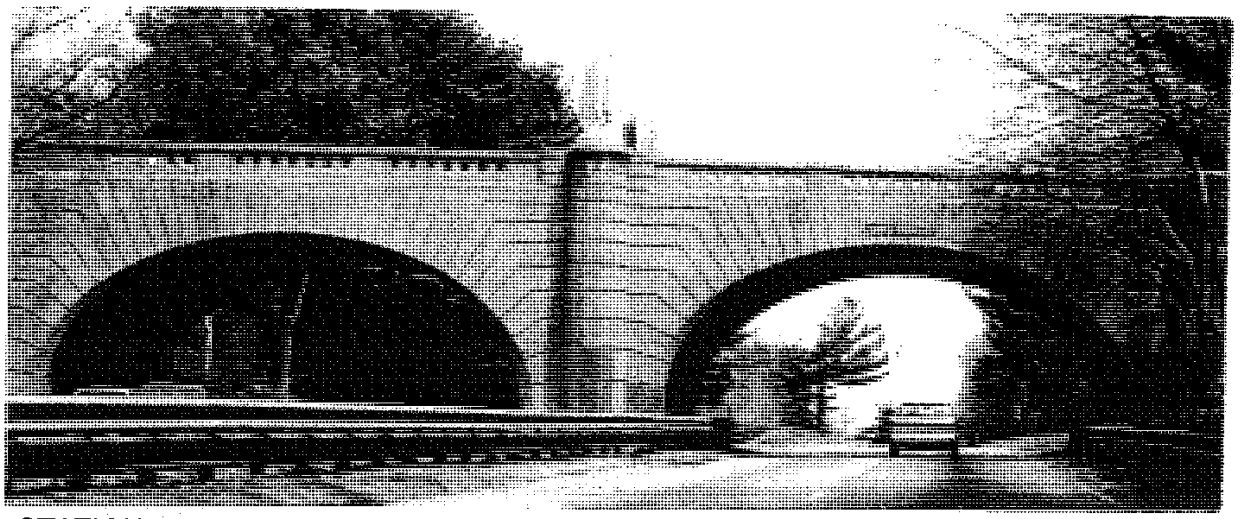
Historic precedent for trees in the median; already an area of enclosure and woods.

CONCERNS:

Plant material must be consistent with surrounding context of plant material for both sides of road.

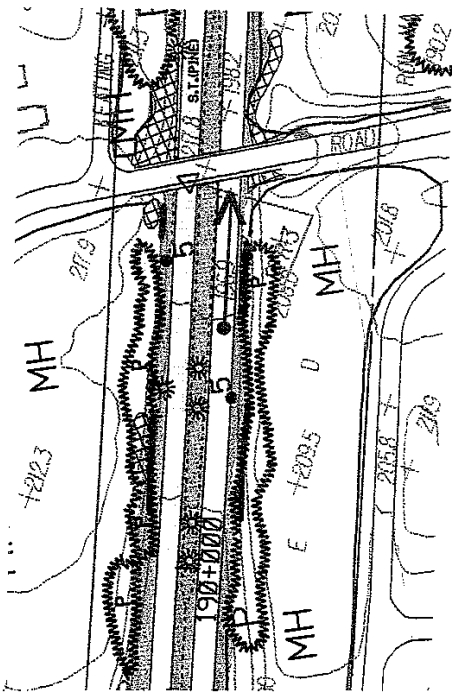
Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.7.1 4
Median Treatments **Vegetation - Enclosure**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp471-4.2



STATION 190+300

LOOKING NORTH TO JAMES FARM ROAD BRIDGE



Scale 1" = 200'

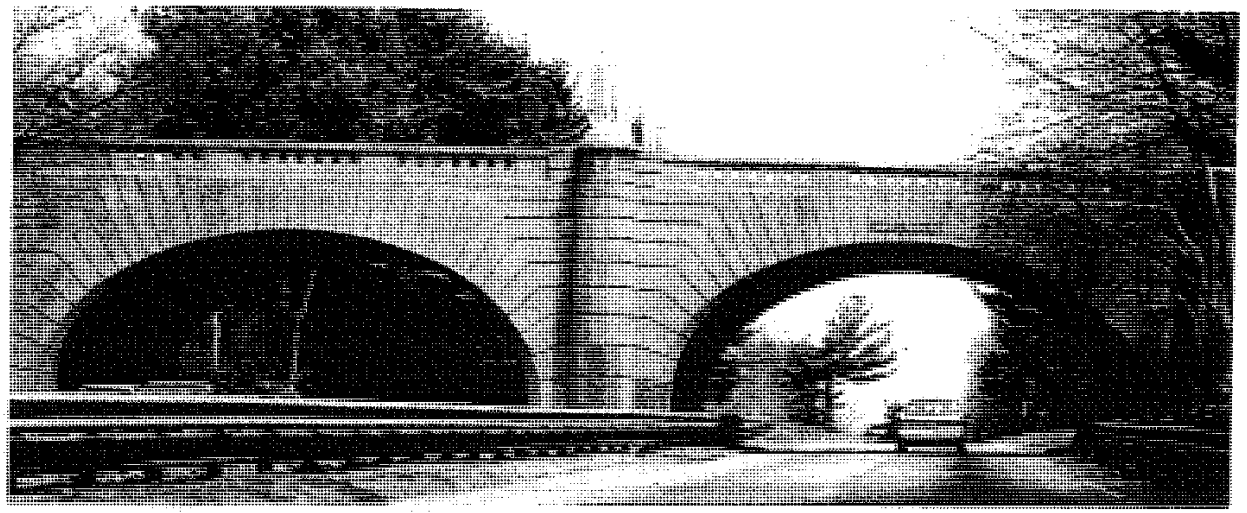
DESIGN ISSUE:

Median guiderail treatment at double arched bridges (areas of wide median):

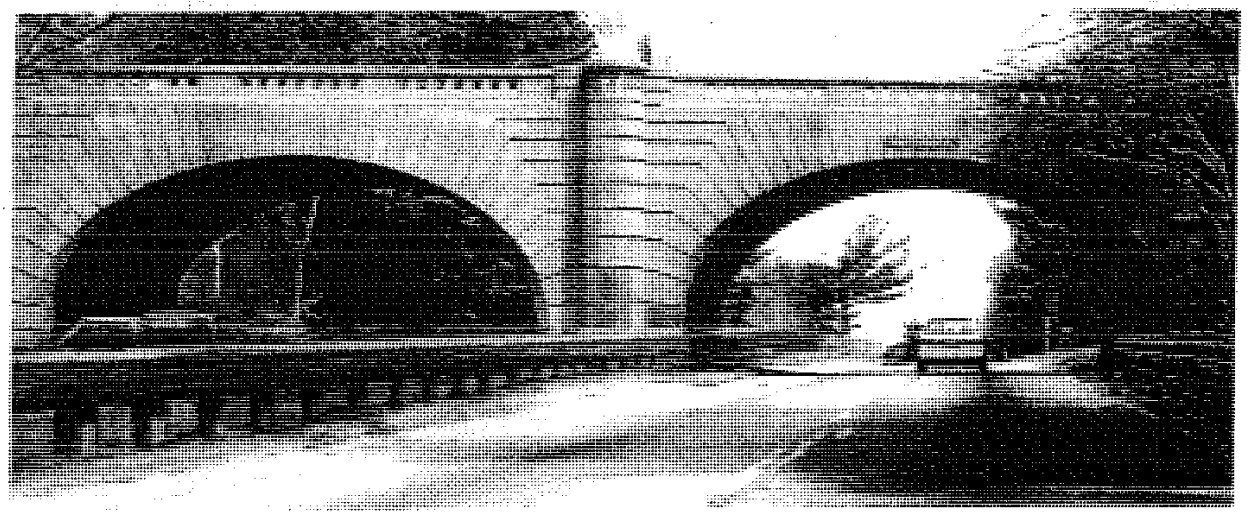
- Type shown not consistent with historic Parkway character or earlier Parkway guiderail design
- Type shown not consistent with bridge architecture
- No consistent guiderail type at bridge medians throughout Parkway
- Safety concerns and protection for cars from striking center bridge pier
- Galvanized finish creates a bright or glaring surface in sunlight
- Significant maintenance behind guiderail required

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.7.2 1
Median Treatments **Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-1.2



EXISTING



OPPORTUNITY:

Steel-backed wood beam with wood posts.

RATIONALE:

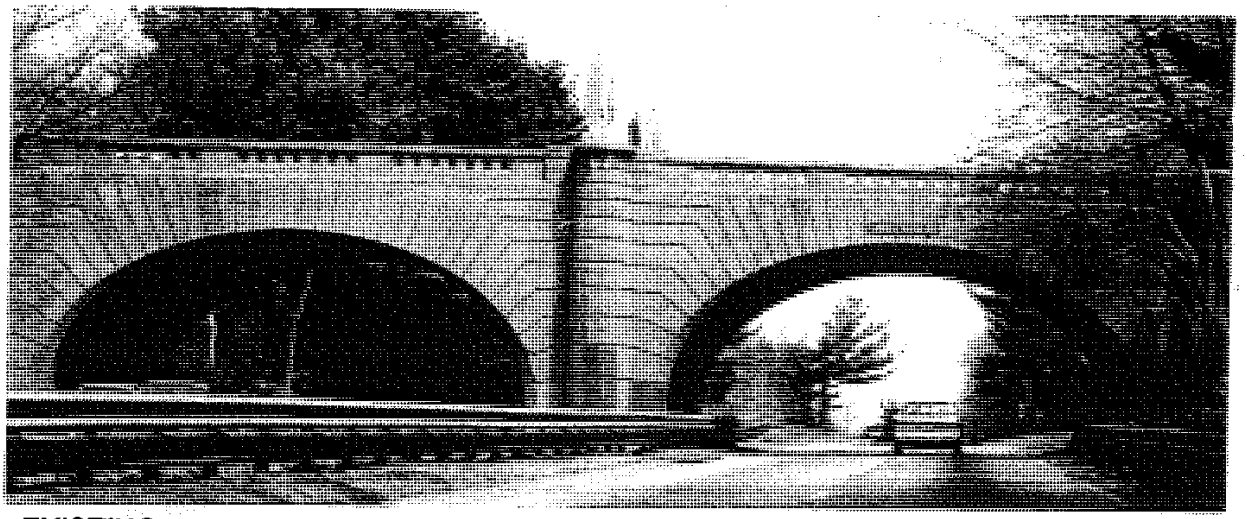
More consistent with original Merritt Parkway design; more overall consistency with Parkway character and image.

CONCERNS:

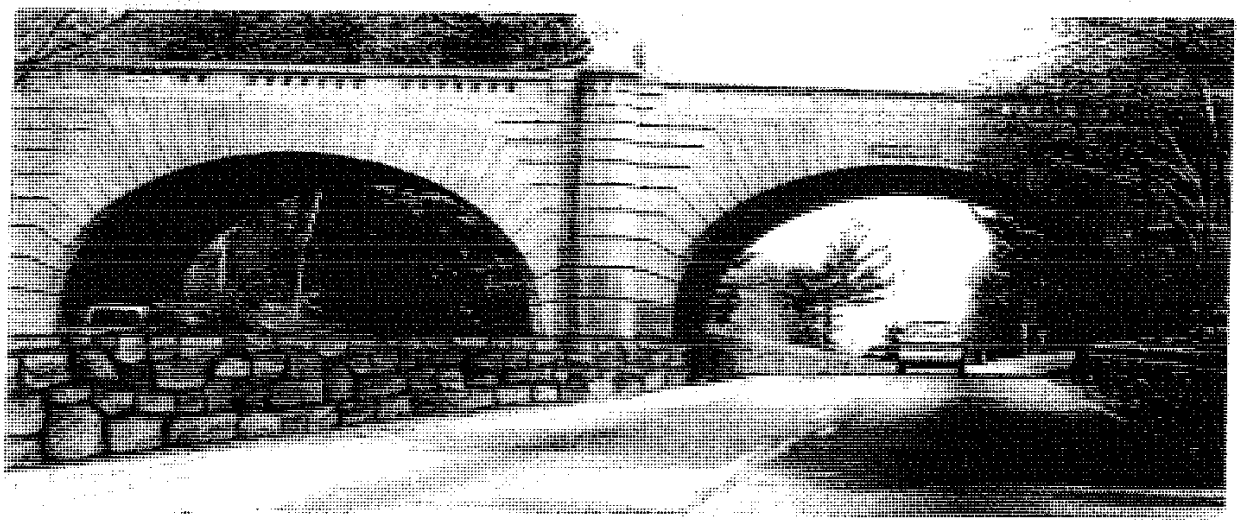
Design and bulk of guiderail needs to incorporate all necessary safety criteria. Can only be utilized where median width is eight feet to provide for deflection. High cost to install and maintain.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.7.2 2
Median Treatments **Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-3.2



EXISTING



OPPORTUNITY:

"Faux" Connecticut stone wall barrier having uniform design throughout the Parkway utilized at all bridge underpasses.

RATIONALE:

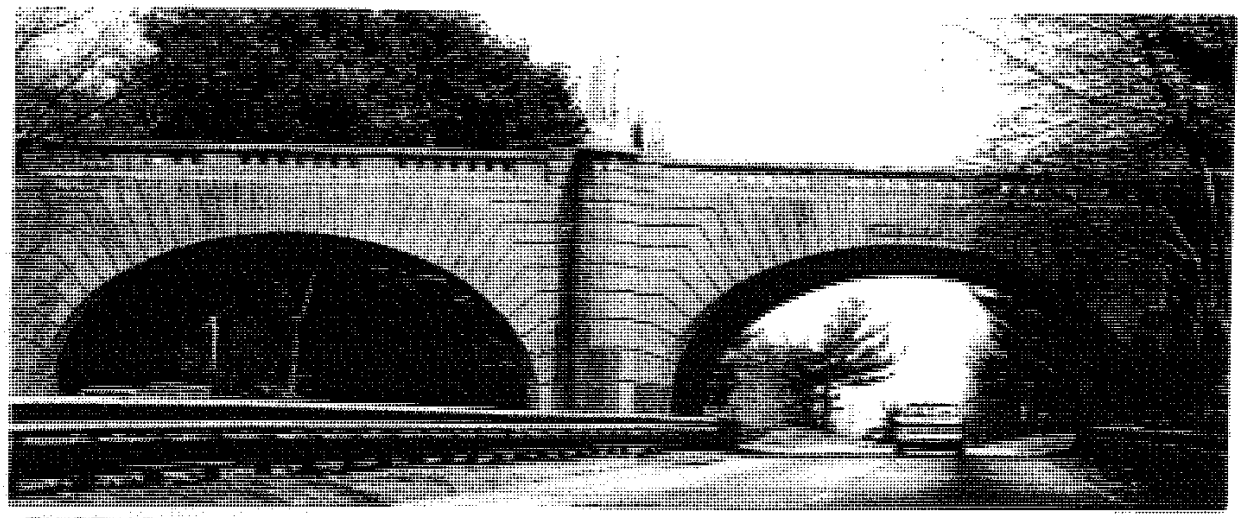
Design is generally more "park-like" than plain barrier. Barrier design satisfies safety issues; consistent barrier style throughout median.

CONCERNS:

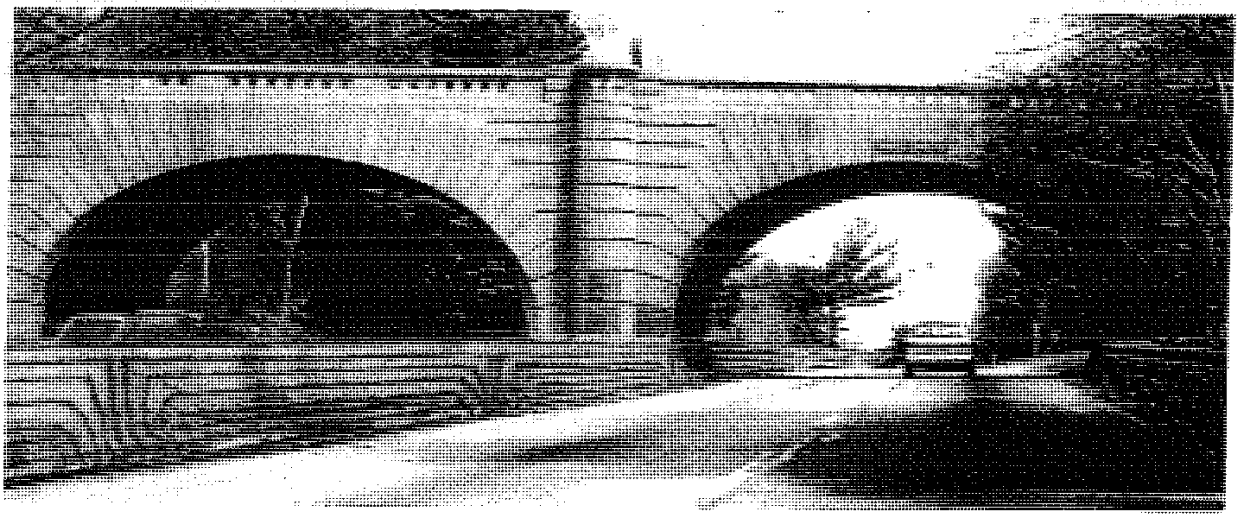
"Faux" Connecticut stone wall not as visually compatible with all bridge designs. Potentially higher cost of installation.

Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.7.2 3
Median Treatments **Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-5.2



EXISTING



OPPORTUNITY:

Designed concrete barrier having standard height unique to each bridge (both northbound and southbound approaches).

RATIONALE:

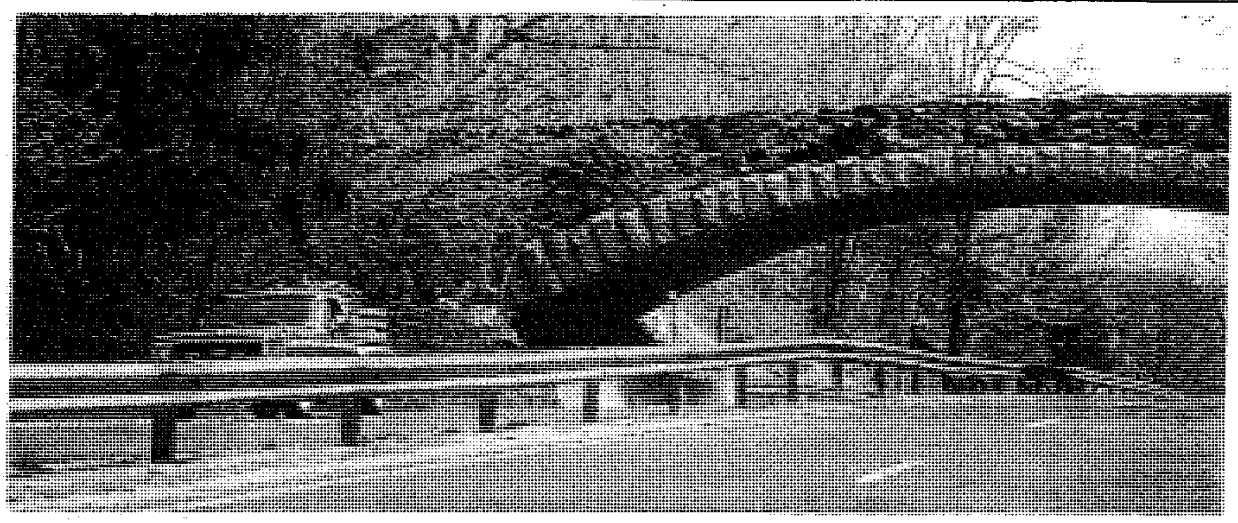
Reinforces unique architectural design of each bridge and enhances overall identity of Parkway.

CONCERNS:

Potential high cost design solution. Extension of the design detailing could dilute the overall visual impact of the bridge's architecture.

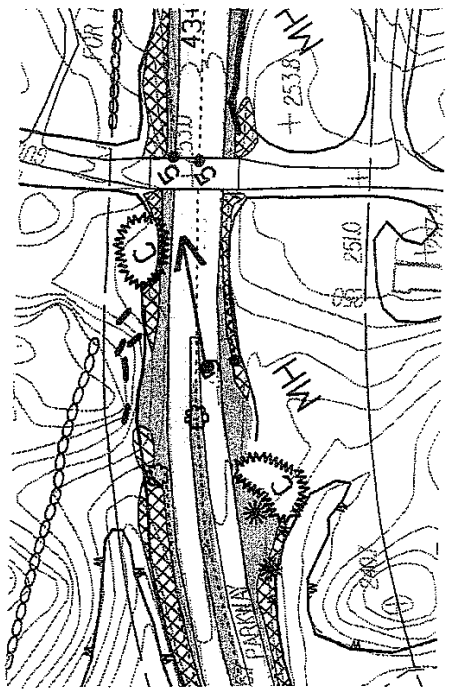
Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.7.2 4
Median Treatments **Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-6.2



STATION 042+500

GUINEA ROAD BRIDGE, LOOKING EAST



Scale 1" = 200'

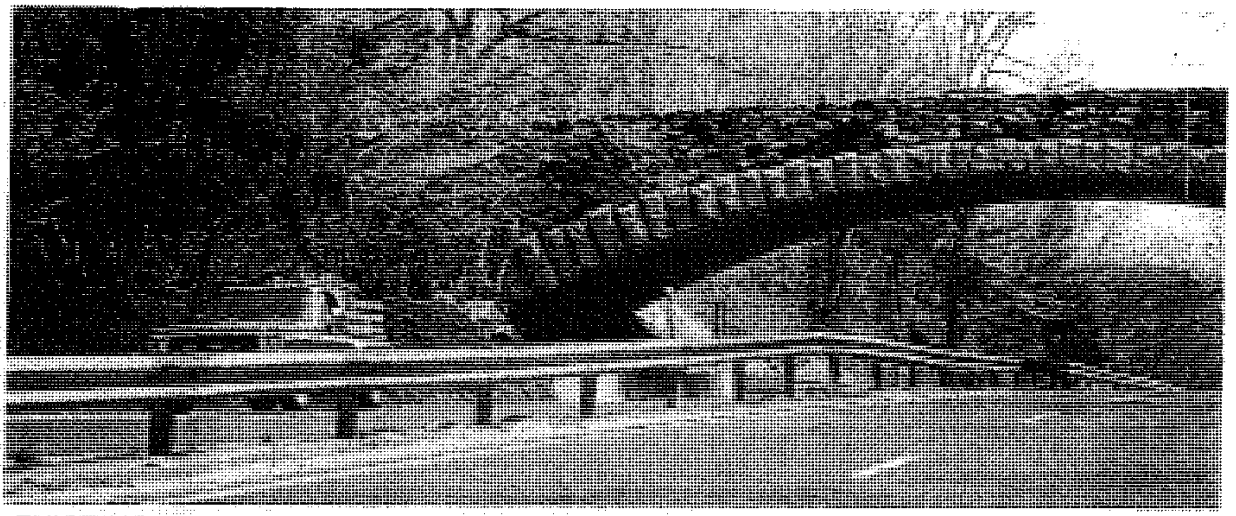
DESIGN ISSUE:

Median guiderail treatment at bridge underpasses with narrow median:

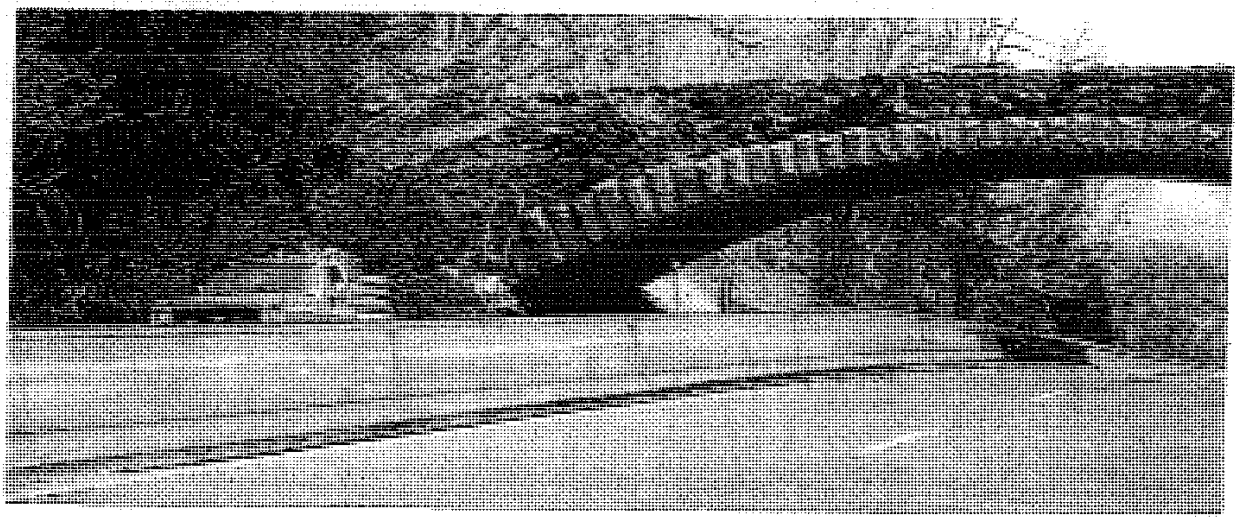
- Type shown not consistent with historic Parkway character or earlier Parkway guiderail design
- Type shown not consistent with bridge architecture
- Median guiderail not consistent throughout length of Parkway
- Safety and barrier concerns due to narrow median under bridge
- Galvanized finish creates a bright or "glaring" surface in sunlight
- Metal beam rail shows dents and moves out of alignment when struck
- High level of maintenance depending on ground surface under guiderail
- Barrrier/guiderail must be designed to meet deflection and terminal standards.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.7.2 5
Median Treatments **Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-7.2



EXISTING



OPPORTUNITY:

Precast concrete barrier (plain/standard).

RATIONALE:

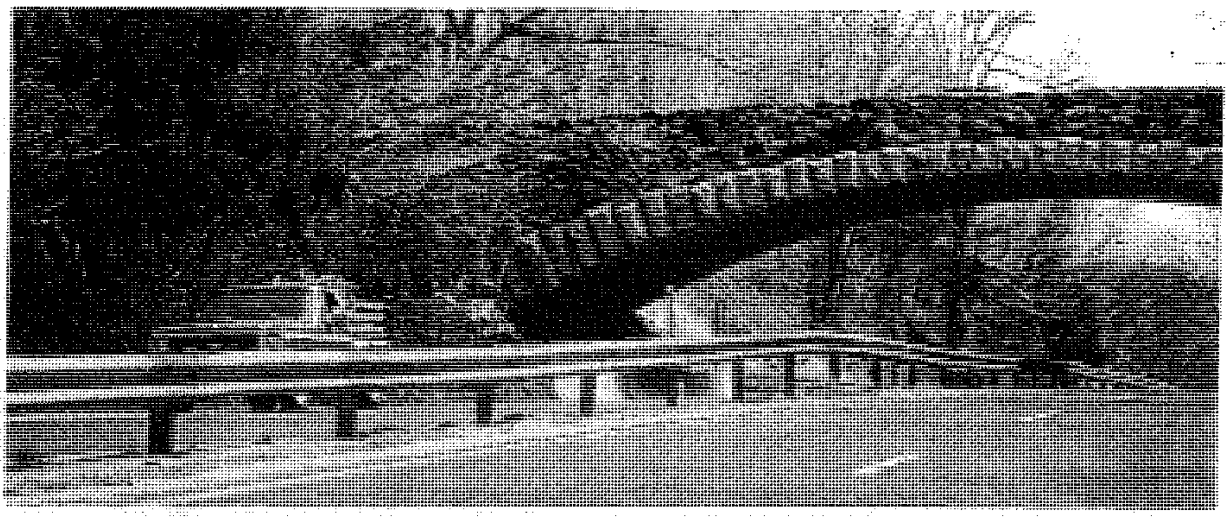
Addresses need for safety barrier in areas of narrow median (zero deflection).

CONCERNS:

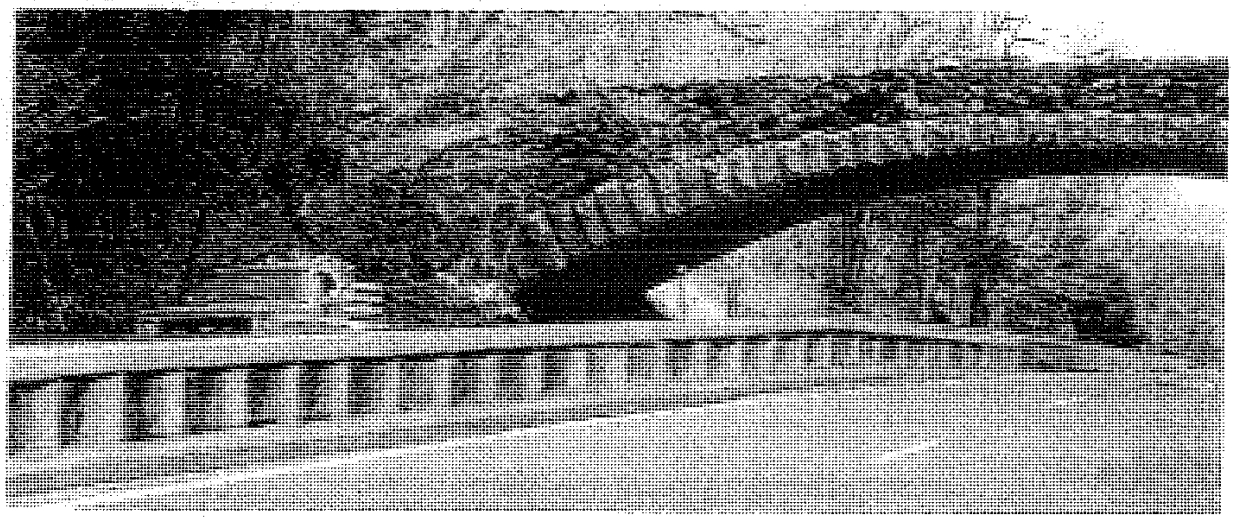
Not in keeping with Parkway character or with historic guiderail design; visually detracts from "park-like" setting.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.7.2 6
Median Treatments **Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-44.2



EXISTING



OPPORTUNITY:

A concrete barrier having a uniform design throughout the Parkway utilized at all bridge underpasses.

RATIONALE:

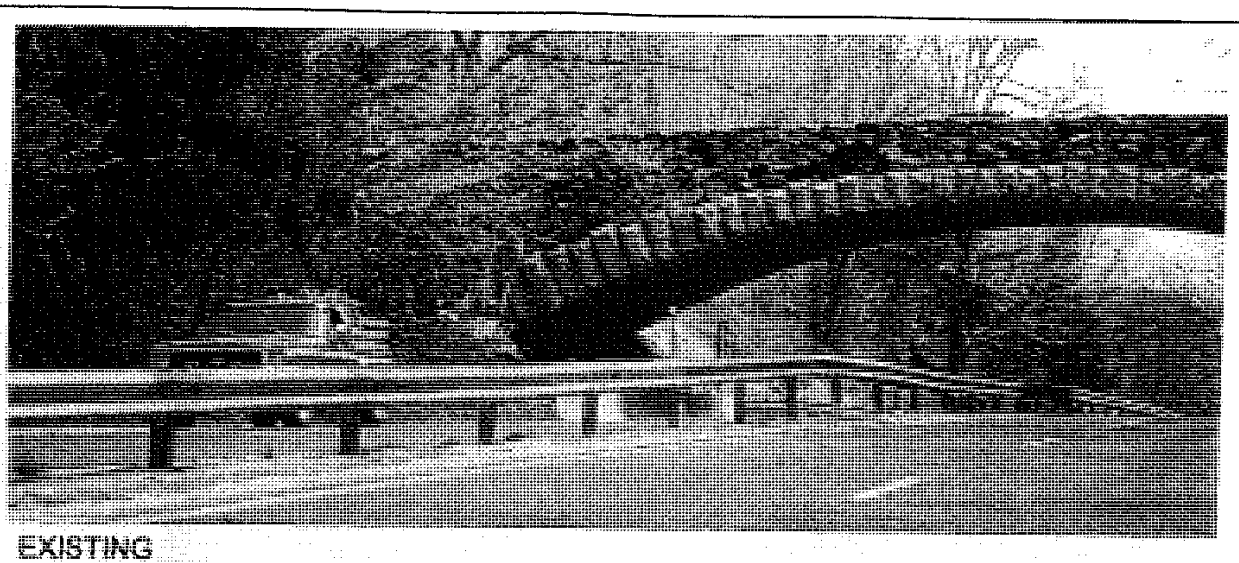
Addresses safety concerns in areas of narrow median (zero deflection).

CONCERNS:

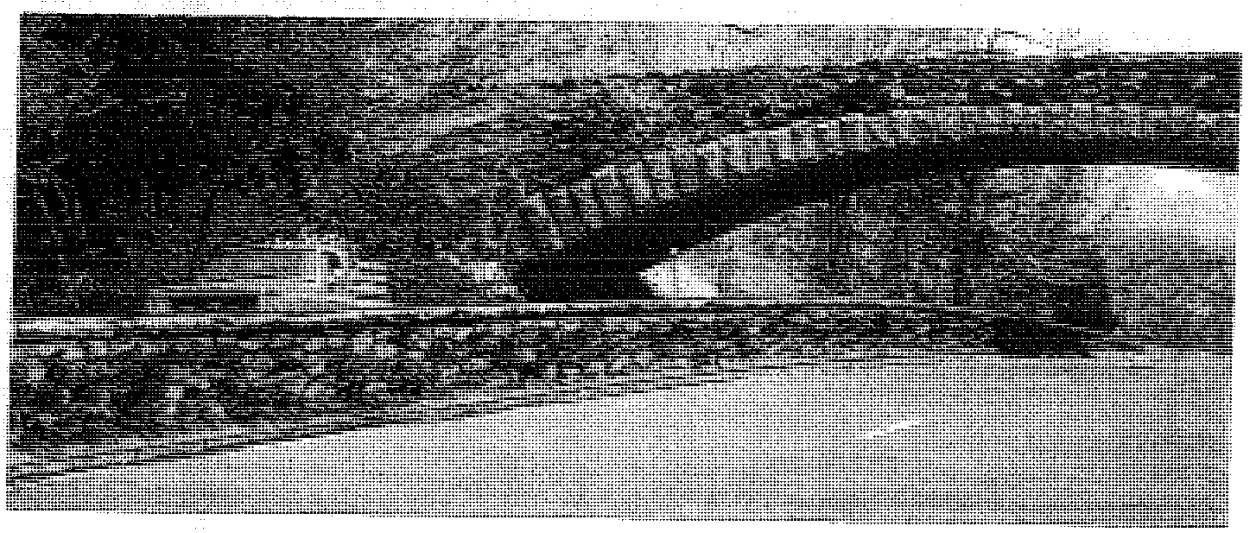
A unified design may be incompatible or incongruous with some of the individual bridge detailing.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.7.2 7
Median Treatments **Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-43.2



EXISTING



OPPORTUNITY:

"Faux" Connecticut stone wall underpasses - or a specific design only for Guinea Road and other stone faced bridges.

RATIONALE:

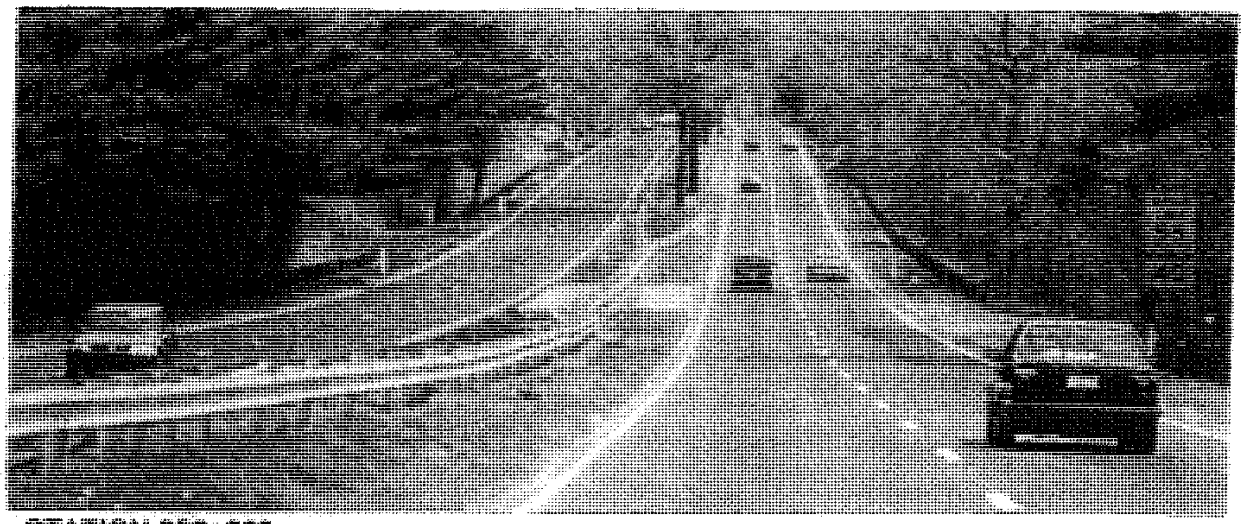
Combines barrier safety with a more "park-like" appearance reflecting of the region's low fieldstone walls.

CONCERNS:

Possibly less compatible in appearance with classically-designed bridges. Potential higher cost if custom designed for only a few bridges.

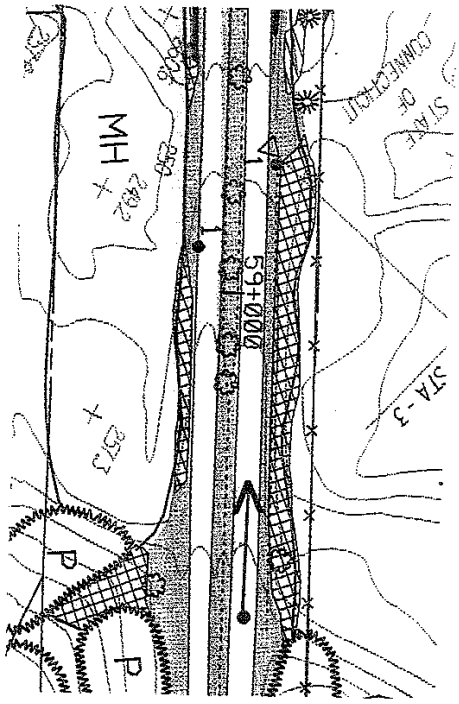
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.7.2 8
Median Treatments **Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-13.2



STATION 058+800

WEST OF NEWFIELD AVENUE



Scale 1" = 200'

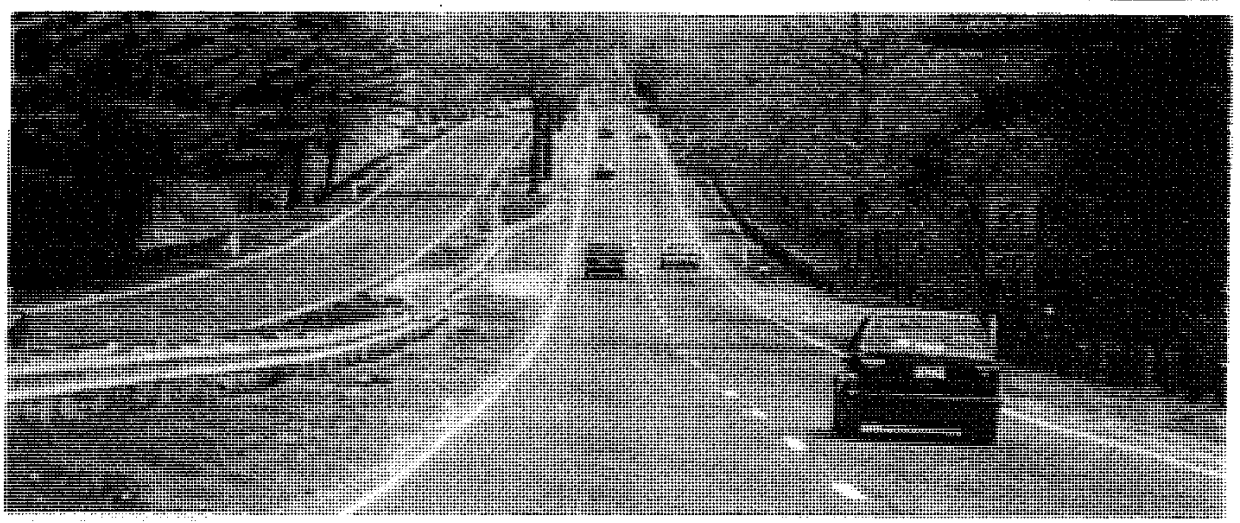
DESIGN ISSUE:

Irregular or inconsistent guiderail layout in wide median (median boats):

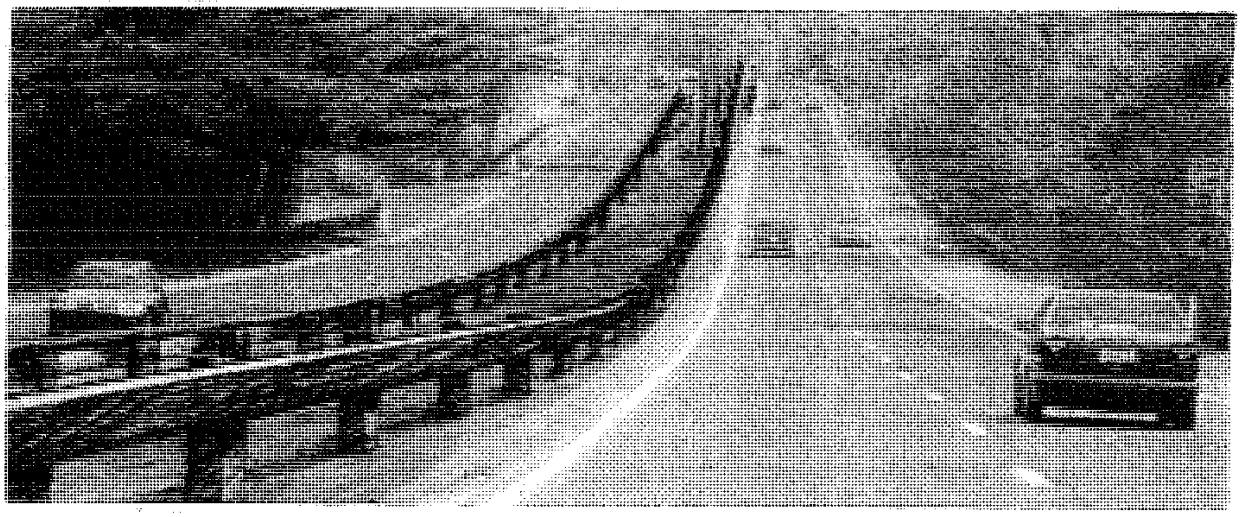
- Inconsistent layout/location of median guiderail
- Center layout precludes planting additional median trees
- Irregular alignment and glare from galvanized steel distracting, particularly on long downhill views
- Curvature of widened guiderail layout around trees too abrupt, often an irregular curve
- Guiderail type not consistent with Parkway image or original Parkway guiderail design
- Maintenance issues in median adjacent to guiderail

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.7.2 9
Median Treatments **Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-23.2



EXISTING



OPPORTUNITY:

Steel-backed wood beam guiderail pulled to edge.

RATIONALE:

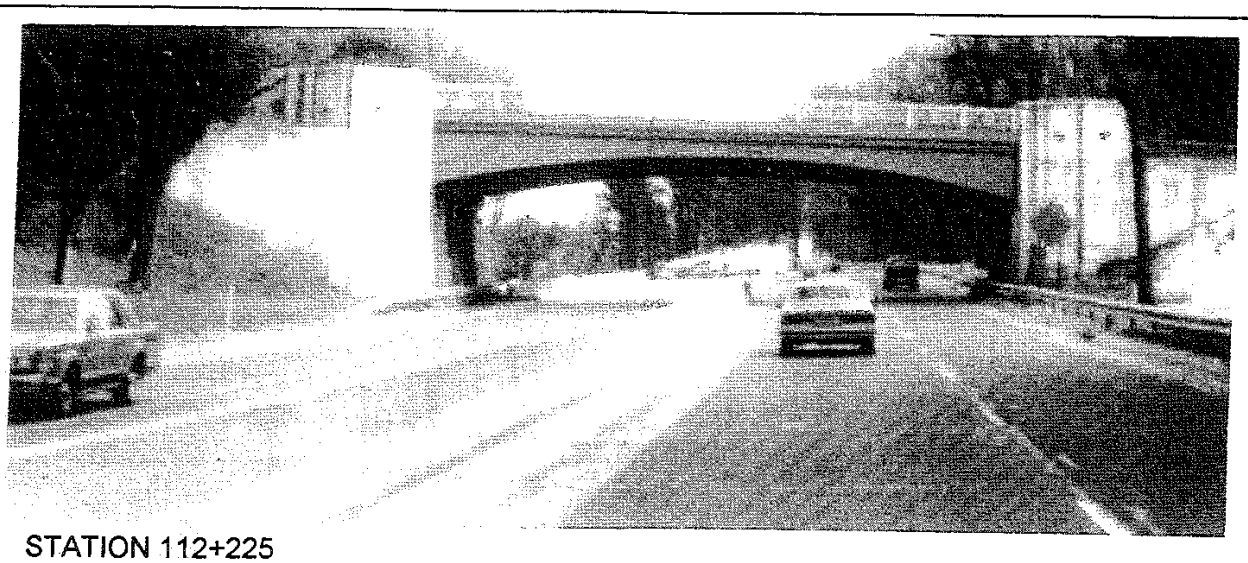
Consistent layout/alignment least visually disruptive, most flexible for adding median trees.
Guiderail type most consistent with Parkway character and original Merritt guiderail design.

CONCERNS:

Maintenance concerns with mowing behind and along outer edge of guiderail.

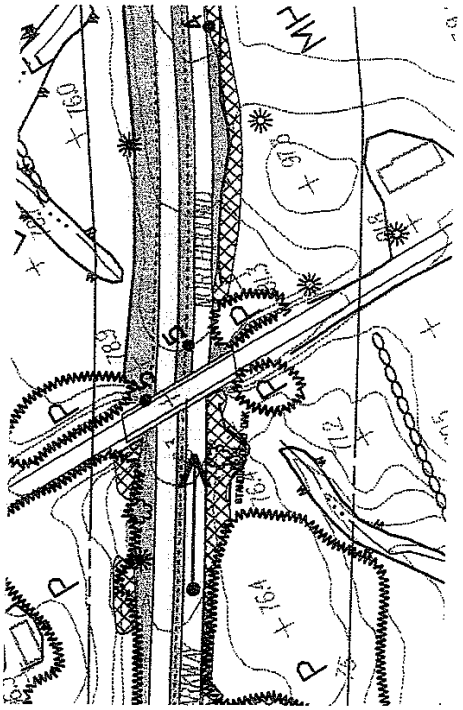
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.7.2 **10**
Median Treatments **Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-25.2



STATION 112+225

LOOKING NORTH AT CLINTON AVENUE BRIDGE



Scale 1" = 200'

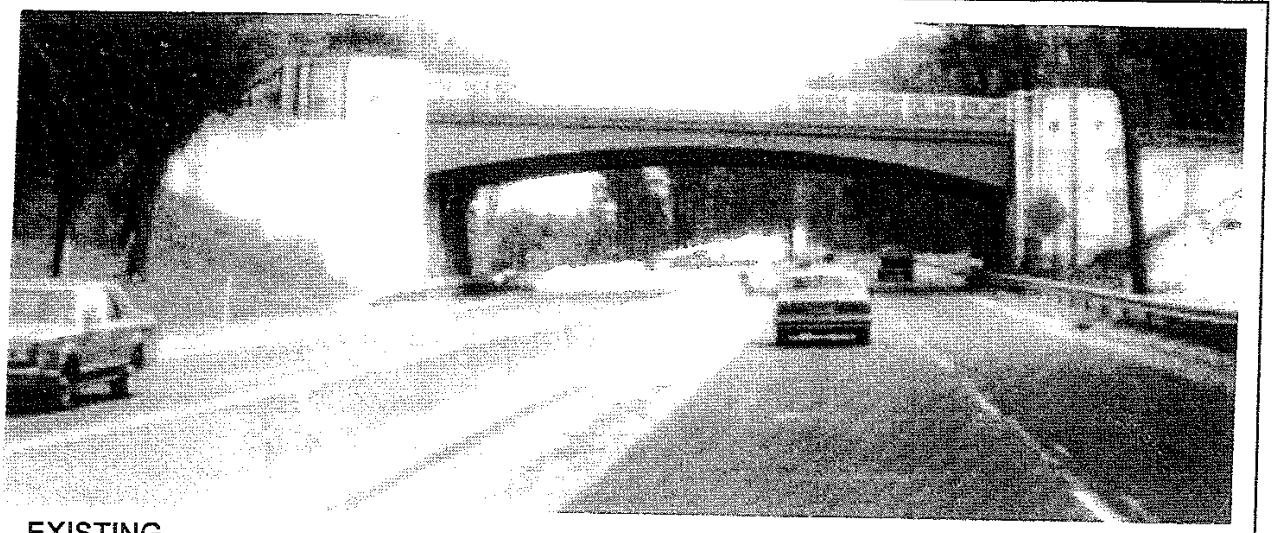
DESIGN ISSUE:

Median guiderail treatment (narrow median with existing concrete barrier):

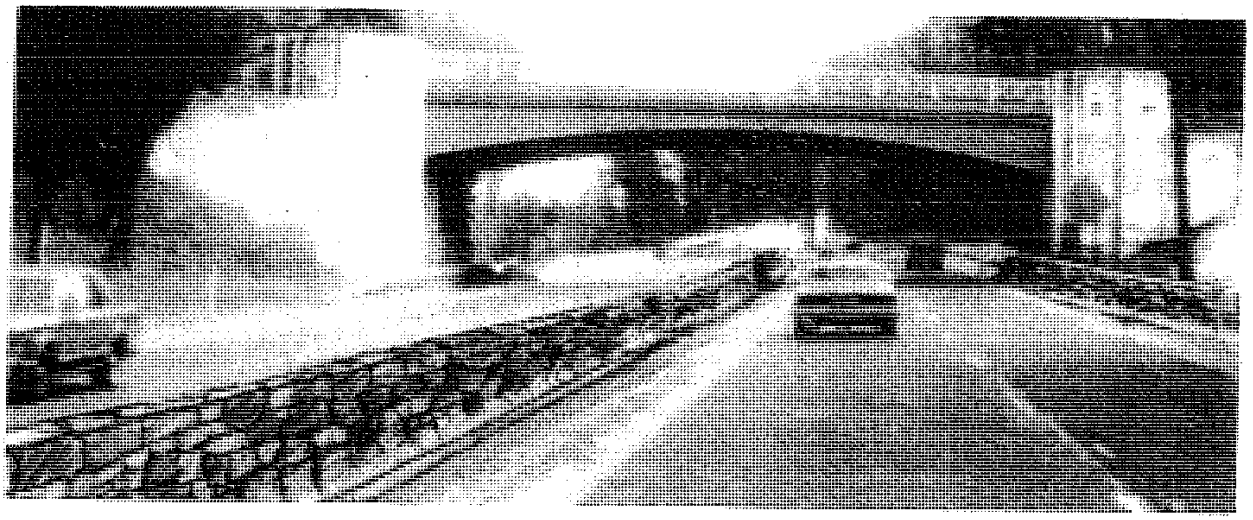
- Type shown not consistent with historic Parkway character or earlier Parkway guiderail design
- Median barrier not consistent over length of Parkway
- Plain barrier lacks design relationship with bridge architecture details
- Concrete barrier meets safety criteria.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.7.2 11
Median Treatments **Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-14.2



EXISTING



OPPORTUNITY:

Replace with "faux" Connecticut stone wall barrier (precast embossed concrete).

RATIONALE:

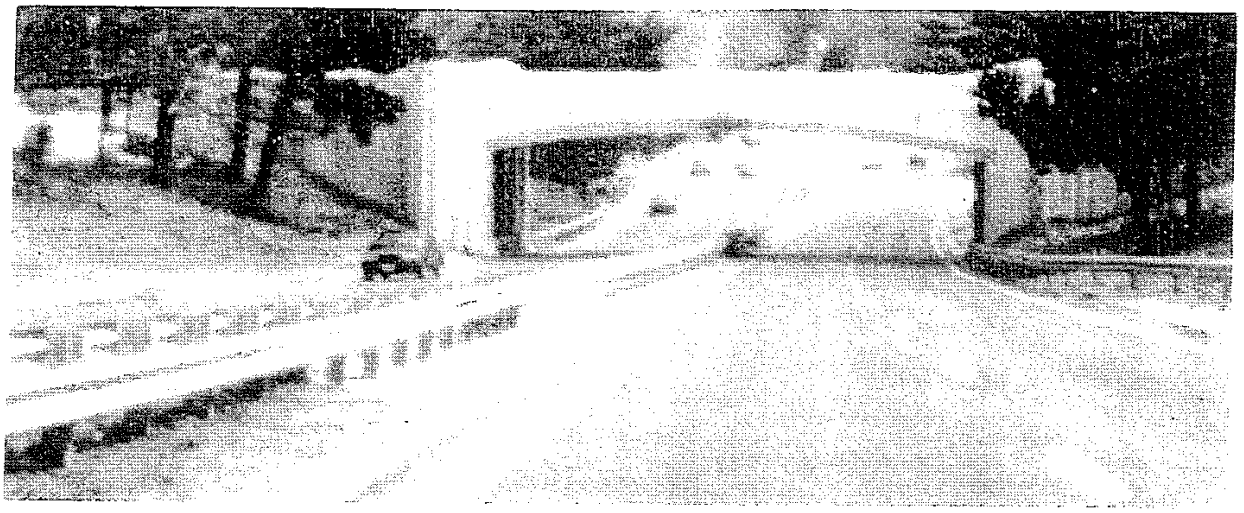
More "park-like" in character and reflecting of the region's stone walls while still meeting engineering and safety standards.

CONCERNS:

Barrier design may not be uniformly compatible with each bridge design.

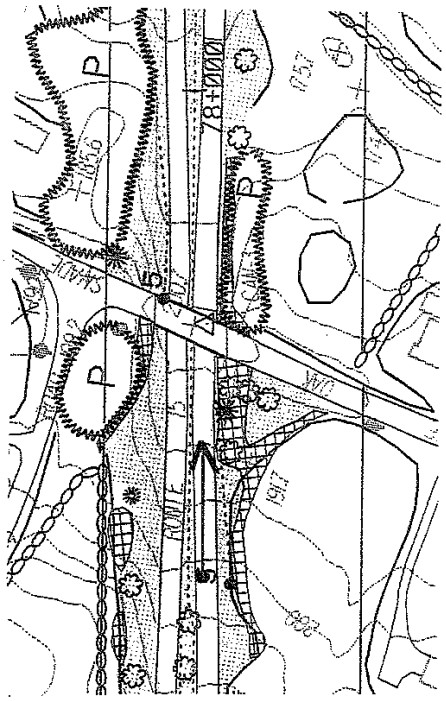
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.7.2 12
Median Treatments **Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-15.2



STATION 077+370

LOOKING NORTH TO WHITE OAK SHADE BRIDGE



Scale 1" = 200'

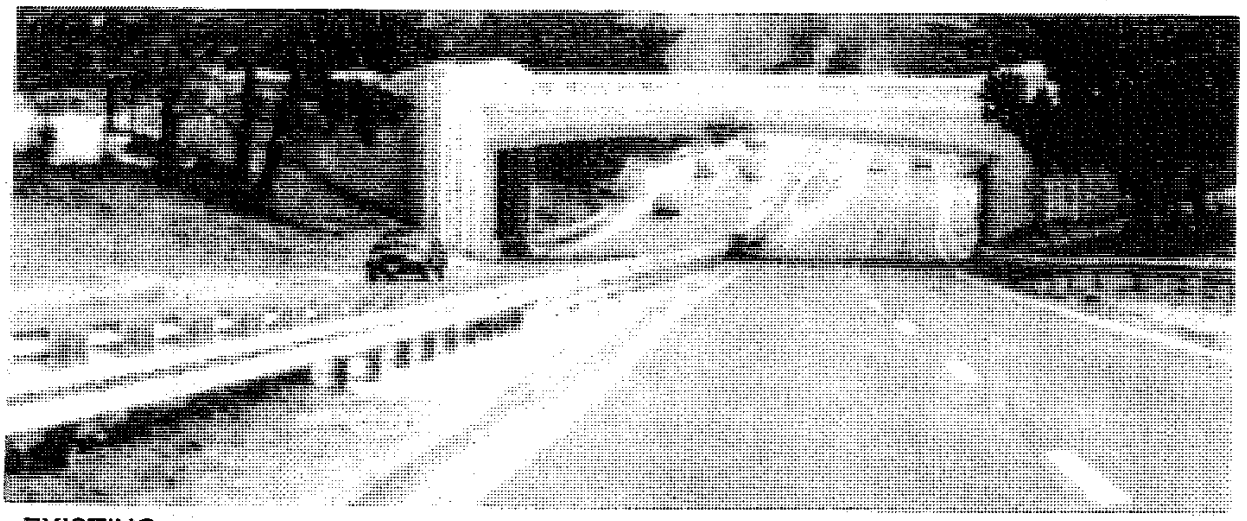
DESIGN ISSUE:

Median guiderail treatment at transition points from wide to narrow medians:

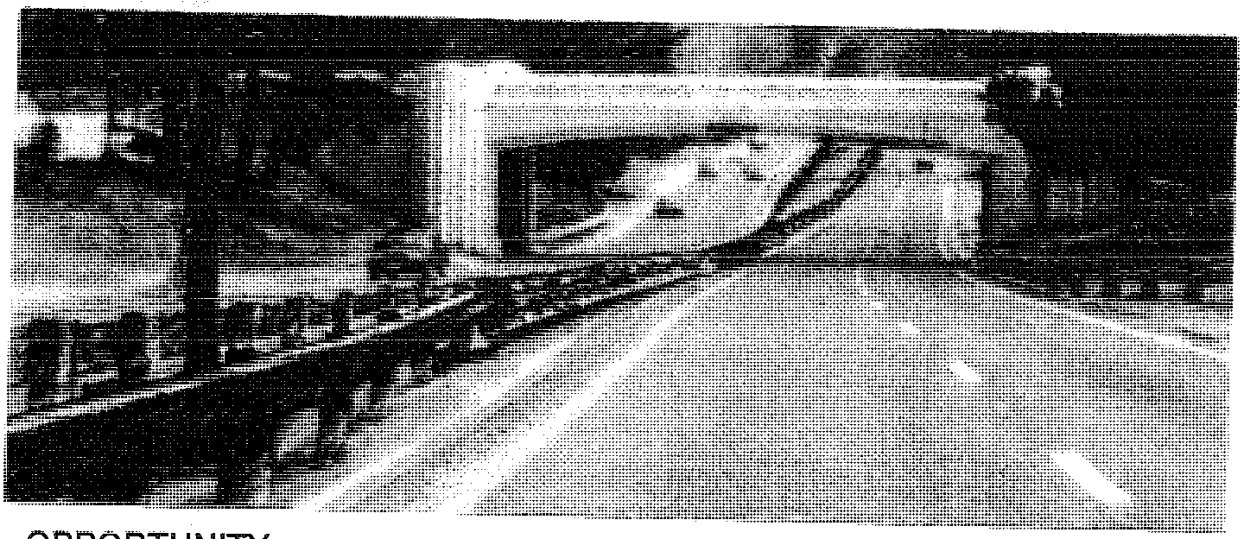
- Type shown not consistent with historic Parkway character or original guiderail design
- There is no consistent transition treatment throughout length of Parkway
- Median guiderail tends to get knocked out of alignment - visually distracting
- Guiderail in center of wide median precludes installation of median trees
- Final design solution may require transitional design treatment between two types of guiderail/barrier systems

Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation	CONCEPT MANUAL	4.7.2 13
Median Treatments **Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-17.2



EXISTING



OPPORTUNITY:

Guiderail transitioned to "faux" Connecticut stone wall barrier beneath bridge.

RATIONALE:

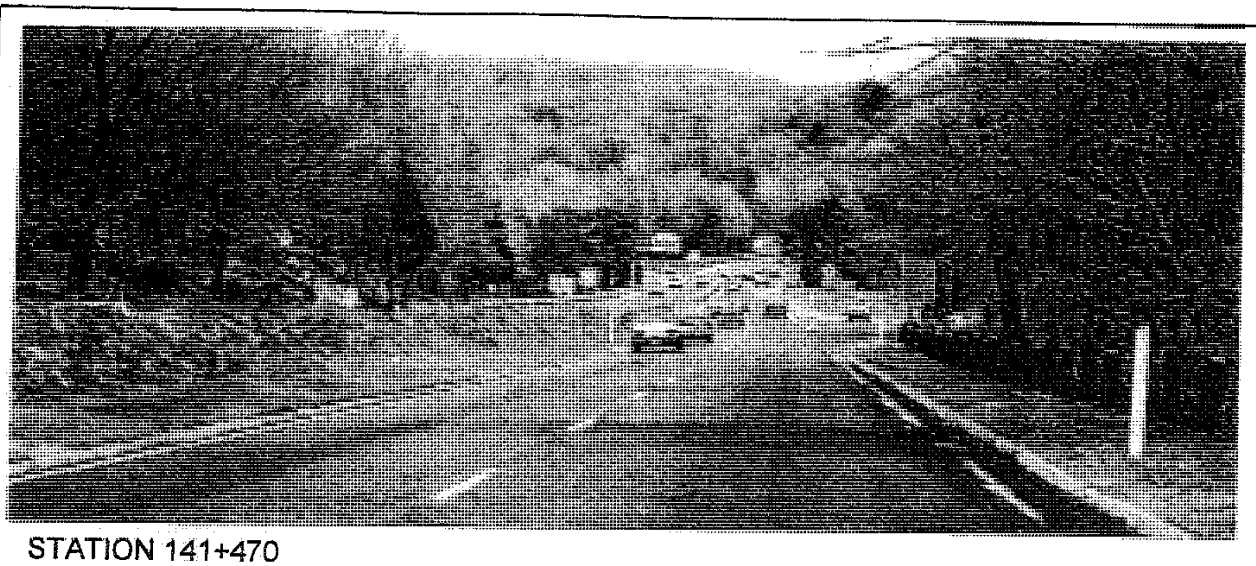
Guiderail at edge of median may allow for additional median trees at bridge approaches where there is adequate width; transition to "faux" Connecticut stone wall at narrow median addresses safety concern.

CONCERNS:

"Faux" Connecticut stone wall barrier more "park-like" in general context, but may be less compatible with certain bridge designs; barrier terminal end must meet safety criteria.

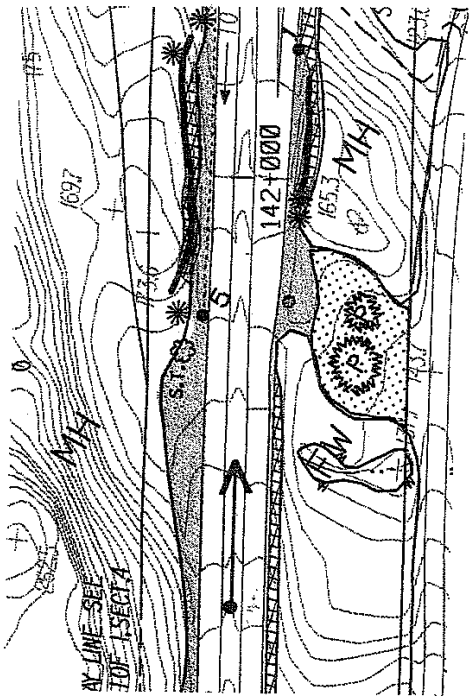
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.7.2 14
Median Treatments **Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-21.2



STATION 141+470

LOOKING NORTH TO EXIT 44



Scale 1" = 200'

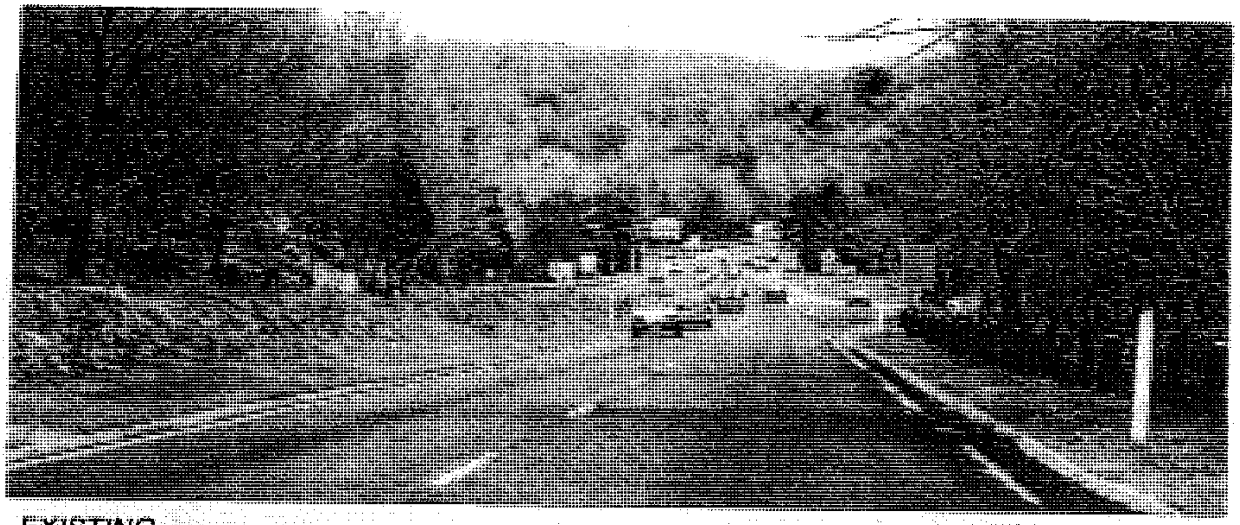
DESIGN ISSUE:

Bermed median (unique condition along Parkway):

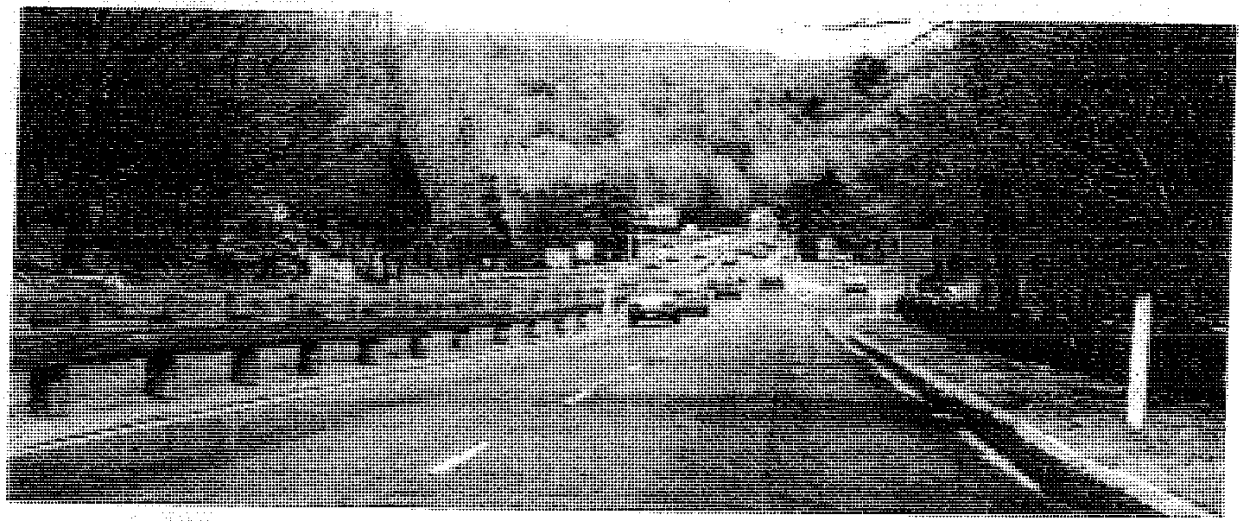
- Berm treatment not consistent with any other section of the Parkway median
- Median condition and slope of berm create maintenance problems
- Irregular surface of grass and mulch visually distracting
- Height intended to cut glare of on-coming traffic headlights

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.7.2 15
Median Treatments **Berm Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-29.2



EXISTING



OPPORTUNITY:

Regrade and replace mound with uniform guiderail.

RATIONALE:

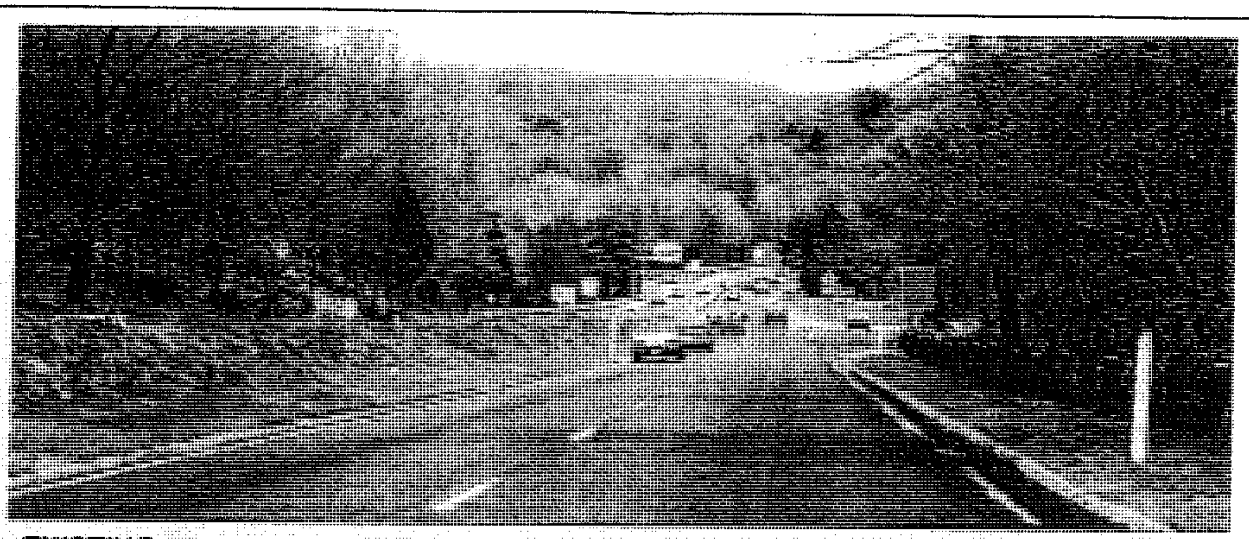
Promotes consistency of median treatment throughout Parkway.

CONCERNS:

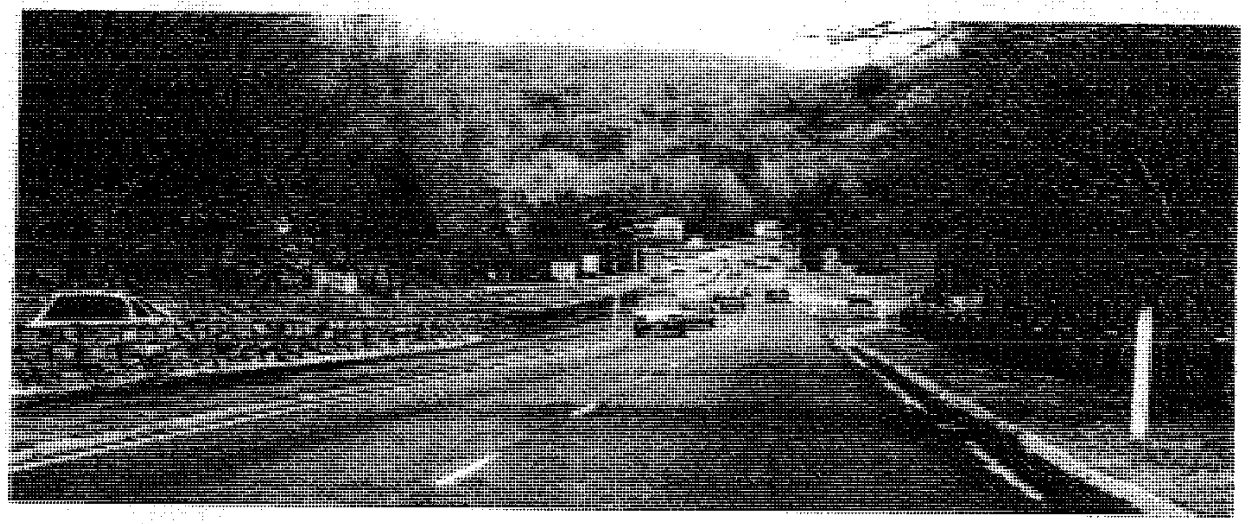
Maintenance concerns of lawn areas either side of guiderail. (Safety concerns must be addressed in design of guiderail.)

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	CONCEPT MANUAL	4.7.2 16
Median Treatments **Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-31.2



EXISTING



OPPORTUNITY:

Replace mound with "faux" Connecticut stone wall.

RATIONALE:

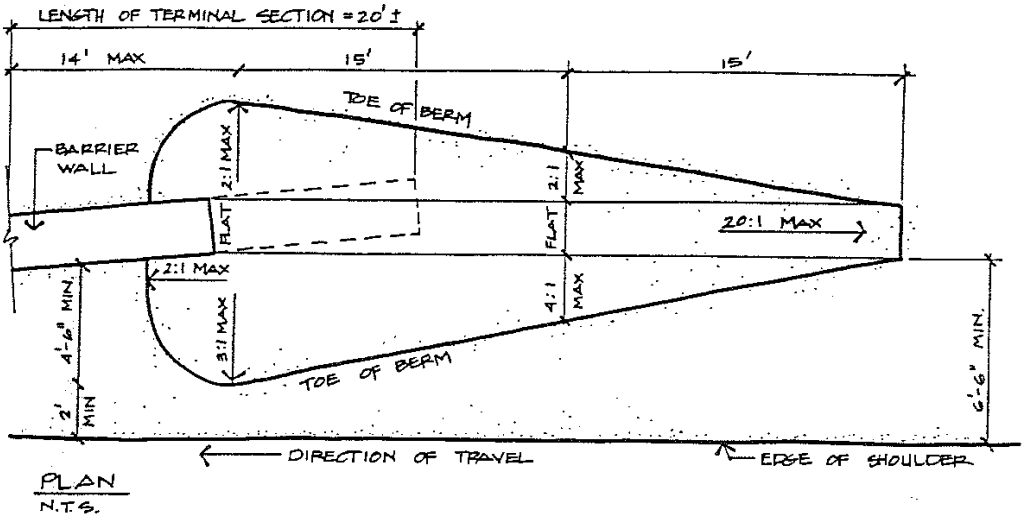
More "park-like" and visually consistent than mound; more unified barrier system with rest of parkway; barrier addresses safety concerns.

CONCERNS:

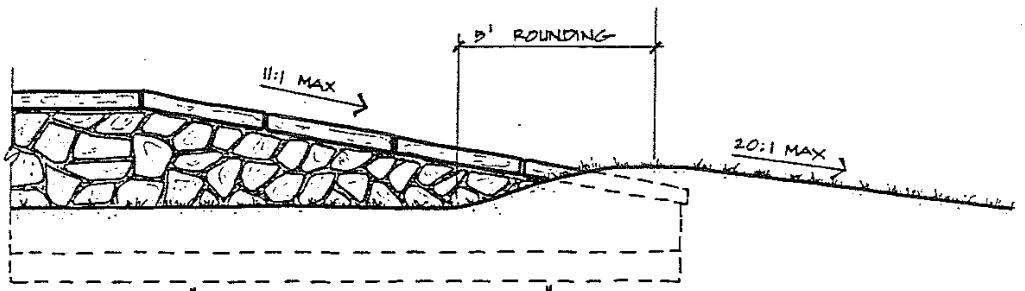
Solution must be part of the overall guiderail design treatment for Parkway and not a "stand alone" application; possible increase in maintenance with lawn either side of berm.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.7.2 17
Median Treatments **Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-32.2



PLAN
N.T.S.



ELEVATION - "FAUX CONNECTICUT STONE WALL"
N.T.S.

STANDARD EARTH BERM FOR ROADSIDE BARRIER TERMINAL SECTIONS

OPPORTUNITY:

"Faux" Connecticut stone wall median barrier.

RATIONALE:

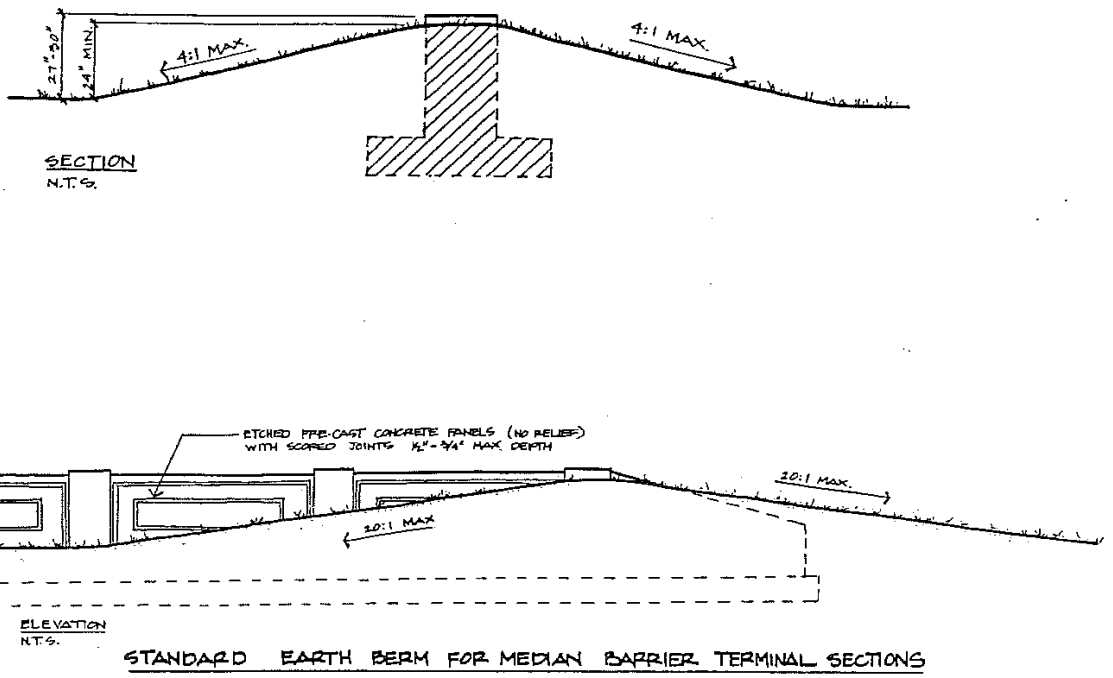
Provide opportunity to reflect the varying character of bridges and topography. Provide zero deflection, meeting engineering safety standards in narrow medians.

CONCERNS:

If unable to tie into a cut slope, must provide earth berm at terminus for safe transition in direction of travel meeting Federal Highway Administration Standards. Sufficient width necessary to accommodate earth berm.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.7.2 18
Median Treatments **Barrier and Guiderail Details**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-33.2



STANDARD EARTH BERM FOR MEDIAN BARRIER TERMINAL SECTIONS

OPPORTUNITY:

Concrete median barrier.

RATIONALE:

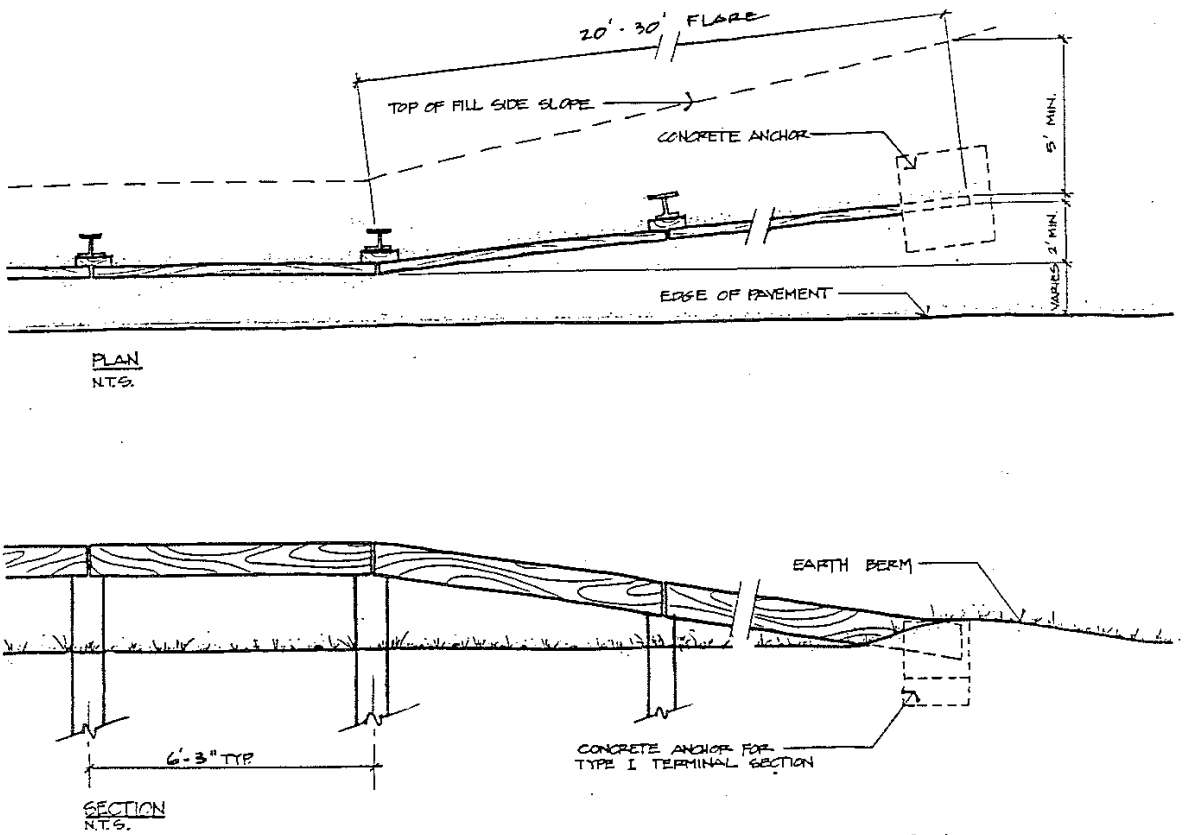
Variety of surface treatments available to reflect the varying character of bridges and topography. Provides zero deflection, meeting engineering safety standards in narrow medians.

CONCERNS:

Provide earth berm at terminus for safe transition in direction of travel meeting Federal Highway Administration Standards. Barrier must be extended to location in median with sufficient width to accommodate earth berm.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.7.2 19
Median Treatments **Barrier and Guiderail Details**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-34.2



STEEL-BACKED TIMBER GUIDERAIL - TERMINAL SECTION

OPPORTUNITY:

Steel-backed wood beam guiderail along road shoulders.

RATIONALE:

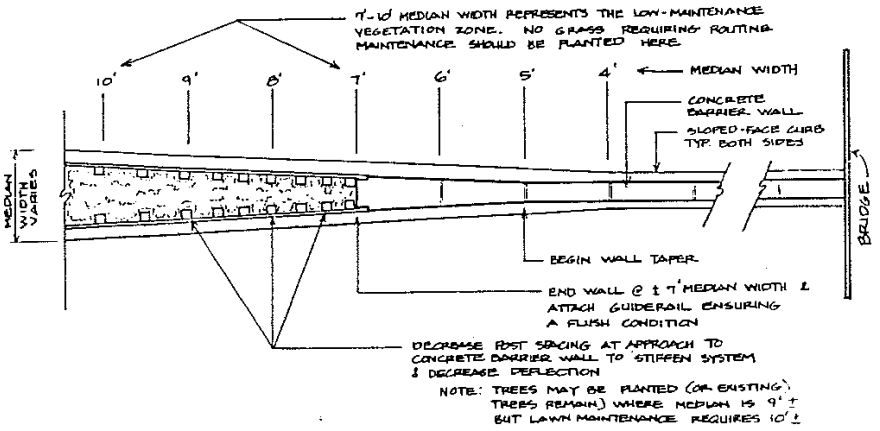
More consistent with original Merritt Parkway design; overall more consistent with Parkway character and image; less visually obtrusive.

CONCERNS:

If unable to tie into a cut slope, must provide earth berm at terminus for safe transition in direction of travel meeting Federal Highway Administration Standards. Sufficient shoulder width necessary to accommodate earth berm.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.7.2 20
Median Treatments **Barrier and Guiderail Details**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

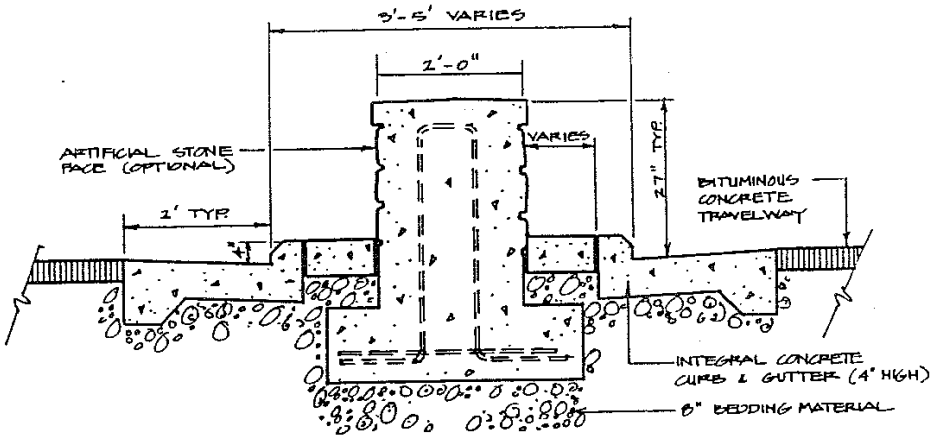
mp472-45.2



PLAN VIEW

BARRIER WALL TO GUIDERAIL TRANSITION

N.T.S.



NOTE: WALL WILL CONTINUE UNTIL SUFFICIENT MEDIAN WIDTH PERMITS TRANSITION TO A GUIDERAIL SYSTEM. THIS WIDTH IS ESTIMATED AT 6'-8' FOR STEEL BACKED TIMBER GUIDERAIL

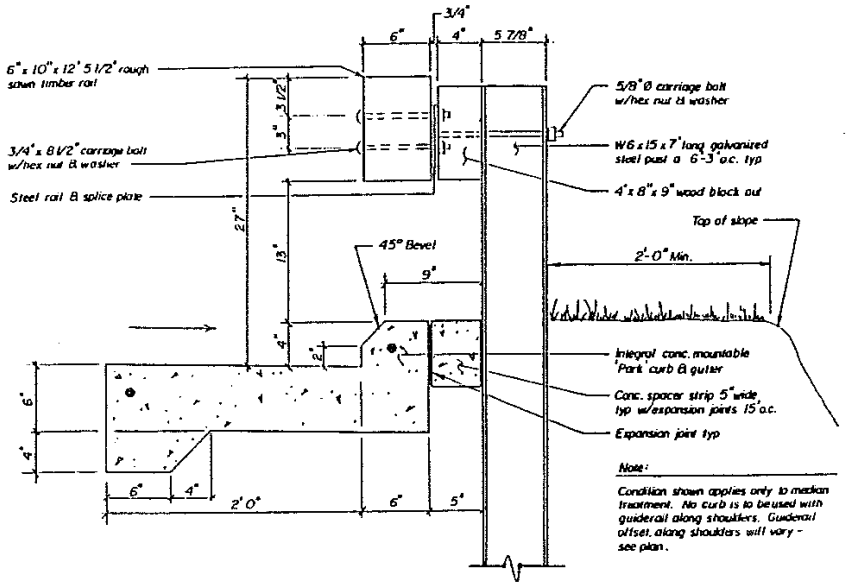
CONCRETE MEDIAN BARRIER

MEDIAN SECTION (0'-5' WIDTH)

N.T.S.

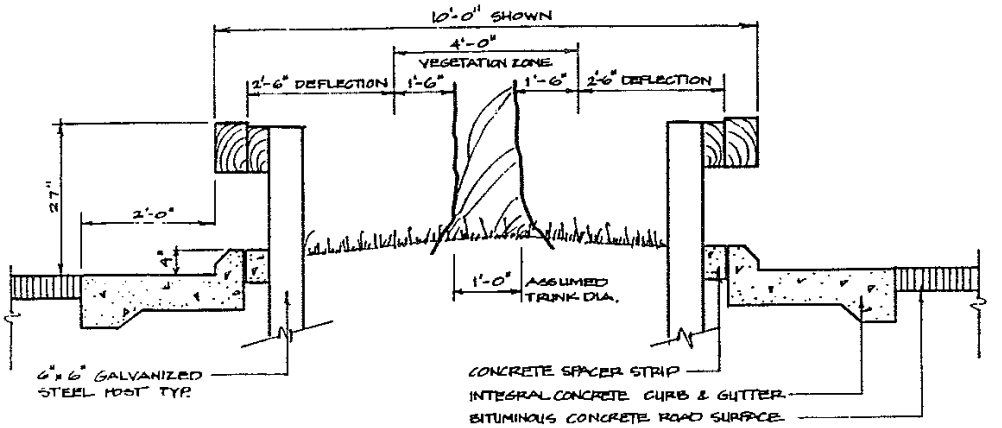
Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.7.2 21
Median Treatments **Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-402



MOUNTABLE CURB/GUTTER & GUIDERAIL AT MEDIAN
N.T.S.

NOTE: TYPICALLY A MEDIAN WIDTH OF 5'-10' REPRESENTS A TRANSITION ZONE, WHERE IT IS CHANGING TO OR FROM A WIDE CONDITION (15'+). IN THE LOWER END OF THIS RANGE (±5'-6') NO TREES SHOULD BE PLANTED AND MEDIAN TREATMENT WOULD TYPICALLY BE A CONCRETE BARRIER WALL TRANSITIONING TO A RAIL SYSTEM.



NOTE: MIN MEDIAN WIDTH NECESSARY TO SAFELY USE STEEL-BACKED TIMBER GUIDERAIL
6'-0" NO TREES PRESENT
7'-0" TREES PRESENT ON ℄

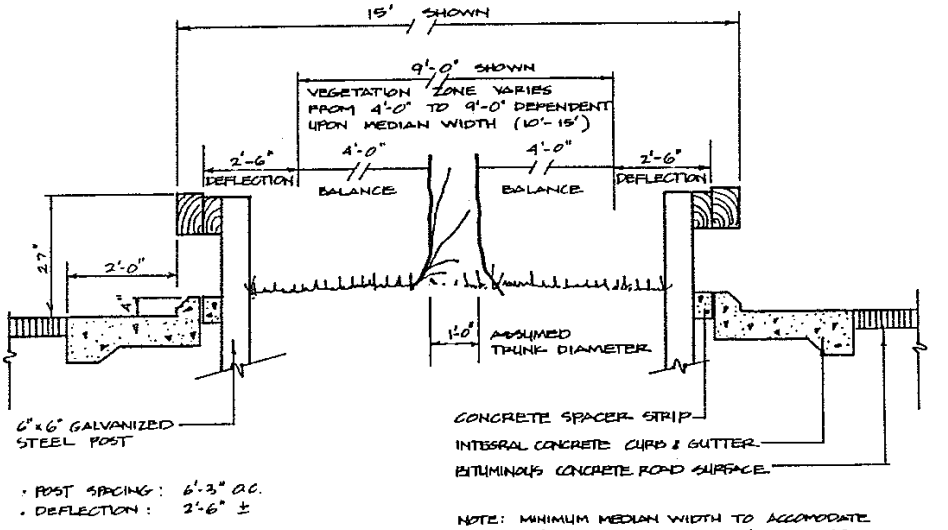
NOTE: MIN. MEDIAN WIDTH REQUIRED TO ACCOMODATE 50" MOWING DECK IS 7' (NO TREES PRESENT)

NOTE: POST SPACING - 6'-3" O.C.
DEFLECTION - 2'-6" ±

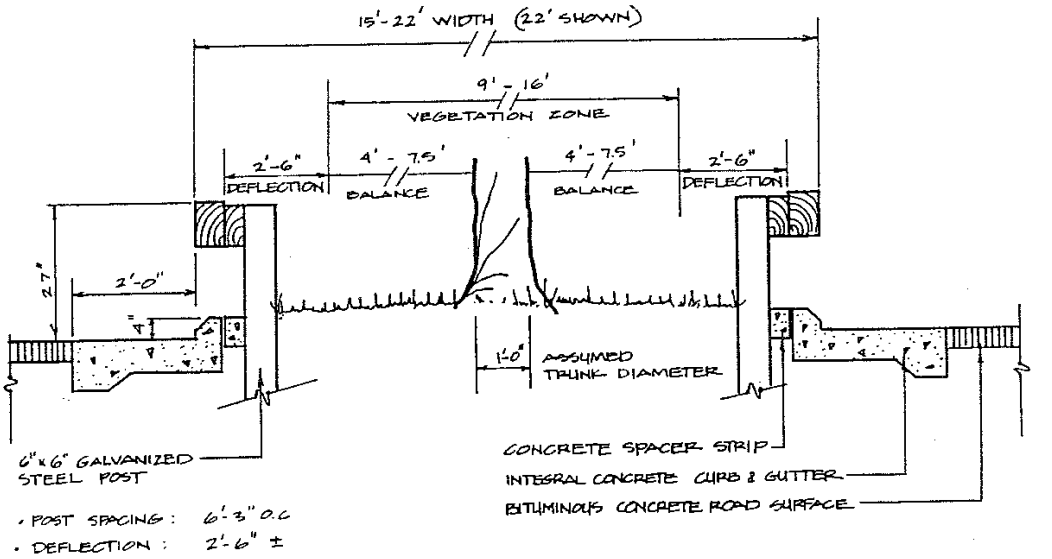
MEDIAN SECTION (5'-10' WIDTH)
N.T.S.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.7.2 22
Median Treatments **Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-41.2



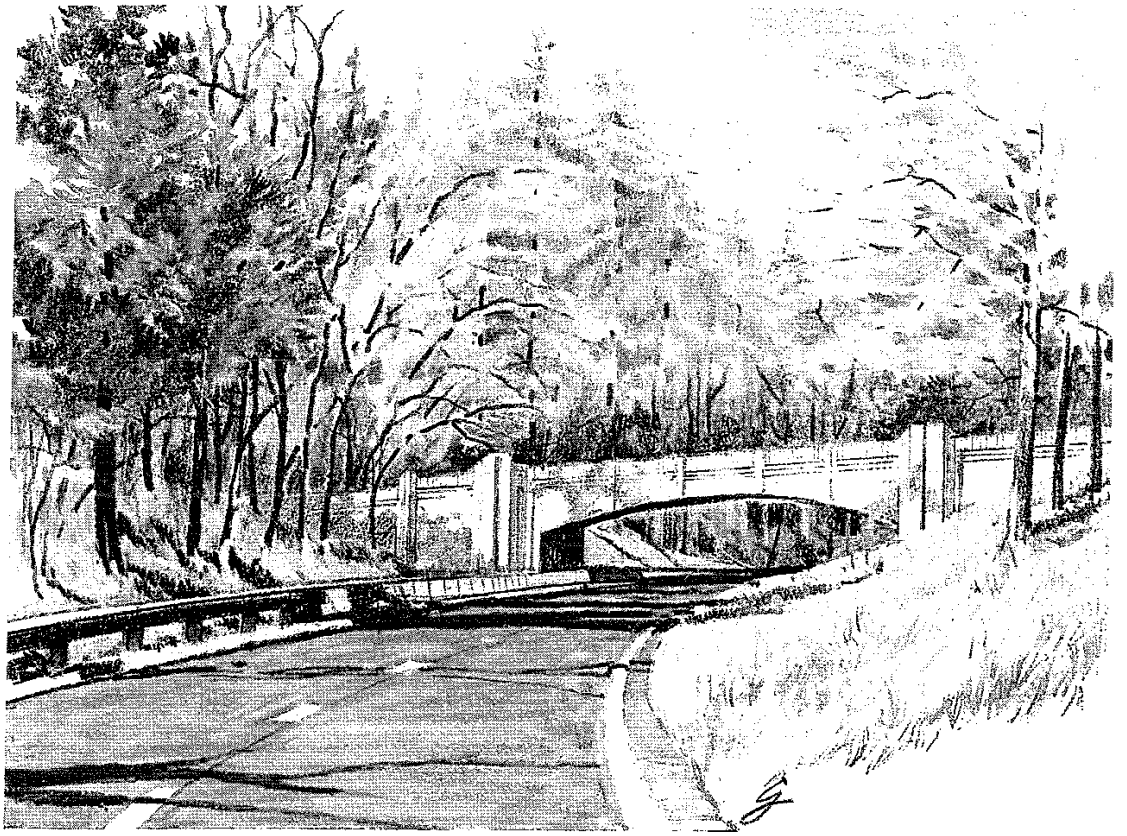
MEDIAN SECTION (10'-15' WIDTH)
N.T.S.



MEDIAN SECTION (15'-22' WIDTH)
N.T.S.

Merritt Parkway Landscape Master Plan **State of Connecticut Department of Transportation**	**CONCEPT MANUAL**	4.7.2 23
Median Treatments **Barriers and Guiderails**	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday, Inc.	

mp472-42.2



Section 5 *Master Plan Recommendations*

5. MASTER PLAN RECOMMENDATIONS

5.1 INTRODUCTION

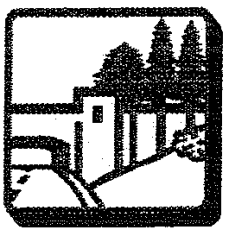
The recommendations for improving the Merritt Parkway identified below articulate the graphic design treatments which were developed during the preparation of this document (see Section 4) and refined through discussions with the Department of Transportation staff and several public participation sessions. Given the length of the Parkway and the variety of field conditions, it is impractical to prepare detailed site-specific recommendations for improvements based on the gross level of base data available at this time.

It is expected that these recommendations will serve as a blueprint for Department action. When a specific project is scheduled for implementation, the guidelines would be interpreted by the project designer and the design principles contained in the Plan would be applied to the specific site conditions.

5.2 APPLICATION OF DESIGN TREATMENTS

The typical design treatments illustrated in the previous section of this report have been applied where appropriate to the entire length of the Parkway and shown on the accompanying sheets. (Full size sheets at 200 scale have also been provided to the Department.) To assist in the interpretation of the master plan, a graphic legend has been created consisting of icons and plan symbols. This technique was selected because a project of this magnitude necessitates a quite generalized level of detail at the master plan stage. The interpretive aids used on the plan are described in detail below.

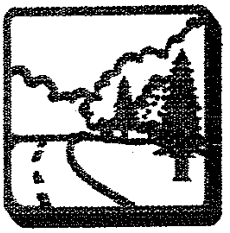
5.2.1 Bridge Abutments



The typical existing condition at bridge abutments consists of mature overstory (both coniferous and deciduous) being crowded by such weed species as Ailanthus, sumac, and black locust. The ground plane vegetation, originally grass or shrub masses, has been replaced by a tangle of undesirable shrubs and vines.

To reestablish the original landscape character, trees flanking these areas, typically mature conifers, should be selectively limbed up sufficiently to reveal the bridge facade. In instances where volunteering deciduous trees compete with the conifers, the deciduous should be removed. Where appropriate, new tree masses should be added to complete the bridge enframement, or, where there are existing evergreen, to reestablish maturing stands of existing conifers. The ground plane may be mowed turf or meadow grass where slopes are gentle; a ground cover may be used when slopes are steep. Informal ornamental shrub massing may be introduced at the tops of slopes (at the ends of the bridge abutments) for added color and interest. Accent lighting should be introduced on several bridges on an experimental basis.

5.2.2 Park-Like



The term "park-like" was used by Thayer Chase to describe the landscape that he tried to achieve throughout the Parkway. The original planting compositions typically included shade trees or conifers, often with flowering trees in a field of mowed lawn.

To reestablish areas of park-like character, new planting compositions should be created. This should be done by pulling back the woodland edge adjacent to the roadway by removing invasive vegetation and selective thinning and/or clearing back to the new treeline as shown on the plan. Desirable mature specimen trees may be retained in the foreground to complement the additional proposed plantings of deciduous, coniferous, and flowering trees. Lawn should be planted to the edge of the treeline or just beyond (5' to 10' inside dripline). In some instances where existing groves of large shade trees are located in an open lawn setting, undesirable understory or invasive vegetation should be removed so that the desirable species becomes more prominent. Cleared areas should be reseeded where continued maintenance is desirable. Care should be exercised when selecting the trees to be retained to assure that mowing equipment fits between the trees.

5.2.3 Terminating Views

Thayer Chase often used evergreen trees to lead the driver around curves and to terminate a vista. The trees were planted both in the median and along the roadside. Over time, many trees have been lost. To recapture this effect, evergreen trees should be introduced in the locations shown on the plan. Typically, this will occur on the outside of curves, on the far side of exit ramps, and in locations where the driver's attention needs to be directed toward the road. Mass planting of evergreens, approximately 30' to 50' in depth and over 100' long, are most desirable to achieve this purpose.

Evergreen trees within these zones should be planted randomly, 15' to 25' apart for larger evergreens, 8' to 15' apart for smaller evergreens such as cedar. Planting size should be mixed, ranging from 6' to 12' in height.

5.2.4 Open Views

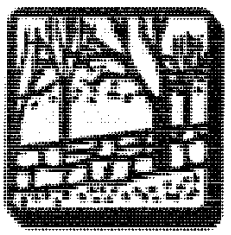
As the Parkway has aged, many views of ponds, watercourses, and other roadside features have become obscured by invasive vegetation. Where noted, the vegetation should be selectively removed to establish these significant views. The limits of the view should be enframed by existing large trees, supplemented where necessary with evergreen and flowering trees as accents and planted sparingly, so as not to further obscure views.

5.2.5 Enhance Rock Cuts

In the original planting scheme, rock cuts were exposed for the most part and were highlighted by evergreen trees. Over time, invasive vegetation has masked the beauty of the rock.

As part of the rehabilitation effort, the invasive species should be removed. Where there is sufficient soil on top of the rock, new evergreen trees or shrubs would be desirable accents to the rock. In the vicinity of sheer, vertical rock face (usually along on/off ramps) and in nonwooded areas, introduction of cedars and/or pines along the base will lessen the visual impact of the construction scars.

5.2.6 Reveal Stone Walls



Much of the Parkway was built through farmland and remnants of the agricultural heritage of Fairfield County can be seen in the stone walls along the right-of-way edge.

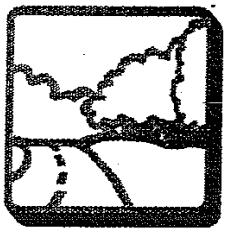
Where the stone walls can be made visible to the motorist, the understory vegetation should be thinned retaining only the higher quality understory trees. Where the walls are close to adjacent residences, existing vegetative buffers should be retained.

5.2.7 Limb Up Conifers

An abundance of conifers were planted at the time of Parkway construction. Since then, even more evergreen trees have grown as part of the natural plant succession process. The general condition of conifer stands, which are typically pine, eastern red cedar, and hemlock, is best described as being mature but unmaintained. Lower branches are often dead.

In the locations noted, the evergreen trees should be pruned exposing lower trunks. Where the trees now serve as a buffer or screen for adjacent residential land uses, the existing trees should be supplemented or underplanted to assure the longevity of the buffer. When it is part of the forest edge the ground plane can be planted as lawn, or needle litter can remain as the woodland floor. Where the conifer stands are isolated in what is now, or could become, open meadow, lawn should be planted when there is sufficient spacing to permit mowing.

5.2.8 Bring Grass to Road Edge



In many instances throughout the length of the Parkway, the original pavement has been widened to varying widths generally along the roadside. Where new interchanges have been built, the pavement width has been increased so that the desired park-like character is nonexistent.

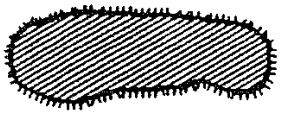
Under the plan for improving the Parkway, the pavement section should have a uniform width throughout. Lawn should be planted to the edge of pavement. Where pavement has been widened at the edge to provide a pull-off area, it should be replaced with lawn back to the original pavement width. The reestablished lawn areas should then be graded and kept free of obstacles in order to maintain safe pull-off areas.

In areas of widened pavement at new interchanges, planting overstory vegetation as close as possible to the pavement edge will help enclose these expansive voids.

5.2.9 New Treeline

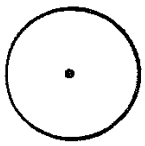
Where the existing vegetation is to be altered, the extent is illustrated by a new treeline (typically proposed in the areas indicated by the "park-like" icon). When removal is indicated, clearing the edge must be tempered with the retention of selected specimen trees which will complement the finished park-like appearance of the corridor. Where a wooded edge is expanded, plantings should include deciduous overstory trees at finished landscape sizes as indicated under the Deciduous Trees category below. New trees should be randomly spaced 15' to 30' apart. Species should reflect the composition of adjoining forest.

5.2.10 Conifer Stands



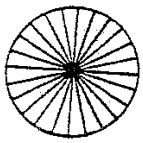
Concentrated plantings of conifers are designated along the Parkway where expansion of existing stands are needed or where introduction of conifers will provide screening, terminating views, or visual accents in the landscape. When associated with existing conifers, the new plantings should reflect the species already present. Where new stands are not associated with existing trees, species selection should be based on site factors at the planting location. Planting sizes in conifer stands should be a mix ranging between 6' to 12' in height. Tree spacing should range between 15' to 25' for larger conifers (e.g. pines) and 8' to 15' for smaller species (e.g. cedar groves) throughout the designated areas. Depth and length of planted areas are as indicated on the master plan.

5.2.11 Deciduous Trees



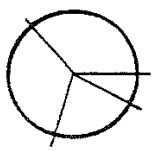
In addition to the forested edges, singular and small groupings of deciduous trees are key design elements throughout the Parkway, both in the medians and along the roadside edges. Opportunities for new plantings are indicated by the Deciduous Tree symbol and should be consistent with surrounding existing trees species. Typically, deciduous trees are added as single specimens or groupings in the open, park-like pockets shown on the plan. These trees should be specimen quality landscape grade stock ranging in size form 2½" to 4" caliper, spaced as indicated on the plan. (Symbol represents one tree.)

5.2.12 Coniferous Trees



The Coniferous Tree symbol identifies the location of new coniferous trees. Generally, evergreens should be planted in masses either at the edge of the woodland or for screening unsightly views. When used as accents in park-like areas, a single symbol or small group of symbols is shown. It is intended that these plantings will be installed as finished landscape stock 6' to 12' in height., with spacing as indicated on the plan. For large species (e.g. pines), the symbol represents one tree. For smaller species (e.g. cedars), the symbol can represent one to three trees, spaced 8' to 12' apart.

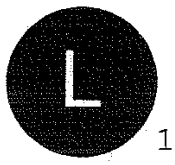
5.2.13 Flowering Trees



Flowering trees are shown on the plan to provide seasonal color. Typically, they are used in masses or drifts along existing woodland edges or with other new installations of shade trees or conifers in park-like areas. Each symbol represents three to five actual trees spaced from 12' to 20' apart, which are installed as finished stock 2" to 2½" caliper or as 6' to 8' in height multistemmed trees.

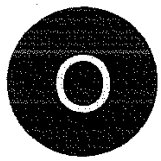
5.2.14 Laurel Treatment

Existing:
Much of the original mountain laurel has become "leggy" where the stems are more obvious than the leaves. Such mature plantings should be reinforced by new installations along the roadway perimeter to "face down" the mass. Where limited planting space is available, selective removal of existing plants may be required to provide room for new material. Mountain laurel should be installed to 2' to 3' in height and 4' to 5' apart.

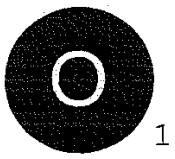


Proposed:
New laurel plantings are also recommended. In keeping with the extensive use of mountain laurel in the original landscape, new plantings should be selectively reintroduced along the Parkway at the locations indicated (typically at the wooded edge, in drifts along rock cuts and tops of slopes) and massed to the depths and lengths shown on the Master Plan.

5.2.15 Ornamental Shrub Mass



Existing:
In addition to the mountain laurel, originally the primary shrub along the Parkway, other shrub masses of other species need to be supplemented or replaced to reestablish their planting design intent. The condition of each mass should be evaluated before implementing any improvements. Some plants can be rejuvenated by heavy pruning; others may be overmature, diseased, or unsuitable to the site, and should be completely removed. Replacements, unless unsuited for the site condition, should reflect the species or character of the original planting. Installation sizes should be 2' to 3' in height and spaced to provide uniform massing for the species used.



Proposed:
At selected locations along the Parkway, new shrub mass plantings are proposed to complete particular landscape settings. In some instances, the shrubs are used as an underplanting for existing trees; in others, the shrubs may be used as part of an overall bridge abutment planting. Species selections should complement and be well suited to the growing niche being planted. Sizes and spacing should be consistent with the criteria identified above.

5.2.16 Reforestation

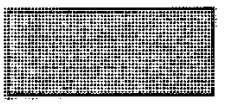
Large areas of tree planting typically associated with new interchanges utilize two planting procedures to more efficiently provide broad coverage with relatively quick impact to the landscape. The species mix should reflect the composition of surrounding plant associations. Thirty foot to 50' wide perimeter zones lining the roadway edges are to be planted with finished landscape material in the sizes described under the various tree types, randomly spaced 15' to 30' for canopy trees. The remainder of the area inside the perimeter zone is to be planted with bare root liner stock randomly installed on 5' to 10' centers. Shade tree liners may range between 3' to 5' whips, ornamentals in 2' to 3' clumps, and conifers at 15" to 24" in height. Weed growth is to be controlled around the trees until they are well established.

5.2.17 Woodland Management ("Release Desirable" Vegetation)

Beyond the edge of lawns or meadows, the woodland along the Parkway has not been maintained. Consequently, either natural forest succession has occurred or invasive vegetation has become more prevalent, choking out original plantings of specimen conifers and/or deciduous trees placed at the wooded edge.

Where this has occurred, surrounding invasive species should be removed and additional thinning of the successive forest edge may also be required next to the original specimen plantings. This practice should allow regenerative growth to then occur on the original deciduous and/or coniferous specimens.

5.2.18 Removal of Invasive Vegetation/New Surface Treatment



Throughout the Parkway corridor, reduced maintenance has permitted scrubby, invasive vegetation to invade and threaten the mature, more desirable stands of trees.

A major component of the overall rehabilitation effort will be removal of these invasive species. Replanting techniques once invasive species have been removed will depend on site-specific conditions. For example, in park-like or open meadow areas, lawn and/or low maintenance meadow grasses may be introduced. In areas of mature tree stands, woodland succession of more desirable species (as found in the ecoregion) should be allowed. In areas of existing wooded enclosure, this woodland succession should be allowed up to the roadway edge (up to 4' to 5' from pavement where there is existing guiderail), otherwise maintaining a 15' clear zone adjacent to travel lanes. Continued control of invasive species growth needs to be maintained through appropriate mechanical/chemical controls.

5.2.19 Slope Stabilization

When invasive vegetation is removed, particularly in the vicinity of bridge abutments, the steeper slopes may become unstable. Where this condition has been anticipated, special measures should be implemented to stabilize the ground plane with ground cover consisting of stolonizing shrubs or meadow grasses. Periodic brush control will be needed to eradicate any volunteering invasive plants.

5.2.20 Remove Existing Guiderail

While it is recommended that all required guiderail be replaced with steel-backed wood beam rails, there are instances where existing guiderail is not required. Most often, this will occur where the obstruction which necessitated the placement of the guiderail in the first place is proposed for removal under the Master Plan. The plan identifies the "span" of guiderail to be removed. Minimal regrading of shoulders (5% maximum) may be required in some areas where guiderail is to be removed.

5.2.21 Guiderail Relocation

Through the rehabilitation process of woodland management techniques and selective clearing, it will be possible to relocate or "pull back" the guiderail along the shoulders. This technique will improve overall safety and visual qualities of the Parkway. The plan identifies the "span" of existing guiderail to be relocated.

5.2.22 Pull-Off Areas

Due to the narrow pavement width and the proximity of rock faces on vegetation to the edge of pavement (all of which contribute to the park-like quality of the Parkway), there are few places for vehicles to pull off the road in case of emergency. The plan identifies additional places where pull-offs can be constructed through regrading and/or the removal of vegetation. These areas must be maintained barrier free.

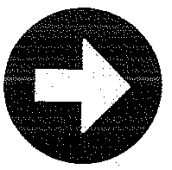
5.2.23 Regrading

Where the existing slopes along the edge of the Parkway exceed 4:1, a guiderail has been installed. In some cases, there is sufficient area to add fill to create a more gentle slope and eliminate or permit relocation of the guiderail further from the travel lanes. Where appropriate, this condition has been identified on the plan.

5.2.24 Low Maintenance Zone

The median width varies from approximately 3' to 22', with most of the narrow conditions found at the approaches to the many bridges. A concrete barrier wall has been proposed in these lengths of narrow median. As the median begins to widen, a guiderail system should be reintroduced, however, maintenance equipment cannot be safely used until the median width has increased to 10'. Within this transition zone no maintenance dependent vegetation should be introduced. More appropriate plantings may consist of ornamental grasses, ground covers, or perennials.

5.2.25 Sign Relocation



Many existing signs block views of the bridge architecture. In some locations they are redundant, causing visual clutter and confusion. Consideration should be given to relocating signs away from the bridge abutments and out of the median. Redundant signs should be eliminated wherever possible.

5.3 PLANT MATERIAL

5.3.1 Proposed Plant Material

The following plant material is proposed for future planting on the Merritt Parkway. It should be noted that this plant list contains most of the same plants (genus only) as originally specified for use on the Parkway at the time of construction. However, new species and varieties have been included where there have been genetic improvements to the original plant or the original species is no longer readily available. To provide the link to the original planting concepts, Thayer Chase graciously reviewed the modifications to the recommended plant list.

The "initial specified height range" is also similar to the original plant list where it was desirable to select different plant sizes in order to obtain variation in a group planting which is reflective of the plant composition found in nature.

* Asterisked items are species that have been modified from the original plant list.
** Double asterisked items are new genus introduced.

Evergreen Trees

	Botanical Name	Common Name	Initial Specified Height Range	Mature Height (under normal conditions)
	Juniperus virginiana	Red Cedar	3'-6'	20'-25'
	Picea abies	Norway Spruce	6'-10'	80'-100'
	Pinus nigra	Austrian Pine	6'-10'	50'-60'
	Pinus strobus	White Pine	6'-10'	65'-75'
*	Thuja occidentalis 'Nigra'	Dark Green American Arborvitae	3'-6'	20'-30'

Deciduous Trees

	Botanical Name	Common Name	Initial Specified Size (Cal.)	Mature Height (under normal conditions)
	Acer rubrum	Red Maple	2.5"-6"	55'-60'
	Acer saccharum	Sugar Maple	2.5"-6"	60'-65'
	Carpinus caroliniana	American Hornbeam	2.5"-4"	30'-40'
	Fagus americana	American Beech	1.5"-3.5"	60'-70'
*	Fraxinus americana 'Autumn Purple'	White Ash	1.5"-4"	55'-60'
*	Fraxinus pennsylvanica 'Summit'	Summit Ash	1.5"-4"	55'-60'
*	Gleditsia triacanthos inermis	Thornless Honey Locust varieties	1.5"-5"	50'-60'
	Liquidambar styraciflua	Sweetgum	1.5"-4"	55'-60'
	Liriodendron tulipifera	Tulip Tree	1.5"-3.5"	80'-90'
**	Nyssa sylvatica	Black Gum	2"-3"	30'-50'
*	Platanus acerifolia	London Planetree	1.5"-4"	90'-100'
	Quercus alba	White Oak	1.5"-4"	55'-60'
	Quercus coccinea	Scarlet Oak	1.5"-4"	70'-75'
	Quercus palustris	Pin Oak	1.5"-4"	75'-80'
	Quercus rubra	Red Oak	1.5"-4"	60'-75'
*	Tilia species	Linden varieties	1.5"-5"	45'-50'
	Ulmus americana 'Pioneer'	Pioneer Elm	2"-4"	40'-60'
	Ulmus americana 'Princeton'	Princeton Elm	2"-4"	40'-60'
*	Ulmus carpinifolia 'Homestead'	Homestead Elm	2"-4"	40'-60'

Ornamental Trees

	Botanical Name	Common Name	Initial Specified Height Range	Mature Height (under normal conditions)
**	Amelanchier canadensis	Shadblow	3'-10' (clump or tree form)	20'-25'
**	Amelanchier laevis	Allegheny Serviceberry	3'-8'	15'-25'
*	Betula nigra	River Birch	6'-14'	40'-50'
*	Betula papyrifera	Paper Birch	6'-12' (clump or tree form)	35'-40'
	Betula populifolia	Gray Birch	6'-10'	35'-40'
*	Cornus atternifolia	Pagoda Dogwood	3'-8'	20'-25'
*	Cornus kousa	Kousa Dogwood	3'-12'	20'-25'
**	Crataequs crusgalli	Cockspur Hawthorn	6'-10'	20'-30'
**	Hamamelis virginiana	Common Witch Hazel	3'-8'	12'-15'
**	Prunus serotina	Black Cherry	6'-10'	50'-60'

Narrow Leaf and Broadleaf Evergreens

	Botanical Name	Common Name	Initial Specified Height Range	Mature Height (under normal conditions)
*	Euonymus fortunei 'Green Lane'	Green Lane Wintercreeper	12"-24"	ground cover
	Juniperus communis depressa	Oldfield Common Juniper	18"-24" Spr.	5'-6' Spr.
	Juniperus communis 'Hornibrookii'	Hornbrook Juniper	12"-18" Spr.	6'-8' Spr.
*	Juniperus pfitzeriana 'Compacta'	Compact Pfitzer Juniper	12"-24" Spr.	5'-8' Spr.
	Kalmia latifolia	Mountain Laurel	1.5'-4'	8'-10'
*	Rhododendron catawbiense	Catawba Rhododendron	1.5'-3.5'	5'-6'
*	Rhododendron l. 'Wilsoni'	Wilson Rhododendron	1.5'-3.5'	3'-6'
	Rhododendron maximum	Rosebay Rhododendron	2'-4'	10'-15'
*	Rhododendron periclymenoides	Pinxterbloom Azalea	1.5'-3'	4'-6'
*	Rhododendron vaseyi	Pinkshell Azalea	1.5'-3'	5'-10'
*	Rhododendron viscosum	Swamp Azalea	1.5'-3'	4'-8'

Deciduous Shrubs

	Botanical Name	Common Name	Initial Specified Height Range	Mature Height (under normal conditions)
	Comptonia peregrina	Sweetfern	15"-24"	2'-4'
*	Cornus racemosa	Gray Dogwood	2'-4'	10'-15'
	Ilex verticillata	Winterberry	1'-3'	6'-8'
	Myrica pensylvanica	Bayberry	1.5'-3'	6'-8'
*	Rhus aromatica 'Gro-Low'	Fragrant Sumac	12"-24"	2'-3'
*	Rosa rugosa	Beach Rose	12"-24"	4'-6'
*	Rosa 'Sea Foam'	Sea Foam Rose	12"-24"	2'-3'
	Sambucus canadensis	American Elder	2'-3'	4'-6'
	Vaccinium corymbosum	Highbush Blueberry	1.5'-3'	6'-8'
*	Viburnum cassinoides	Whiterod Viburnum	18"-30"	4'-6'
*	Viburnum dentatum	Arrowwood	2'-3'	6'-8'
*	Viburnum tomentosum 'Mariesii'	Mariesii Doublefile Viburnum	2'-4'	6'-8'
*	Viburnum trilobum	American Highbush Cranberry	2'-4'	8'-12'

Climbing Vines and Ground Covers

	Botanical Name	Common Name	Initial Specified Height Range	Mature Spread (under normal conditions)
	Hedera helix 'Baltica'	Baltic Ivy	3"-1 gal.	10"-18"
	Lonicera japanica 'Halliana'	Hall's Honeysuckle	3" pot-2 gal.	20'-30'
	Pachysandra terminalis	Pachysandra	2¼"-4" pot	8"-12"
	Parthenocissus quinquefolia	Virginia Creeper	1-2 gal.	50'
*	Parthenocissus tricuspidata 'Veitchii'	Boston Ivy	1-2 gal.	8"-18"'
*	Vinca minor 'Bowles'	Bowles myrtle	3"-1 gal.	10"-18"

** *Lawn and Meadow Grasses*

	Plant Type	Specific Variety		Mature Height (without seed heads)
	Alkaligrass	variety:	Salty	1'-1½'
	Fine Fescue	variety:	Reliant	10"-12"
			Jamestown II	
	Kentucky Bluegrass	variety:	Baron	2'-2½'
			Ram I	
			Sydsport	
	Perennial Ryegrass	variety:	Repell II	2'-3'
			Palmer II	
*	Poa trivialis	variety:	Laser	1½'-2'
*	Tall Fescue	variety:	Rebel 3D	2'-2½'
			Tribute	2½'-3'

** *Wild Flowers*

Botanical Name	Common Name	Mature Height
Achillea millefolium	White Yarrow	2'-3'
Chrysanthemum leucanthemum	Ox-Eye Daisy	2'-3'
Coreopsis lanceolata	Lance-leaf coreopsis	2'-3'
Eupatorium purpureum	Joe Pye Weed	5'-6'
Hemerocallis species	Daylily	1'-2'
Myosotis sylvatica	Forget-Me-Not	12"-18"
Rudbeckia hirta	Black-eyed Susan	2'-3'
Vernonia noveboracensis	Ironweed	4'-5'
Viola cornuta	Johnny Jump-Up	6"-12"

5.4 IMPLEMENTATION AND COST ESTIMATES

From the beginning of this study, the term "Landscape" as it has been applied to the Merritt Parkway has been interpreted to include the entire visual experience perceived by the travelling motorist. The landscape includes not only the vegetation or planting compositions, but also such other roadway elements as topography, guiderail, curbing, barriers, and bridges.

It would be somewhat idealistic and unrealistic to expect that the landscape improvements proposed in this plan could be implemented in toto and in a short period of time, even though the Parkway has been perceived as a single entity composed of many structural and nonstructural elements. It is more likely that the traditional landscape features - plantings, lawn, forest - will be treated as roadside enhancements while the support elements - the guiderail/barrier, curbs, regrading - will be treated as safety improvements. In the latter case, the planned improvements would be incorporated into ongoing Parkway improvements. For example, guiderail would be replaced on an as-needed basis and new curbing would be installed as part of pavement reconstruction. In contrast, some landscape improvements such as pruning could be undertaken as either maintenance or as a capital project. Basically, structural elements would be completed as capital improvements while many landscape treatments can be accomplished under an expanded maintenance operation.

In short, the return to the desired park-like quality will be gradual, perhaps taking as long as 15 to 20 years before the full effect of the plan's recommendations will be realized. However, the design principles espoused in this plan can be achieved if the plan and design treatments are adopted by the Department and become accepted practice applied to all Parkway projects.

5.4.1 Near-Term Implementation

There are several actions or projects related to the landscape which could be undertaken in the immediate future since they can be fairly well defined and would not be dependent on the progress of related construction projects. Generally, such projects are located along the roadside or at the recently completed and about-to-be completed interchange.

a. ***Landscape Improvements at Route 8 Interchange***
   Activity: Remove invasive species
   Selective pruning
   Install additional landscape plant material
   Selective reforest open areas
   Concept Manual Reference: Sections 4.4.2, 4.4.3, 4.5.4, 4.5.5, and 4.5.6

b. ***Landscape Improvements at Route 25 Interchange***
   Activity: Remove Invasive Species
   Selective pruning
   Install additional landscape plant material
   Selective reforest open areas
   Concept Manual Reference: Sections 4.4.2, 4.4.3, 4.4.4, 4.5.4, and 4.5.5

c. ***Landscape Improvements at Smaller Interchanges***
   Activity: Install additional landscape plant material
   Install guiderail
   Concept Manual Reference: Section 4.4.1

d. ***Landscape Improvements at Bridges***
   Activity: Remove invasive species
   Selective pruning of mature trees
   Install additional landscape plant material
   Concept Manual Reference: Sections 4.5.1 and 4.5.2

e. ***Landscape Improvements to Roadside***
   Activity: Remove invasive species
   Selective pruning
   Install additional landscape plant material
   Concept Manual Reference: Sections 4.2.1, 4.2.2, 4.6.1, 4.6.2, 4.6.3, 4.6.4, 4.6.5, 4.6.6, 4.6.7, and 4.6.8

f. ***Shoulder Improvements***
   Activity: Eliminate unneeded guiderail by regrading shoulders to ease back slopes
   Concept Manual Reference: Sections 4.6.7 and 4.6.8

5.4.2 Long-Range Projects

The more significant and highly visible improvements to the Parkway can only be implemented in stages coincidental with other roadway and safety improvements. The installation of guiderail/barrier system for the median, together with related landscape improvements and curb/gutter systems, will clearly impact the appearance of the Parkway but the mere construction of the median improvements will affect the daily operations of the Parkway during the construction process. Moreover, due to the level of engineering, design, and the significant capital cost of the median improvements, a phased project is justified.

Such other Parkway improvements as the replacement of roadside guiderail or the regrading around bridges should also be implemented over a longer period of time. It would not be fiscally prudent at this time to remove metal beam guiderail which is in good condition solely for aesthetic reasons. However, as replacement is justified for safety sake, then the new steel-backed wood system could be installed.

5.4.3 Service Areas

Improvements to the service areas will be highly visible Parkway improvements. The recent policy is to have the vendor undertake required improvements as part of the lease. It is expected that this policy will continue in the future and the recommendations illustrated in the Master Plan will be considered at the time of lease renewal.

5.4.4 Capital Improvement Costs

Estimating the costs of construction on any project is always somewhat risky since the costs must be based on recent construction bids and other published data. Preparing estimates of probable construction costs from a master plan of the Merritt Parkway having a length of 37.5 miles is even more risky since material quantities can only be determined with a limited degree of accuracy, particularly when the plan is drawn at 200 scale. Consequently, the budgetary estimates of implementation costs presented here should only be utilized to aid in long range planning and budgeting and must be refined as both long- and short-term projects are undertaken.

In Table 5-1, the budgetary estimates for the recommended improvements are presented for the entire Parkway. The estimates are separated into two categories: landscape improvements; and related safety improvements. Tables 5-2 and 5-3 separate the costs further by breaking out the improvements into the major Parkway features on systems (i.e. median, roadside, bridges, and major interchanges).

Briefly, it is estimated that the proposed landscape improvements for the Parkway will cost in the range of $9.2 million and the related safety improvements will cost in the range of $62.4 million. The largest single system cost can be attributed to the median where the structural elements are likely to cost in the range of $46 million with an additional $1.5 million for landscaping.

However, not all recommended improvements are as costly as the median. Such modest projects as the landscaping at bridge facades are likely to cost less then $100,000 per bridge to implement all the desired improvements. Similarly, the roadside landscaping can be achieved at a cost of approximately $72,000 per mile ($36,000 each side).

TABLE 5-1

Budgetary Estimates for Selected Improvements for Merritt Parkway

LANDSCAPE IMPROVEMENTS

Initial Removal of Invasive Vegetation (177 acres at $3,000/Ac.)		$ 531,000
Initial Selective Pruning and Thinning (37.5 Miles at ±$20,000/Mile)		$ 765,000
Landscape Materials		$ 6,965,000
Deciduous Trees (3,975 at $400/Ea.)	$1,590,000	
Coniferous Trees (18,475 at $105/Ea.)	$1,940,000	
Ornamental Trees (4,000 at $350/Ea.)	$1,400,000	
Shrubbery (20,000 at $50/Ea.)	$1,000,000	
Ground Cover/Low Maintenance (267,500 SF at $2/SF)	$535,000	
Reforestation (71 acres at $7,500/Ac.)	$535,000	
Subtotal		$ 8,261,000
Contingency		$ 939,000
TOTAL		$ 9,200,000

RELATED SAFETY IMPROVEMENTS

Eliminate Guiderail (16,000 LF at $6/LF)		$ 100,000
Regrade Shoulders (100,000 sy at $7/sy)		$ 700,000
Remove and Replace Guiderail		$31,850,000
Medians and Interchanges (350,000 LF at $65/LF)	$22,750,000	
Shoulders (140,000 LF at $65/LF)	$9,100,000	
Concrete Curb and Gutter at median only (400,000 LF at $35/LF)		$14,000,000
Concrete Barrier (40,000 LF at $250/LF)		$10,000,000
Subtotal		$56,650,000
Contingency		$ 5,750,000
TOTAL		$62,400,000

TABLE 5-2

Budgetary Estimates for Landscape Improvements for Individual Parkway Features
(in dollars)

FEATURE	MEDIAN	ROADSIDE	BRIDGES	ROUTE 7	ROUTE 8	ROUTE 25	TOTAL
Initial Removal of Invasive Vegetation	—	450,000	60,000	6,000	9,000	6,000	531,000
Selective Pruning	225,000	265,000	230,000	15,000	15,000	15,000	765,000
Landscape Plants (includes reforestation)	1,050,000	1,715,000	2,546,000	563,000	543,000	548,000	6,965,000
Subtotal	1,275,000	2,430,000	2,836,000	584,000	567,000	569,000	8,261,000
±10% Contingency	145,000	275,000	325,000	66,000	64,000	64,000	939,000
TOTAL	1,420,000 (38,000/Mile)	2,705,000 (72,000/Mile)	3,161,000 (83,000/Mile)	650,000	631,000	633,000	9,200,000

TABLE 5-3

Budgetary Estimates of Related Safety Improvements for Individual Parkway Features
(in dollars)

FEATURE	MEDIAN	ROADSIDE	BRIDGES	ROUTE 7	ROUTE 8	ROUTE 25	TOTAL
Eliminate Guiderail	—	100,000	—	—	—	—	100,000
Regrade Shoulder	—	400,000	—	100,000	100,000	100,000	700,000
Remove and Replace Guiderail	19,279,000	9,100,000	—	676,000	1,300,000	1,495,000	31,850,000
Concrete Curb/Gutter	12,950,000	—	—	350,000	350,000	350,000	14,000,000
Concrete Barrier	9,400,000	—	—	175,000	—	425,000	10,000,00
Subtotal	41,629,000	9,600,000	—	1,301,000	1,750,000	2,370,000	56,650,000
±10% Contingency	4,206,000	975,000	—	138,000	184,000	247,000	5,750,000
TOTAL	45,835,000 (1,222,000/Mile)	10,575,000 (282,000/Mile)	—	1,439,000	1,934,000	2,617,000	62,400,000

TABLE 5-4

Budgetary Estimates for Landscape/Safety Improvements for Service Areas

(in dollars)

Estimates do not include pump relocation, sign relocation, or other building improvements.

LANDSCAPE IMPROVEMENTS	Greenwich, CT Northbound	Greenwich, CT Southbound	New Canaan, CT Northbound	New Canaan, CT Southbound	Fairfield, CT Northbound	Fairfield, CT Southbound
Initial Removal of Invasive Vegetation	1,000	1,000	1,000	1,000	1,000	1,000
Selective Pruning, Thinning	6,000	6,000	6,000	6,000	6,000	6,000
Landscape Plants	55,000	40,000	50,000	60,000	66,000	76,800
Subtotal (Rounded)	62,000	47,000	57,000	67,000	73,000	83,800
±10% Contingency (Rounded)	6,200	4,700	5,700	6,700	7,300	8,380
TOTAL (Rounded)	69,000	52,000	63,000	74,000	80,000	92,000
SAFETY IMPROVEMENTS						
Pavement Removal	22,000	18,000	19,500	19,500	16,500	20,000
New Pavement	80,000	56,000	85,000	84,000	70,000	90,000
Drainage Improvements	10,000	10,000	10,000	10,000	10,000	10,000
New Bituminous Curb	20,400	17,000	20,000	18,000	15,600	24,000
Remove Existing Guiderail	12,000	12,000	10,000	10,000	10,000	10,000
New Steel-backed Wood Guiderail	136,000	117,000	130,000	130,000	97,500	104,000
Concrete Curb/Gutter	70,000	70,000	56,000	56,000	52,500	56,000
Concrete Barrier Wall	80,000	80,000	100,000	87,500	150,000	175,000
Subtotal (Rounded)	430,000	380,000	430,500	415,000	422,000	489,000
±10% Contingency (Rounded)	43,000	38,000	43,000	41,000	42,000	48,900
TOTAL (Rounded)	473,000	418,000	473,500	456,000	464,000	538,000

5.5 MAINTAINING PARKWAY AESTHETICS

As noted previously in this report, the Parkway maintenance has been progressively reduced starting sometime in the early 1960's when the specialized landscape crews assumed non-Parkway duties. It is believed that this change occurred gradually so that the impact was not readily discernible. Today, the impact is observable in the amount of invasive plant growth, the reduction in open lawns and meadows, and the extent of weeds and vines along the roadside.

Significant emphasis has been placed throughout this report on reestablishing the Parkway's park-like character. The capital improvements contemplated by the Master Plan will be quickly lost if the level of roadside landscape maintenance, as distinguished from other roadway maintenance such as pavement repair, snow plowing, and litter control, is not increased.

5.5.1 Lawn Maintenance

At present, the Department now maintains approximately 250 acres of lawn along the roadside and an additional 70 acres of lawn in the median. Mowing typically is performed throughout the growing season so that there are two to three cuttings annually.

By far, on a per unit basis, the mowing of the median is a time consuming and labor intensive effort which adversely affects traffic operations. Due to the present placement of the guiderail, mowing of the strip between the edge of pavement and the guiderail can only be performed by closing the left lane and utilizing crash trucks.

The proposed plan calls for increasing the roadside lawn area by approximately 25 percent to 325 acres. To partially offset the increase in mowing while still achieving a "park-like" quality, it is suggested that a "tiered" mowing system be adopted.

a. Meadow Areas

For the meadow areas, which can be less manicured due to the distance from the travelway, the grass should be cut once a year. Using a flail mower or a rotary mower, the mowing height should be set at approximately six inches. Mowing should take place in late summer after seed heads become mature. Mowing on slopes greater than 2:1 should be eliminated except at critical areas adjacent to bridges. Fertilization is not required for meadow areas.

b. Roadside and Median

The "middle ground" should be mowed two to three times per year and the roadside edge should receive three to four cuttings. Using either a flail or rotary mower, the mowing height should be set at approximately four inches.

In the median, a "walk-behind" mower having a width of 48 inches can be used. A special accessory or mowing unit may be utilized for trimming around the guiderail posts

The curb/gutter system and the location of the guiderail proposed in the Master Plan eliminates the need for mowing between the curb and guiderail. In addition, the introduction of newer grass species listed on the plant list which require less frequent mowing and low maintenance vegetation planted where the median becomes narrow will further reduce the maintenance effort. Selective application of growth retardants along guiderails, sign standards, and other fixed objects is recommended.

Lane closure during mowing operations will be reduced but not eliminated through the proposed median improvements where the grass strip along the edge is to be eliminated. There will still be the need for some crash truck protection when maintenanec personnel need to move from one median to another.

5.5.2 Brush and Invasive Vegetation Control

It is recommended that the removal of brush and invasive vegetation be undertaken as a capital improvement project. Thereafter, brush and invasive species such as bittersweet, multiflora rose, grape, sumac, and other similarly aggressive species not consistent with the landscape scheme should be removed at least annually within the mowing zones and along the woodland edges.

a. Primary Control

Mowing of brush should occur at least once a year using a rotary brush cutter. Areas not accessible to such mowers should be trimmed with hand-held power brush cutters. Areas adjacent to bridges where slopes are steep (greater than 2:1) are best maintained with brush cutters.

b. Secondary Control

Herbicides may be required in areas where brush is persistent and aggressive. In such instances, herbicides should be applied at least biennially. However, care is required in areas in close proximity to wetlands or watercourses and in water supply watersheds.

5.5.3 Pruning

For the past few years, the Department has undertaken a tree pruning and thinning program, including removal of invasive species at the facades of the bridges. Trees have been limbed to a height sufficient to expose the facade and underbrush has been eliminated.

In the Master Plan, it is recommended that the work at the bridges be continued not as a routine maintenance but as a capital program where all the remaining work can be accomplished at once and the visual impact will be more dramatic. At the same time, the recommended improvement of the forest edge along the roadside can also be completed. By undertaking the tree removal, pruning, and thinning as a capital project, maintenance personnel can be made available for other tasks. It is anticipated that the tree maintenance effort will actually be reduced to the periodic removal of invasive sprouts, most of which can be performed with mowing along the reestablished treeline.

Tree maintenance within the median will remain essentially as it is today. The existing larger specimens will continue to need periodic pruning of dead limbs and will eventually be removed. The new plants will need minimal care once established until their spread begins to interfere with traffic safety about 10 to 15 years after planting, at which time routine pruning will be required.

a. *Pruning Methods*

All pruning should be done in accordance with practices adopted by the National Arborist Association, and limited to the selective removal of hazardous or obstructing limbs along travel lanes, bridge facades, and in view corridors. Additional tree limbs may have to be removed to achieve a balanced appearance in the tree canopy. Cuts having a diameter in excess of three inches and facing the travelway should be painted for appearance purposes only.

In the case of required pruning of conifers, weathered branch stubs which do not otherwise cause a hazardous condition could remain in an attempt to maintain a more naturalistic appearance.

All pruning debris should be chipped and blown into the surrounding woodland.

5.5.4 Selective Thinning

The Master Plan calls for the thinning of woodland in selected areas as a means of releasing desired dominant species. Depending on where the thinning is called for, care should be exercised so as not to cause a "clean-cut" appearance exposing nearby residences to a view from the travelway. Generally, the selective thinning should be performed as a capital improvement and should not be required again for another 20 to 25 years.

a. Thinning Methods

Undesirable trees, dead trees, windfalls, etc. should be removed from the visible forest edge. Debris should be chipped and blown into the woodland. The removals should be cut flush with the ground and done in such a manner as to avoid damage to desirable vegetation.

In order to control regrowth of sprouts from stumps, herbicides may be selectively applied. Care should be taken in areas close to wetlands, watercourses, and in water supply watersheds.

5.5.5 Selective Tree Removal

From time to time, trees in close proximity to the travelway become a hazard and must be removed. Under the Master Plan, trees that are within the deflection zone of guiderail or are unprotected within the roadside clear zone may have to be removed as well, in order to avoid risk to the motorist. In addition, it may be desirable to remove some mature trees in certain locations in order to achieve the desired landscape character and enhance the health of adjacent trees.

a. Tree Removal Methods

Where required, trees having an 8 to 10 inch D.B.H. which have died, pose a risk to traffic, or need to be eliminated should be cut flush to the ground. In lawn areas, stumps should be ground eight inches below ground, backfilled, and seeded. Large limbs should be removed from the area. Chips should be blown into nearby woodland wherever possible.

5.5.6 Replacement Planting

The plant material recommended for use on the Parkway has been selected for hardiness and low maintenance. Aside from routine care performed by the landscape contractor during the normal warranty period, only minimal annual maintenance by the Department should be expected. However, it is recommended that the plant material at the time of planting be larger than what the Department normally specifies in order to promote healthy growth and reduce maintenance.

Despite best efforts and horticultural practices, some plants may not thrive or spread and do not reach the desired shape or maturity. Consequently, plants may need replacement to assure that the park-like quality of the Parkway is perpetuated.

a. Replacement Practices

At least every five years, all missing, damaged, or dead plants in a shrub composition should be replaced with new plant stock equal in size to what had been originally planted.

At least once every 10 years, or as trees are lost, underplant designated planting units, i.e. conifer masses and ornamental compositions with new material. Replacement plants should be finished landscape grade with calipers of three inches or more for deciduous trees and six feet in height for conifers.

Mulch (wood chips or shredded bark) should be maintained around both individual trees and planting masses for at least five years. However, care should be taken so as not to mound it around the trunks of the tree.

b. Reforestation Zones

There are many areas throughout the Parkway where the Master Plan calls for reforestation. In such large, unwooded areas so designated, planting should be performed either mechanically or by hand using two year transplants at a 6' x 6' spacing. For the first five years, weeds should be controlled by mowing or the use of selective herbicides.

o31mp5.2

MERRITT PARKWAY
LANDSCAPE MASTER PLAN

CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Lowell P. Weicker Jr.
Governor

Emil H. Frankel, Commissioner
Department of Transportation

List of Drawings

Sheet	Title	Scale
SV1–SV3	Spatial/Visual Analysis	1"=2000'
OV1–OV8	Overview of Features	1"=800'
P1	Points of Interest (South to North)	
G1	Graphic Legend	
1–40	Landscape Master Plan	1"=200'
SA1–SA3	Service Areas	1"=50'
PM1	Plant Materials List	

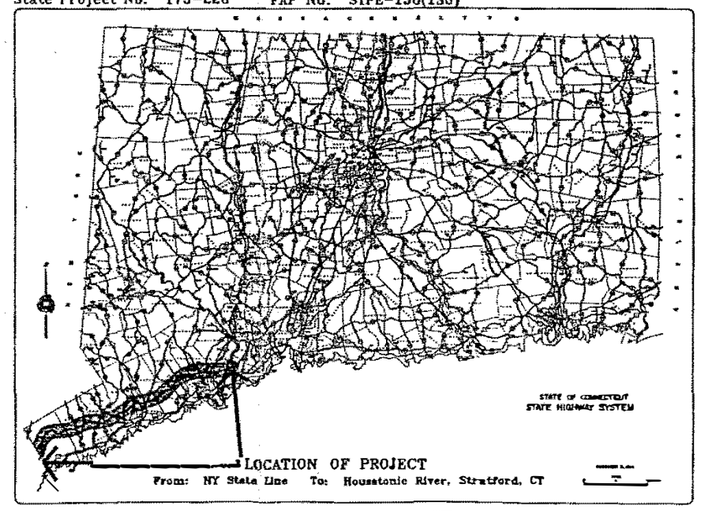
Milone & MacBroom Inc.
Civil, Water Resource and Transportation Engineering . Landscape Architecture and Planning
Cheshire, CT

Johnson, Johnson & Roy/inc
Planning . Landscape Architecture . Urban Design . Environmental Services
Ann Arbor, MI

Johnson Land Design
Landscape Architecture
Hartford, CT

Fitzgerald & Halliday
Transportation Planning
Hartford, CT

Site Location Map
State Project No. 173–226 FAP No. STPE–150(136)



BRIDGE ABUTMENTS

- Remove invasive species at abutments.
- Reestablish previous tree mass, as necessary.
- Limb up existing conifers to reveal abutments.
- Ornamental shrub mass at top of slope.
- Lawn or meadow grasses on gradual slopes and ground cover on steep slopes.
- New concrete barrier at abutment, with simplified detailing of specific bridge.

ENHANCE PARK-LIKE

- Remove invasive species.
- Selectively thin/clear wooded edge to depth noted on the plan (retaining any desirable specimen trees).
- Install new plantings of deciduous, coniferous, and/or flowering trees as noted on plan (spacing and representative quantities as specified).
- Maintain lawn around plantings.

TERMINATING VIEWS

- For outside of curves and along exit ramps as noted on plan.
- Mass conifers to depths of 30'-50', length variable, see plan.
- Plant larger evergreen species, 15'-25' apart, random spacing.
- Plant smaller species (e.g. cedar), 8'-15' apart, random spacing.
- Mixed planting size, 6'-12' height at time of planting.

OPEN VIEWS

- Remove invasive vegetation.
- Selectively thin for major views to water bodies, wetlands.
- Selectively limb up overstory as necessary to open views.
- Leave specimen deciduous and coniferous at key locations to frame, filter views.
- Use flowering trees sparingly as accent plants.

ENHANCE ROCK CUTS

- Remove vines and invasive species.
- Plant new conifers and/or shrub masses where there is sufficient soil on top of rock face.
- Plant cedar, pine in small groups intermittent at rock base where space permits.

REVEAL STONE WALLS

- Remove invasive vegetation.
- Clear understory along view angle to wall.
- Selectively thin and/or limb up overstory to reveal wall; unless there is close proximity to residential area.

LIMB UP PINES

- Clear understory of invasive growth.
- Prune dead or damaged lower branches in existing stands where noted on plan.
- Reestablish lawn underneath in meadow areas, where space will allow mowing - otherwise maintain pine needle surface.
- Do not limb up conifers where it will expose views to adjacent residential area.

BRING GRASS TO ROAD EDGE

- Reestablish lawn to original road edge where pavement has been widened (as noted on the plan).
- Keep area free of obstacles to maintain safe pull-off area on grass.

NEW TREELINE

- Symbol indicates proposed deciduous treeline (edge of drip line) for areas noted on the plan.
- In cleared areas, retain selected specimen trees from cleared edge.
- In expanded areas, plant new deciduous trees 15'-30' apart, randomly spaced.
- New species reflective of existing forest composition.
- Size at time of planting to be 2½"-4" caliper.

CONIFER STANDS

- Plant new coniferous masses to depths and lengths noted on plan.
- New plantings similar to existing species present, or related to specific site conditions.
- Large species (e.g. pine) should be randomly spaced 15'-25' apart.
- Smaller species (e.g. cedar) should be randomly spaced 8'-15' apart.
- Mix sizes at time of planting, 6'-12' height range.

DECIDUOUS TREES

- Symbol represents one new deciduous tree.
- New tree type consistent with associated woodland/forest composition.
- Size at time of planting to be 2½" to 4" caliper.
- Spacing and location as indicated on plans.

CONIFEROUS TREES

- Symbol represents one tree for all median plantings and for large evergreen species (e.g. pine).
- Symbol can represent one to three trees for smaller species (cedar), spaced 8'-12' apart when grouped.
- Tree type should reflect existing coniferous species, or site specific conditions.
- Location and spacing as indicated on plan.
- Mix heights at time of planting, (6'-12' in height).

ORNAMENTAL TREES

- Symbol represents three to five flowering trees randomly spaced at 12'-20' apart.
- Location and extent as indicated on the plan.
- Planting size 2"-2½" caliper or 6'-8' height multistemmed tree.
- Tree type should be reflective of specific site conditions.

LAUREL TREATMENT

- **ENHANCEMENT:** Remove dead or excessively leggy plants. Supplement existing masses as noted on plan; spaced 4'-5' apart, planting size 2'-3' in height.
- **PROPOSED:** Plant to depths and lengths as indicated on plan; spaced 4'-5' apart, planting size 2'-3' in height.

ORNAMENTAL SHRUB MASS

- **ENHANCEMENT:** Remove dead or excessively leggy plants. Supplement or replace existing overgrown masses, matching original species. Planting size 2'-3' in height.
- **PROPOSED:** Plant to depth and length in locations noted on plan. For tops of slopes at bridge abutments, space approximately 4'-5' apart, planting size 2'-3' in height (see plant list for species).

REMOVE INVASIVE/NEW SURFACE TREATMENT:

- Remove invasive, aggressive, and undesirable vegetation.
- Selectively prune and thin.
- Reestablish lawn or meadow grasses in open or park-like areas.
- Allow woodland succession in areas of mature tree stands to within 15' of roadway (or to within 4'-5' of roadway where there is existing guiderail).

RELEASE DESIRABLE VEGETATION

- Remove invasive vegetation.
- Selectively thin immediately adjacent to existing coniferous groves or specimen deciduous, in locations as noted on plan.
- Supplement existing coniferous with new, same species planting, where noted on plan.

REFORESTATION

- Introduce new stands of woods in locations, and to depths and lengths as noted on the plan.
- Plant a "perimeter zone" of 30'-50' adjacent to the roadway with larger landscape stock (2½"-4" caliper deciduous, 6'-8' height coniferous) 15'-30' apart, random spacing.
- Plant the remaining interior zone with bare root linear stock, 5'-10' apart, randomly spaced (shade trees as 3'-5' whips, coniferous at 15"-24" height, ornamentals at 2'-3' clumps).

GUIDERAIL

- Proposed steel-backed wood beam on steel post where shown on plan.
- Median installation should occur in conjunction with installation of new integral concrete curb and gutter.

CONCRETE BARRIER

- Proposed median treatment in areas of narrow median width (0'-5') where zero deflection distance is necessary.
- Generally occurs at the approaches to bridges/overpasses, as shown on plan.

GUIDERAIL REMOVAL

- Remove existing guiderail in the locations and for the span indicated on the plan (from arrow to arrow).
- Some regrading and/or selective tree removal may be required as noted on the plan.
- Spans indicated not to be replaced with new guiderail.

GUIDERAIL RELOCATION

- Remove span of existing guiderail as indicated.
- Relocate and install new guiderail (using steel-backed wood beam on steel posts) where indicated on the plan.
- May require selective tree removal and/or regrading as indicated.

SIGN RELOCATION

- Symbol indicates existing sign to be relocated.
- Typically relocate signs away from the immediate approach side of bridge abutments and out of median.

SLOPE STABILIZATION

- Install ground cover, stabilizing shrubs, and/or low maintenance grasses depending on site specific conditions for areas indicated on the plan.

REGRADING

- Regrade edge as indicated on plan to a 5% maximum grade, to allow for guiderail removal or relocation, or to enhance/create pull-off areas.

PULL-OFF AREAS

- Regrade and/or selectively remove vegetation in specific areas as indicated on the plan for barrier-free pull-off areas.

LOW MAINTENANCE ZONE

- Symbol indicates those areas of the median where the guiderail transitions and attaches to the proposed median barrier.
- To eliminate the need for hand mowing in this narrow median condition, plant with a low maintenance, low growing plant material, as indicated on the plant list.

Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

G1

Graphic Legend

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday

Merritt Parkway Plant List

Evergreen Trees

Botanical Name	Common Name	Initial Specified Height Range	Mature Height (under normal conditions)
Juniperus virginiana	Red Cedar	3'-6'	20'-25'
Picea abies	Norway Spruce	6'-10'	80'-100'
Pinus nigra	Austrian Pine	6'-10'	50'-60'
Pinus strobus	White Pine	6'-10'	65'-75'
* Thuja occidentalis 'Nigra'	Dark Green American Arborvitae	3'-6'	20'-30'

Deciduous Trees

Botanical Name	Common Name	Initial Specified Size (Cal.)	Mature Height (under normal conditions)
Acer rubrum	Red Maple	2.5"-6"	55'-60'
Acer saccharum	Sugar Maple	2.5"-6"	60'-65'
Carpinus caroliniana	American Hornbeam	2.5"-4"	30'-40'
Fagus americana	American Beech	1.5"-3.5"	60'-70'
* Fraxinus americana 'Autumn Purple'	White Ash	1.5"-4"	55'-60'
* Fraxinus pennsylvanica 'Summit'	Summit Ash	1.5"-4"	55'-60'
* Gleditsia triacanthos inermis	Thornless Honey Locust varieties	1.5"-5"	50'-60'
Liquidambar styraciflua	Sweetgum	1.5"-4"	55'-60'
Liriodendron tulipifera	Tulip Tree	1.5"-3.5"	80'-90'
** Nyssa sylvatica	Black Gum	2"-3"	30'-50'
* Platanus acerifolia	London Planetree	1.5"-4"	90'-100'
Quercus alba	White Oak	1.5"-4"	55'-60'
Quercus coccinea	Scarlet Oak	1.5"-4"	70'-75'
Quercus palustris	Pin Oak	1.5"-4"	75'-80'
Quercus rubra	Red Oak	1.5"-4"	60'-75'
* Tilia species	Linden varieties	1.5"-5"	45'-50'
Ulmus americana 'Pioneer'	Pioneer Elm	2"-4"	40'-50'
Ulmus americana 'Princeton'	Princeton Elm	2"-4"	40'-60'
* Ulmus carpinifolia 'Holmstead'	Holmstead Elm	2"-4"	40'-60'

Ornamental Trees

Botanical Name	Common Name	Initial Specified Height Range	Mature Height (under normal conditions)
** Amelanchier canadensis	Shadblow	3'-10' (clump or tree form)	20'-25'
** Amelanchier laevis	Allegheny Serviceberry	3'-8'	15'-25'
* Betula nigra	River Birch	6'-14'	40'-50'
* Betula papyrifera	Paper Birch	6'-12' (clump or tree form)	35'-40'
Betula populifolia	Gray Birch	6'-10'	35'-40'
* Cornus alternifolia	Pagoda Dogwood	3'-8'	20'-25'
* Cornus kousa	Kousa Dogwood	3'-12'	20'-25'
** Crataegus crusgalli	Cockspur Hawthorn	6'-10'	20'-30'
** Hamamelis virginiana	Common Witch Hazel	3'-8'	12'-15'
** Prunus serotina	Black Cherry	6'-10'	50'-60'

Narrow Leaf and Broadleaf Evergreens

Botanical Name	Common Name	Initial Specified Height Range	Mature Height (under normal conditions)
* Euonymus fortunei 'Green Lane'	Green Lane Wintercreeper	12"-24"	ground cover
Juniperus communis depressa	Oldfield Common Juniper	18"-24" Spr.	5'-6' Spr.
Juniperus communis 'Hornibrookii'	Hornbrook Juniper	12"-18" Spr.	6'-8' Spr.
* Juniperus pfitzeriana 'Compacta'	Compact Pfitzer Juniper	12"-24" Spr.	5'-8' Spr.
Kalmia latifolia	Mountain Laurel	1.5'-4'	8'-10'
* Rhododendron catawbiense	Catawba Rhododendron	1.5'-3.5'	5'-6'
* Rhododendron l. 'Wilsoni'	Wilson Rhododendron	1.5'-3.5'	3'-6'
Rhododendron maximum	Rosebay Rhododendron	2'-4'	10'-15'
* Rhododendron periclymenoides	Pinxterbloom Azalea	1.5'-3'	4'-6'
* Rhododendron vaseyi	Pinkshell Azalea	1.5'-3'	5'-10'
* Rhododendron viscosum	Swamp Azalea	1.5'-3'	4'-8'

Deciduous Shrubs

Botanical Name	Common Name	Initial Specified Height Range	Mature Height (under normal conditions)
Comptonia peregrina	Sweetfern	15"-24"	2'-4'
* Cornus racemosa	Gray Dogwood	2'-4'	10'-15'
Ilex verticillata	Winterberry	1'-3'	6'-8'
Myrica pensylvanica	Bayberry	1.5'-3'	6'-8'
* Rhus aromatica 'Gro-Low'	Fragrant Sumac	12"-24"	2'-3'
* Rosa rugosa	Beach Rose	12"-24"	4'-6'
* Rosa 'Sea Foam'	Sea Foam Rose	12"-24"	2'-3'
Sambucus canadensis	American Elder	2'-3'	4'-6'
Vaccinium corymbosum	Highbush Blueberry	1.5'-3'	6'-8'
* Viburnum cassinoides	Whitrod Viburnum	18"-30"	4'-6'
* Viburnum dentatum	Arrowwood	2'-3'	6'-8'
* Viburnum tomentosum 'Mariesii'	Mariesii Doublefile Viburnum	2'-4'	6'-8'
* Viburnum trilobum	American Highbush Cranberry	2'-4'	8'-12'

Climbing Vines and Ground Covers

Botanical Name	Common Name	Initial Specified Height Range	Mature Spread (under normal conditions)
Hedera helix 'Baltica'	Baltic Ivy	3"-1 gal.	10"-18"
Lonicera japanica 'Halliana'	Hall's Honeysuckle	3" pot-2 gal.	20'-30'
Pachysandra terminalis	Pachysandra	2¼"-4" pot	8"-12"
Parthenocissus quinquefolia	Virginia Creeper	1-2 gal.	50'
* Parthenocissus tricuspidata 'Veitchii'	Boston Ivy	1-2 gal.	8"-18"
* Vinca minor 'Bowles'	Bowles myrtle	3"-1 gal.	10"-18"

** *Lawn and Meadow Grasses*

Plant Type	Specific Variety		Mature Height (without seed heads)
Alkaligrass	variety:	Salty	1'-1½'
Fine Fescue	variety:	Reliant	10"-12"
		Jamestown II	
Kentucky Bluegrass	variety:	Baron	2'-2½'
		Ram I	
		Sydsport	
Perennial Ryegrass	variety:	Repell II	2'-3'
		Palmer II	
* Poa trivialis	variety:	Laser	1½'-2'
* Tall Fescue	variety:	Rebel 3D	2'-2½'
		Tribute	2½'-3'

** *Wild Flowers*

Botanical Name	Common Name	Mature Height
Achillea millefolium	White Yarrow	2'-3'
Chrysanthemum leucanthemum	Ox-Eye Daisy	2'-3'
Coreopsis lanceolata	Lance-leaf coreopsis	2'-3'
Eupatorium purpureum	Joe Pye Weed	5'-6'
Hemerocallis species	Daylily	1'-2'
Myosotis sylvatica	Forget-Me-Not	12"-18"
Rudbeckia hirta	Black-eyed Susan	2'-3'
Vernonia noveboracensis	Ironweed	4'-5'
Viola cornuta	Johnny Jump-Up	6"-12"

* Asterisked items are species that have been modified from the original plant list.
** Double asterisked items are new genus introduced.

Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

PM1

Plant Materials List

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday

MERRITT PARKWAY LANDSCAPE MASTER PLAN
POINTS OF INTEREST (SOUTH TO NORTH)

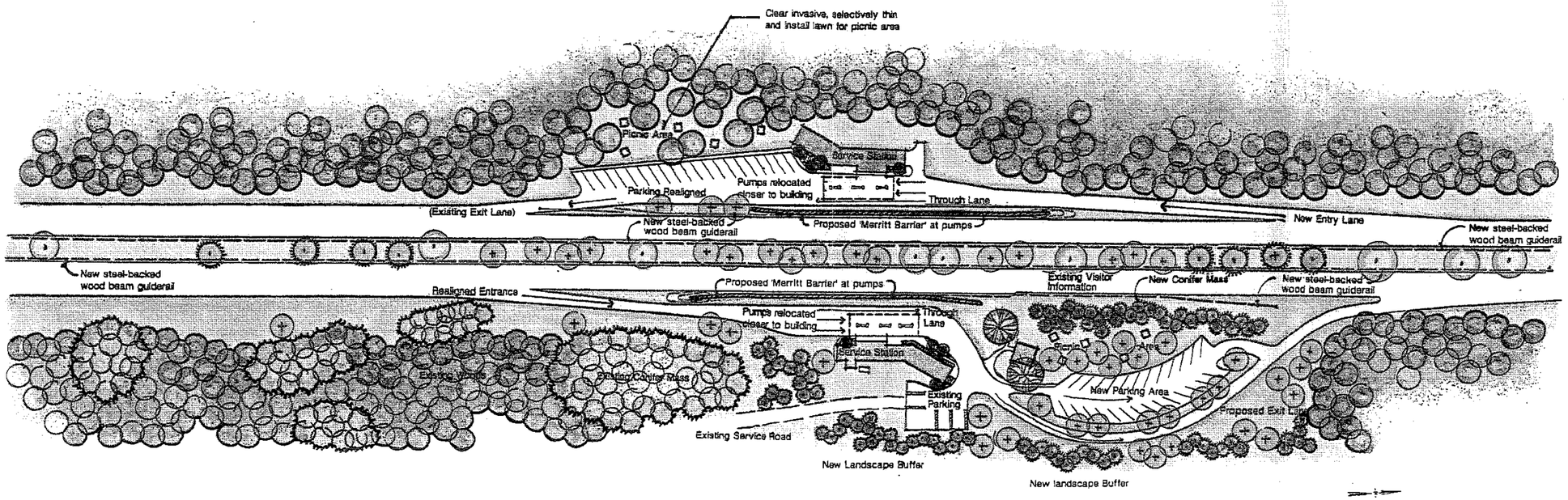
Sheet No.		
T	☐	Harrison, NY - Greenwich, CT Town Line
1	☐	Exit 27 King Street/King Street Bridge
1	☐	Service Area #1 - Greenwich
2/3	☐	Former Tollgate Plaza - Greenwich
5	☐	Exit 28 Round Hill Road/Round Hill Road Bridge
6	☐	Exit 29 Old Mill Road (N) Lake Avenue/Lake Avenue Bridge(S)
7/8	☐	Exit 31 North Street/North Street Bridge
10	☐	Stanwich Road Bridge
10	☐	Greenwich-Stamford Town Line
10	☐	Guinea Road Bridge (formerly "Rocky Craig" Bridge)
11	☐	Riverbank Road Bridge
12	☐	Exit 33 Den Road
12	☐	Exit 34 Long Ridge Road (Rt. 104)/Long Ridge Road Bridge
13	☐	Wire Mill Road Bridge
13	☐	Exit 35 High Ridge Road (Rt. 137)/High Ridge Road Bridge
14	☐	Newfield Avenue Bridge
14	☐	Stamford-New Canaan Town Line
15	☐	Ponus Ridge Bridge
16	☐	Old Stamford Road (Rt. 106)/Rt. 106 Bridge
17	☐	Lapham Road Bridge
17	☐	Exit 37 South Avenue (Rt. 124)/South Avenue Bridge
17	☐	Service Area #2 - New Canaan
18	☐	White Oak Shade Road Bridge
18	☐	Marvin Ridge Road Bridge
18	☐	New Canaan - Norwalk Town Line
19	☐	Exit 38 New Canaan Avenue (Rt. 123)
19	☐	Comstock Hill Road Bridge
19	☐	Exit 39A Route 7 South
20	☐	Exit 39B Route 7 North
20	☐	Exit 40A Main Avenue (old Rt. 7)
20	☐	Exit 40B Main Avenue
20	☐	West Rocks Road Bridge
21	☐	East Rocks Road Bridge
21	☐	Gruman Avenue Bridge
22	☐	Norwalk-Westport Town Line
22	☐	Newtown Turnpike Bridge (Rt. 53)
22/23	☐	Exit 41 Wilton Road (Rt. 33)
23	☐	Clinton Avenue Bridge
23/24	☐	Exit 42 Weston Road
24	☐	North Avenue Bridge
25	☐	Westport-Fairfield Town Line
26	☐	Merwins Lane Bridge
27	☐	Redding Road Bridge
27	☐	Congress Street Bridge
28	☐	Burr Street Bridge
29	☐	Exit 44 Black Rock Turnpike (Rt. 58)
29	☐	Exit 45 Black Rock Turnpike (Rt. 58)
30	☐	Morehouse Drive Bridge
30	☐	Service Area #3 - Fairfield
31	☐	Exit 46 Easton Turnpike (Rt. 59)/Easton Turnpike Bridge (formerly "Sport Hill Road" Bridge)
31	☐	Fairfield-Trumbull Town Line
32	☐	Exit 47 Park Avenue/Park Avenue Bridge
32	☐	Plattsville Road Bridge
32	☐	Madison Avenue Bridge
33	☐	Exit 48 Main Street (Rt. 111)/Main Street Bridge
34	☐	Frenchtown Road Bridge
34/35	☐	Exit 49 Route 25 Interchange
35	☐	Exit 50 White Plains Road (Rt. 127)
36	☐	Exit 51 Nichols Avenue (Rt. 108 Huntington Turnpike)/Nichols Avenue Bridge
37	☐	Exit 52 Route 8 Interchange
38	☐	Trumbull-Stratford Town Line
39	☐	James Farm Road Bridge
39/40	☐	Exit 53 River Road (Rt. 110)
40	☐	Stratford-Milford Town Line at Housatonic River/Bridge

Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

P1

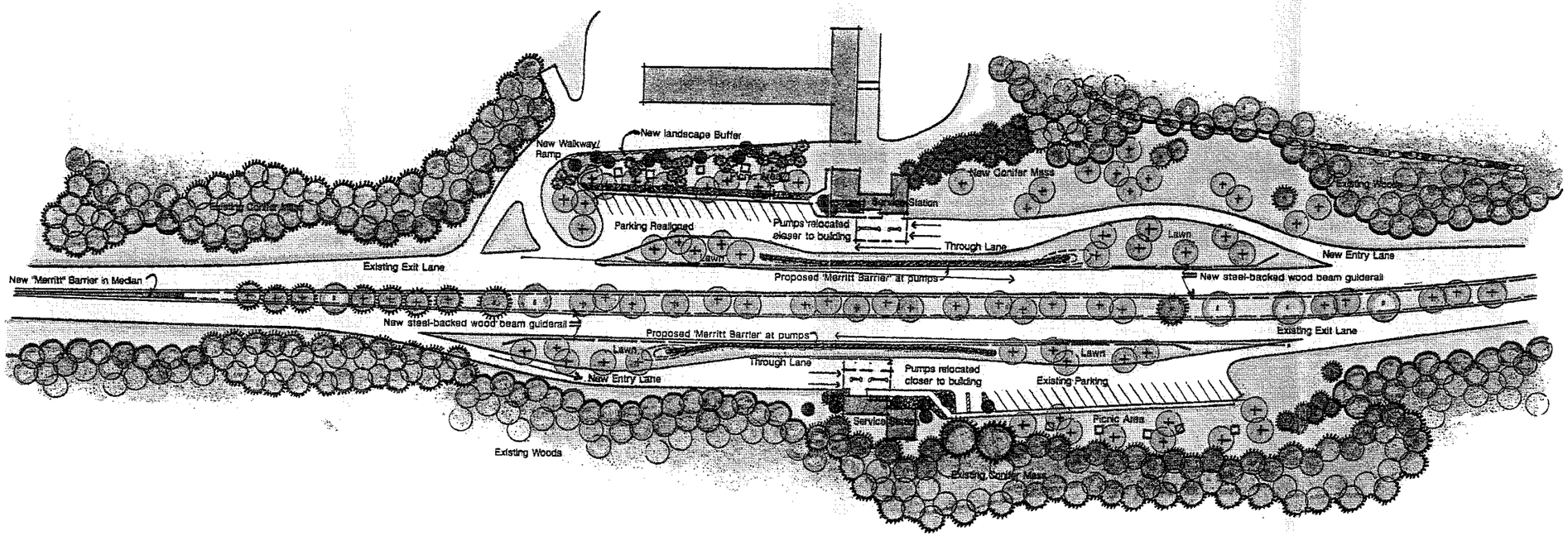
Points of Interest
(South to North)

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday



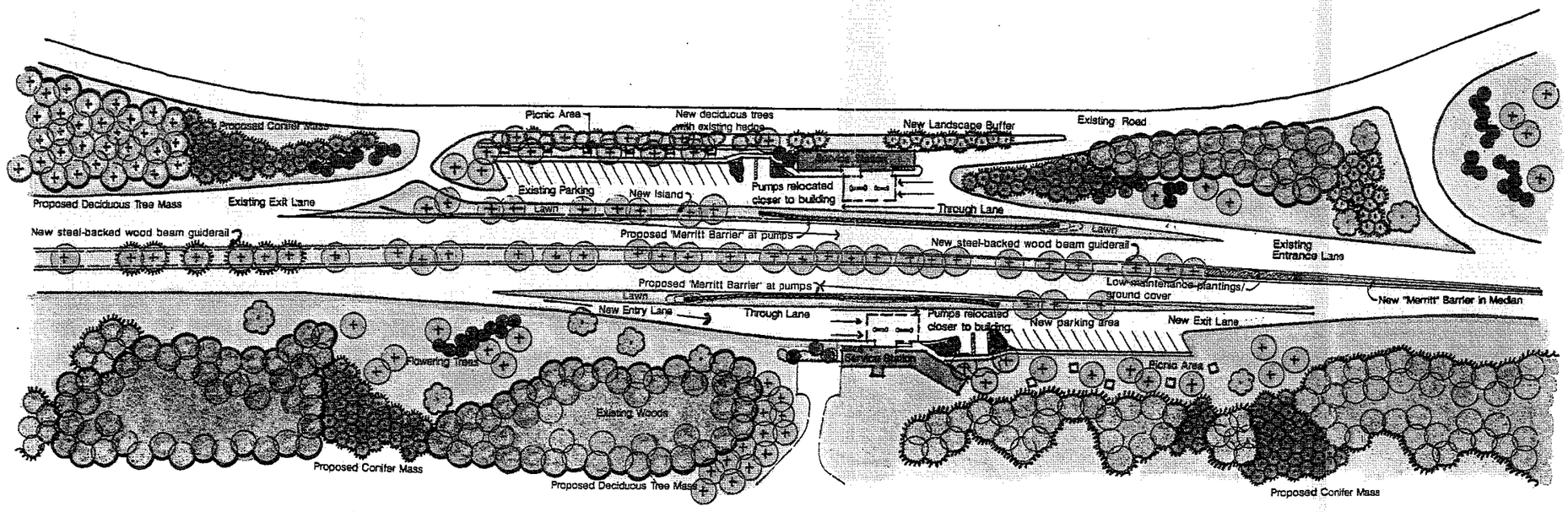
Greenwich, CT

	Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation		SA1
	Service Areas	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday	



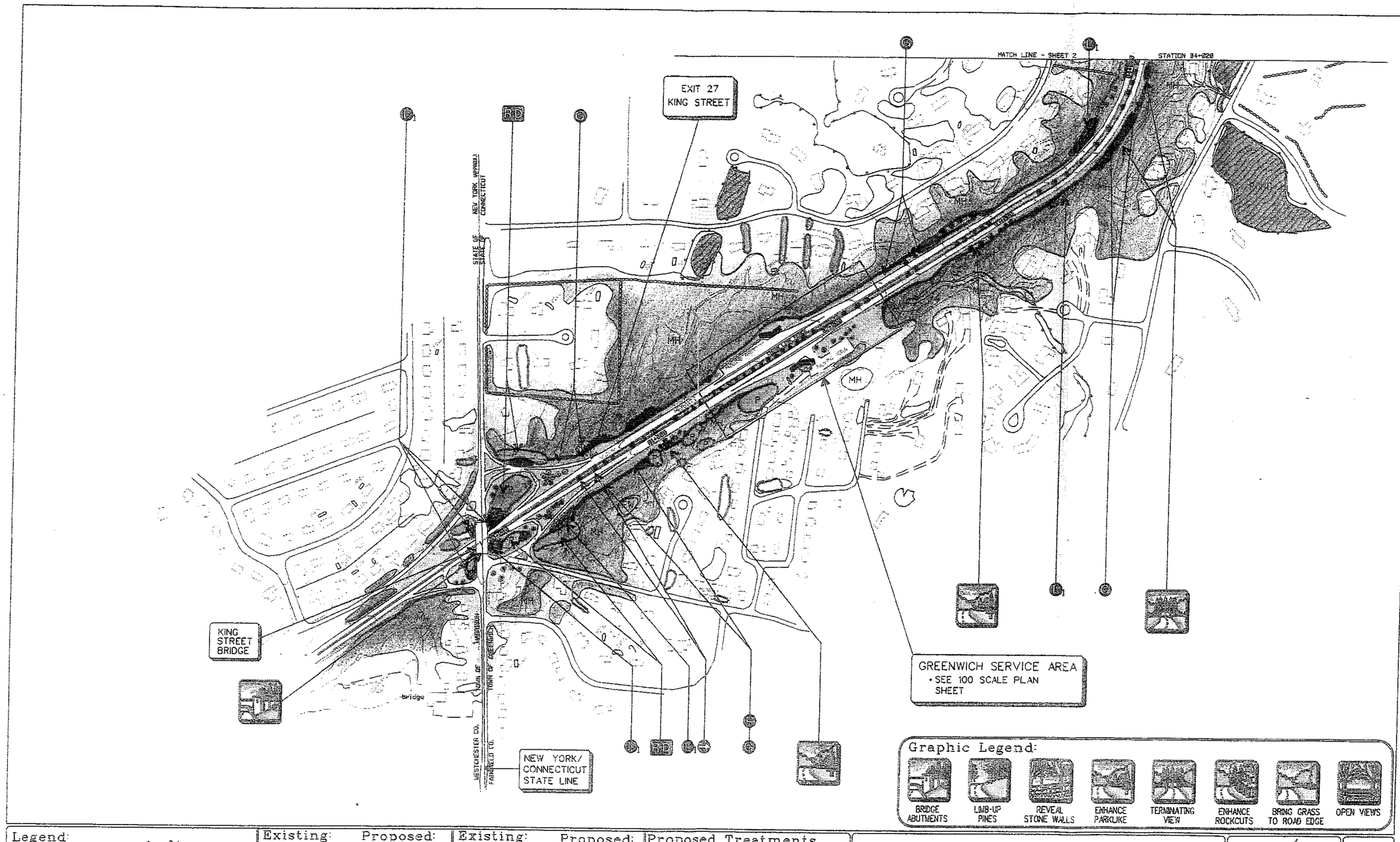
New Canaan, CT

	Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation		SA2
	Service Areas	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday	



Fairfield, CT

	Merritt Parkway Landscape Master Plan State of Connecticut Department of Transportation		SA3
	Service Areas	Milone & MacBroom, Inc. Johnson, Johnson & Roy, Inc. Johnson Land Design Fitzgerald & Halliday	



Legend:

- Contours
- Spot Elevation
- Buildings
- Right-of-Way
- Townline
- Stationing
- Easements
- Catenary Towers
- Poles
- Rock Outcropping
- Stone Wall
- Fence
- Wetland/Water Course
- Body of Water
- Stream or Water Boundary
- Visually Intrusive Sign

Existing:	Proposed:
Mixed Hardwoods	Tree Line
Conifer Stand: C-Cedar P-Pine H-Hemlock	Conifer Stand
Deciduous Tree	Deciduous Tree
Significant Tree	Coniferous Tree
Coniferous Tree Pine/Cedar	Ornamental Tree
Laurel	

Existing:	Proposed:
Forested Wetland	Ornamental Shrub Mass
Scrub Wetland	Laurel Mass
Turf/Lawn	
Meadow	
Ornamental Shrub Mass	
Laurel Enhancement	
Removed Invasive/ New Surface Treatment	

Proposed Treatments

- Guiderail
- Concrete Barrier/Curb
- Sign Relocation
- Guiderail Removal
- Guiderail Relocation
- Slope Stabilization
- Low Maintenance Vegetation Zone
- Release Desirable Vegetation
- Regrading
- Pull-off Area
- Reforestation

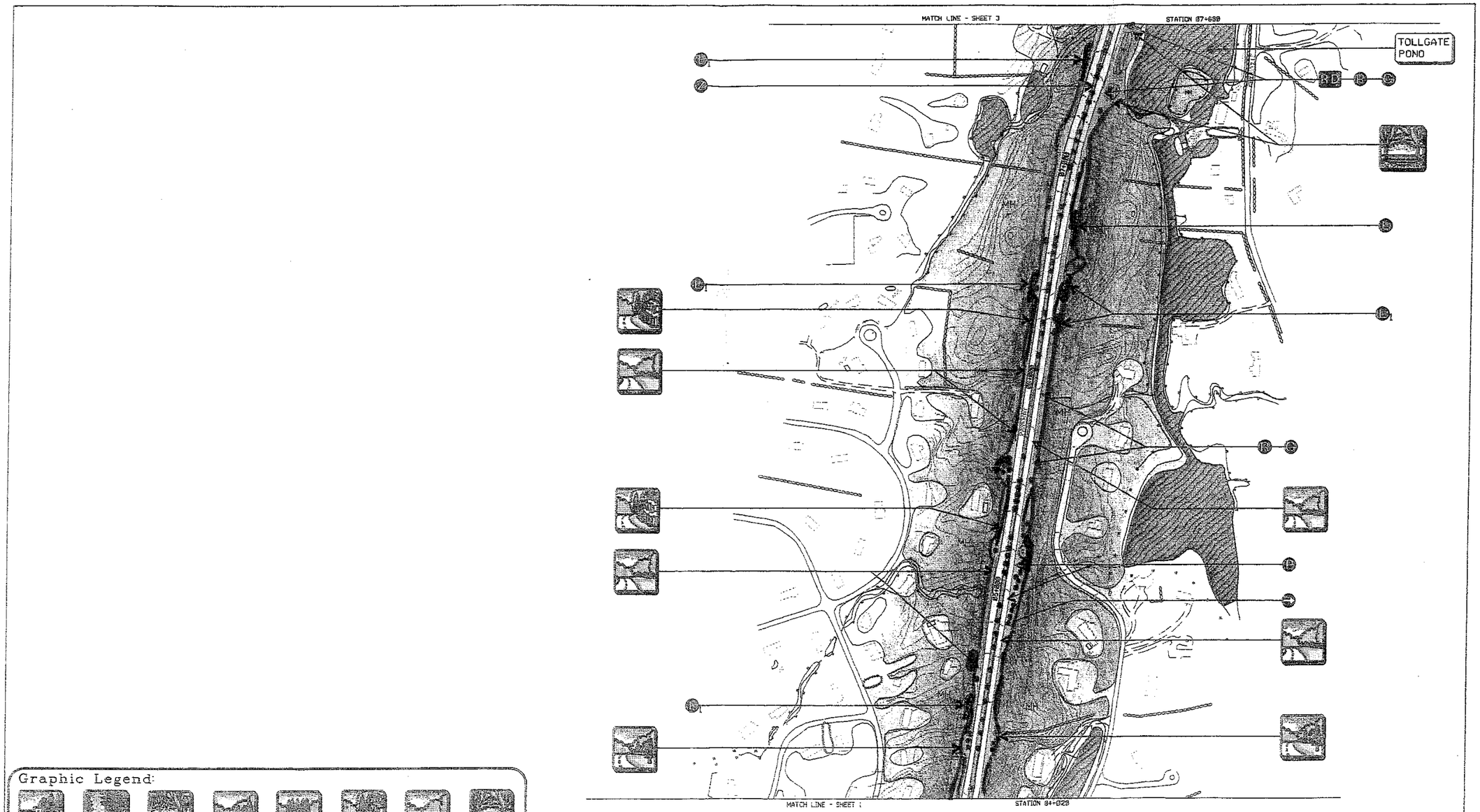
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

1 of 40

Landscape Master Plan

Station 00+000 to Station 04+020

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday



Graphic Legend:

BRIDGE ABUTMENTS | LIMB-UP PINES | REVEAL STONE WALLS | ENHANCE PARKLIKE | TERMINATING VIEW | ENHANCE ROCKCUTS | BRING GRASS TO ROAD EDGE | OPEN VIEWS

Legend:

- Contours
- Spot Elevation
- Buildings
- Right-of-Way
- Townline
- Stationing
- Easements
- Catenary Towers
- Poles
- Rock Outcropping
- Stone Wall
- Fence
- Wetland/Water Course
- Body of Water
- Stream or Water Boundary
- Visually Intrusive Sign

Existing:	Proposed:
Mixed Hardwoods	Tree Line
Conifer Stand: C-Cedar P-Pine H-Hemlock	Conifer Stand
Deciduous Tree	Deciduous Tree
Significant Tree	Coniferous Tree
Coniferous Tree Pine/Cedar	Ornamental Tree
Laurel	

Existing:	Proposed:
Forested Wetland	Ornamental Shrub Mass
Scrub Wetland	Laurel Mass
Turf/Lawn	
Meadow	
Ornamental Shrub Mass	
Laurel Enhancement	
Removed Invasive/ New Surface Treatment	

Proposed Treatments

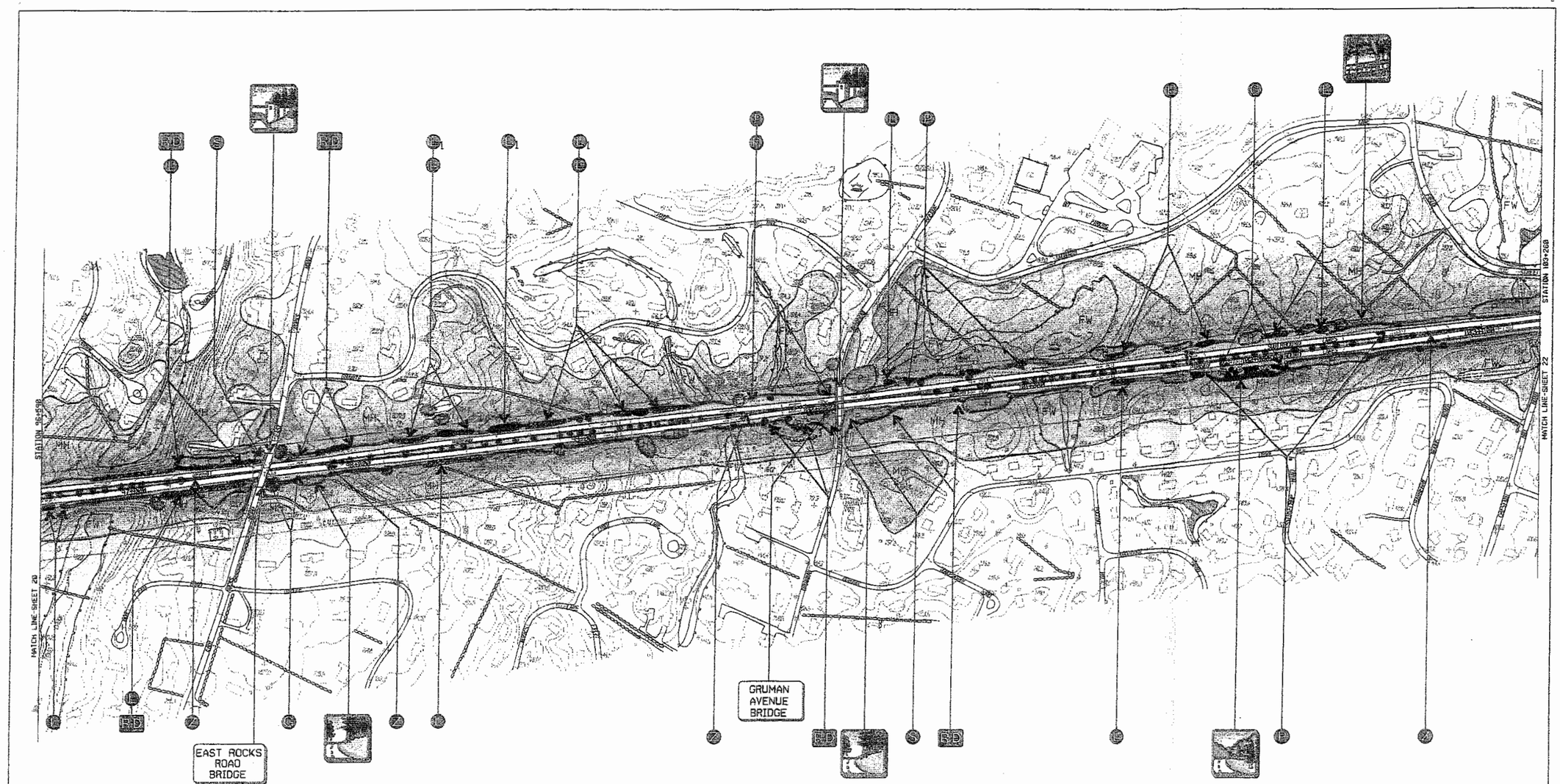
- Guiderail
- Concrete Barrier/Curb
- Sign Relocation
- Guiderail Removal
- Guiderail Relocation
- Slope Stabilization
- Low Maintenance Vegetation Zone
- Release Desirable Vegetation
- Regrading
- Pull-off Area
- Reforestation

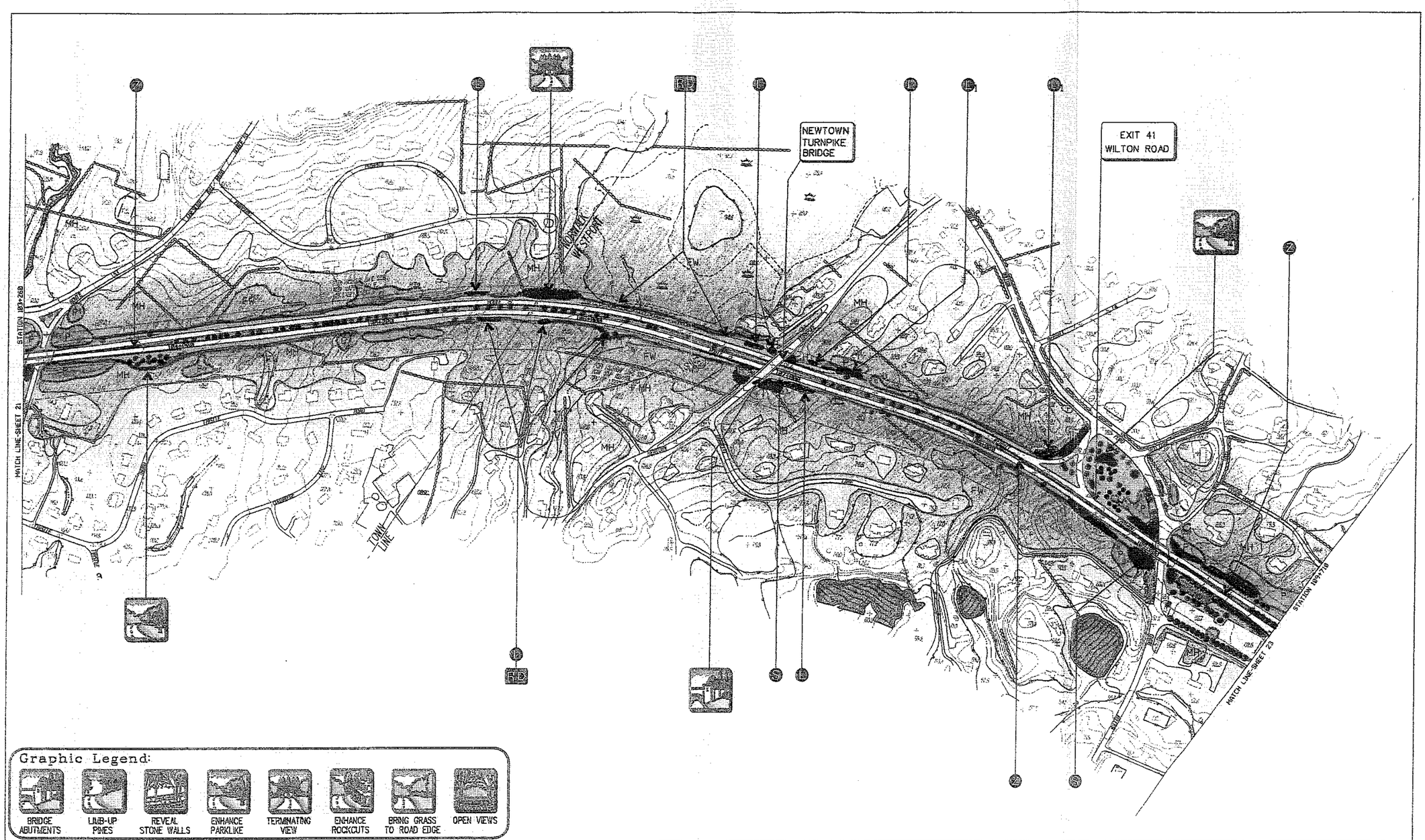
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

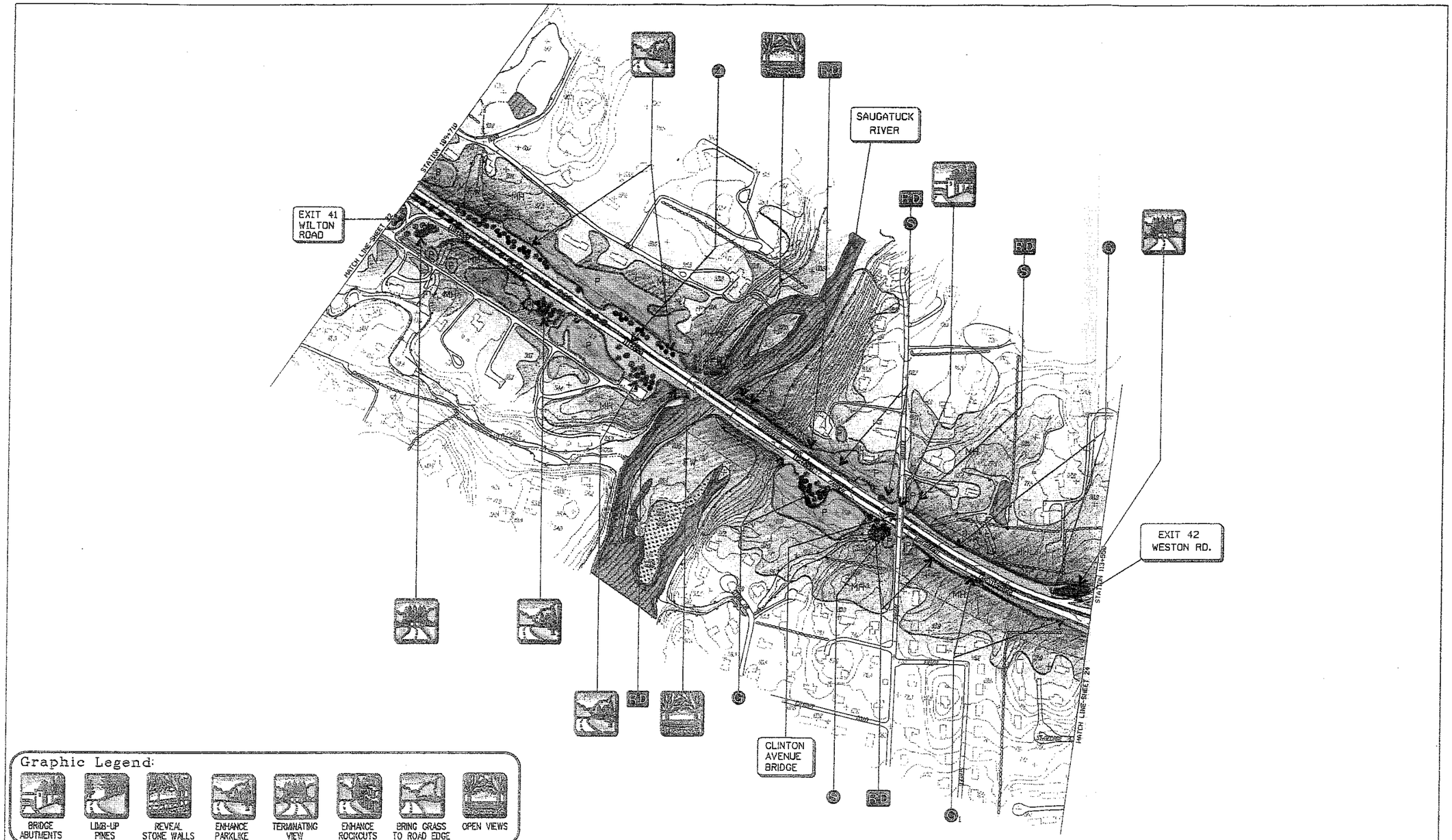
2 of 40

Landscape Master Plan
Station 04+020 to Station 07+680

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday


MATCH LINE-SHEET 20
STATION 96+50
MATCH LINE-SHEET 22
STATION 103+260
EAST ROCKS ROAD BRIDGE
GRUMAN AVENUE BRIDGE
Graphic Legend:
BRIDGE ABUTMENTS
LIMB-UP PINES
REVEAL STONE WALLS
ENHANCE PARKLIKE
TERMINATING VIEW
ENHANCE ROCKCUTS
BRING GRASS TO ROAD EDGE
OPEN VIEWS
Legend:
Contours
Spot Elevation
Buildings
Right-of-Way
Townline
Staticring
Easements
Catenary Towers
Poles
Rock Outcropping
Stone Wall
Fence
Wetland/Water Course
Body of Water
Stream or Water Boundary
Visually Intrusive Sign
Existing:
Proposed:
Mixed Hardwoods
Tree Line
Conifer Stand:
C-Cedar P-Pine H-Hemlock
Conifer Stand
Deciduous Tree
Significant Tree
Coniferous Tree
Ornamental Tree
Pine/Cedar
Laurel
Ornamental Shrub Mass
Laurel Mass
Existing:
Proposed:
Forested Wetland
Scrub Wetland
Turf/Lawn
Meadow
Ornamental Shrub Mass
Laurel Enhancement
Removed Invasive/ New Surface Treatment
Proposed Treatments
Guiderail
Concrete Barrier/Curb
Sign Relocation
Guiderail Removal
Guiderail Relocation
Slope Stabilization
Low Maintenance Vegetation Zone
Release Desirable Vegetation
Regrading
Pull-off Area
Reforestation
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation
21 of 40
Landscape Master Plan
Station 96+590 to Station 103+260
Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday


NEWTOWN TURNPIKE BRIDGE
EXIT 41 WILTON ROAD
NORTH WESTPORT
TOWN LINE
MATCH LINE-SHEET 21
STATION 103+260
MATCH LINE-SHEET 23
STATION 109+710
Graphic Legend:
BRIDGE ABUTMENTS
LIMB-UP PINES
REVEAL STONE WALLS
ENHANCE PARKLIKE
TERMINATING VIEW
ENHANCE ROCKCUTS
BRING GRASS TO ROAD EDGE
OPEN VIEWS
Legend:
Contours
Spot Elevation
Buildings
Right-of-Way
Townline
Stationing
Easements
Catenary Towers
Poles
Rock Outcropping
Stone Wall
Fence
Wetland/Water Course
Body of Water
Stream or Water Boundary
Visually Intrusive Sign
Existing: Proposed:
Mixed Hardwoods
Conifer Stand:
C-Cedar P-Pine H-Hemlock
Deciduous Tree
Significant Tree
Coniferous Tree Pine/Cedar
Laurel
Tree Line
Conifer Stand
Deciduous Tree
Coniferous Tree
Ornamental Tree
Existing: Proposed:
Forested Wetland
Scrub Wetland
Turf/Lawn
Meadow
Ornamental Shrub Mass
Laurel Enhancement
Removed Invasive/ New Surface Treatment
Ornamental Shrub Mass
Laurel Mass
Proposed Treatments
Guiderail
Concrete Barrier/Curb
Sign Relocation
Guiderail Removal
Guiderail Relocation
Slope Stabilization
Low Maintenance Vegetation Zone
Release Desirable Vegetation
Regrading
Pull-off Area
Reforestation
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation
22 of 40
Landscape Master Plan
Station 103+260 to Station 109+710
Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday



Graphic Legend:

BRIDGE ABUTMENTS | LIMB-UP PINES | REVEAL STONE WALLS | ENHANCE PARKLIKE | TERMINATING VIEW | ENHANCE ROCKCUTS | BRING GRASS TO ROAD EDGE | OPEN VIEWS

Legend:

- Contours
- Spot Elevation
- Buildings
- Right-of-Way
- Townline
- Stationing
- Easements
- Catenary Towers
- Poles
- Rock Outcropping
- Stone Wall
- Fence
- Wetland/Water Course
- Body of Water
- Stream or Water Boundary
- Visually intrusive Sign

Existing: / Proposed:

- Mixed Hardwoods
- Conifer Stand: C-Cedar P-Pine H-Hemlock
- Deciduous Tree
- ST Significant Tree
- Coniferous Tree Pine/Cedar
- Laurel
- Tree Line
- Conifer Stand
- Deciduous Tree
- Coniferous Tree
- Ornamental Tree

Existing: / Proposed:

- Forested Wetland
- Scrub Wetland
- Turf/Lawn
- Meadow
- Ornamental Shrub Mass
- Laurel Enhancement
- Removed Invasive/ New Surface Treatment
- Ornamental Shrub Mass
- Laurel Mass

Proposed Treatments

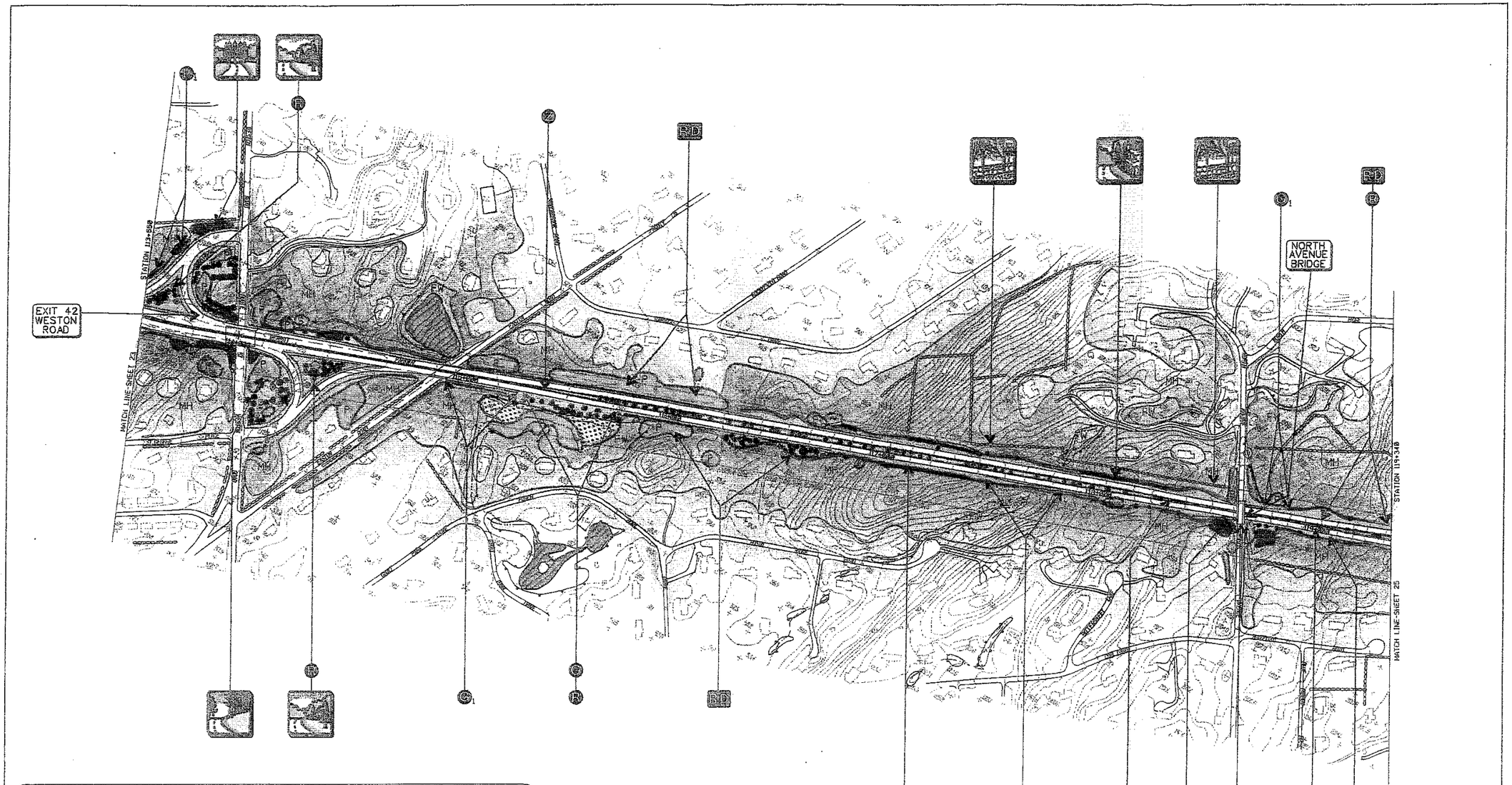
- Guiderail
- Concrete Barrier/Curb
- Sign Relocation
- Guiderail Removal
- Guiderail Relocation
- Slope Stabilization
- Low Maintenance Vegetation Zone
- Release Desirable Vegetation
- Regrading
- Pull-off Area
- Reforestation

Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

23 of 40

Landscape Master Plan
Station 109+710 to Station 113+550

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday



Graphic Legend:

BRIDGE ABUTMENTS | LIMB-UP PINES | REVEAL STONE WALLS | ENHANCE PARKLIKE | TERMINATING VIEW | ENHANCE ROCKCUTS | BRING GRASS TO ROAD EDGE | OPEN VIEWS

Legend:

- Contours
- Spot Elevation
- Buildings
- Right-of-Way
- Townline
- Stationing
- Easements
- Catenary Towers
- Poles
- Rock Outcropping
- Stone Wall
- Fence
- Wetland/Water Course
- Body of Water
- Stream or Water Boundary
- Visually Intrusive Sign

Existing:	Proposed:
Mixed Hardwoods	Tree Line
Conifer Stand: C-Cedar P-Pine H-Hemlock	Conifer Stand
Deciduous Tree	Deciduous Tree
Significant Tree	Coniferous Tree
Coniferous Tree Pine/Cedar	Ornamental Tree
Laurel	

Existing:	Proposed:
Forested Wetland	Ornamental Shrub Mass
Scrub Wetland	Laurel Mass
Turf/Lawn	
Meadow	
Ornamental Shrub Mass	
Laurel Enhancement	
Removed Invasive/ New Surface Treatment	

Proposed Treatments

- Guiderail
- Concrete Barrier/Curb
- Sign Relocation
- Guiderail Removal
- Guiderail Relocation
- Slope Stabilization
- Low Maintenance Vegetation Zone
- Release Desirable Vegetation
- Regrading
- Pull-off Area
- Reforestation

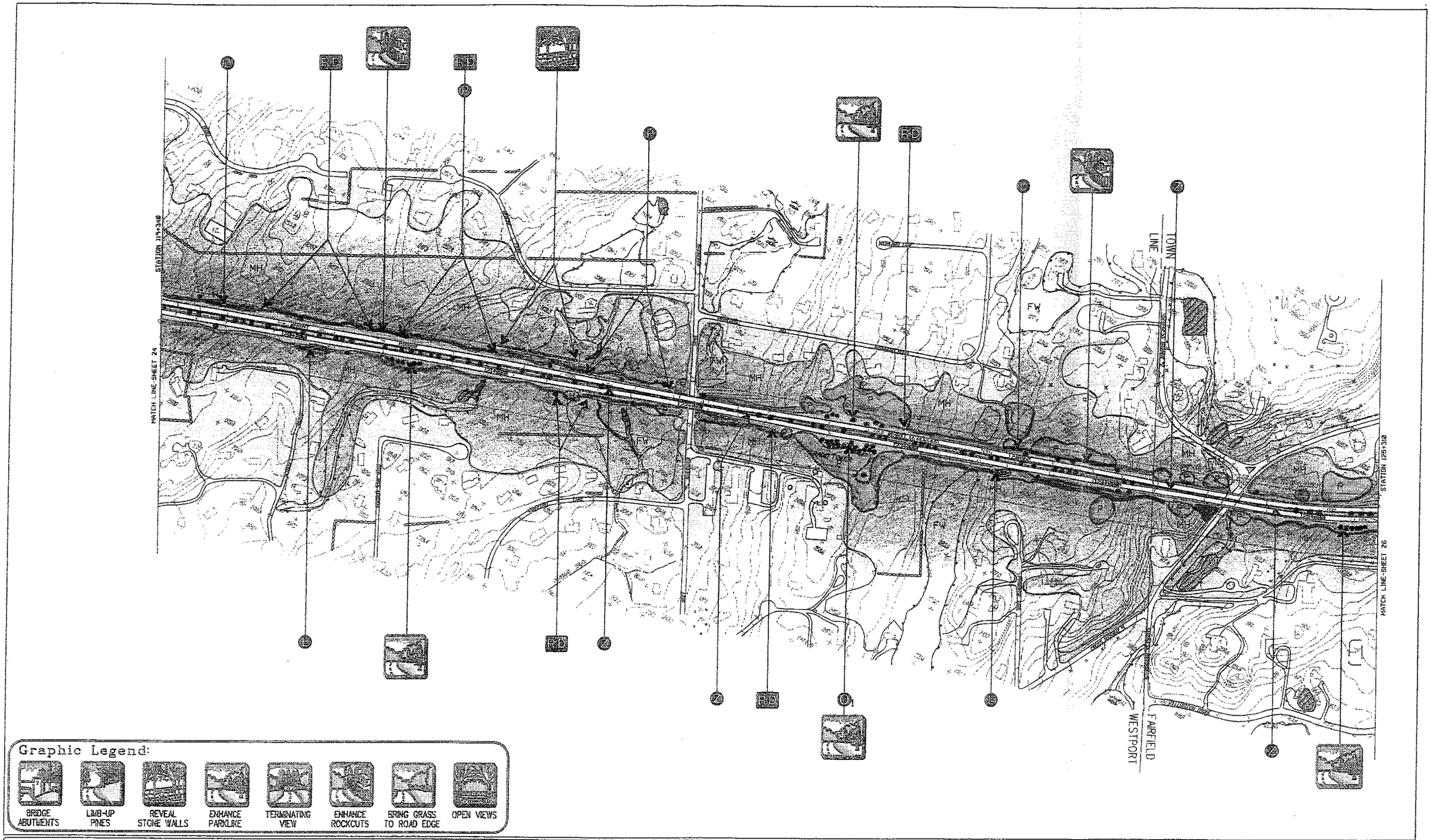
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

24 of 40

Landscape Master Plan

Station 113+550 to Station 119+340

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday



Graphic Legend:

BRIDGE ABUTMENTS | LIMB-UP PINES | REVEAL STONE WALLS | ENHANCE PARKLIKE | TERMINATING VIEW | ENHANCE ROCKCUTS | BRING GRASS TO ROAD EDGE | OPEN VIEWS

Legend:

- Contours
- Spot Elevation
- Buildings
- Right-of-Way
- Townline
- Stationing
- Easements
- Catenary Towers
- Poles
- Rock Outcropping
- Stone Wall
- Fence
- Wetland/Water Course
- Body of Water
- Stream or Water Boundary
- Visually Intrusive Sign

Existing:	Proposed:
Mixed Hardwoods	Tree Line
Conifer Stand: C-Cedar P-Pine H-Hemlock	Conifer Stand
Deciduous Tree	Deciduous Tree
Significant Tree	Coniferous Tree
Coniferous Tree Pine/Cedar	Ornamental Tree
Laurel	

Existing:	Proposed:
Forested Wetland	
Scrub Wetland	
Turf/Lawn	
Meadow	
Ornamental Shrub Mass	Ornamental Shrub Mass
Laurel Enhancement	Laurel Mass
Removed Invasive/ New Surface Treatment	

Proposed Treatments

- Guiderail
- Concrete Barrier/Curb
- Sign Relocation
- Guiderail Removal
- Guiderail Relocation
- Slope Stabilization
- Low Maintenance Vegetation Zone
- Release Desirable Vegetation
- Regrading
- Pull-off Area
- Reforestation

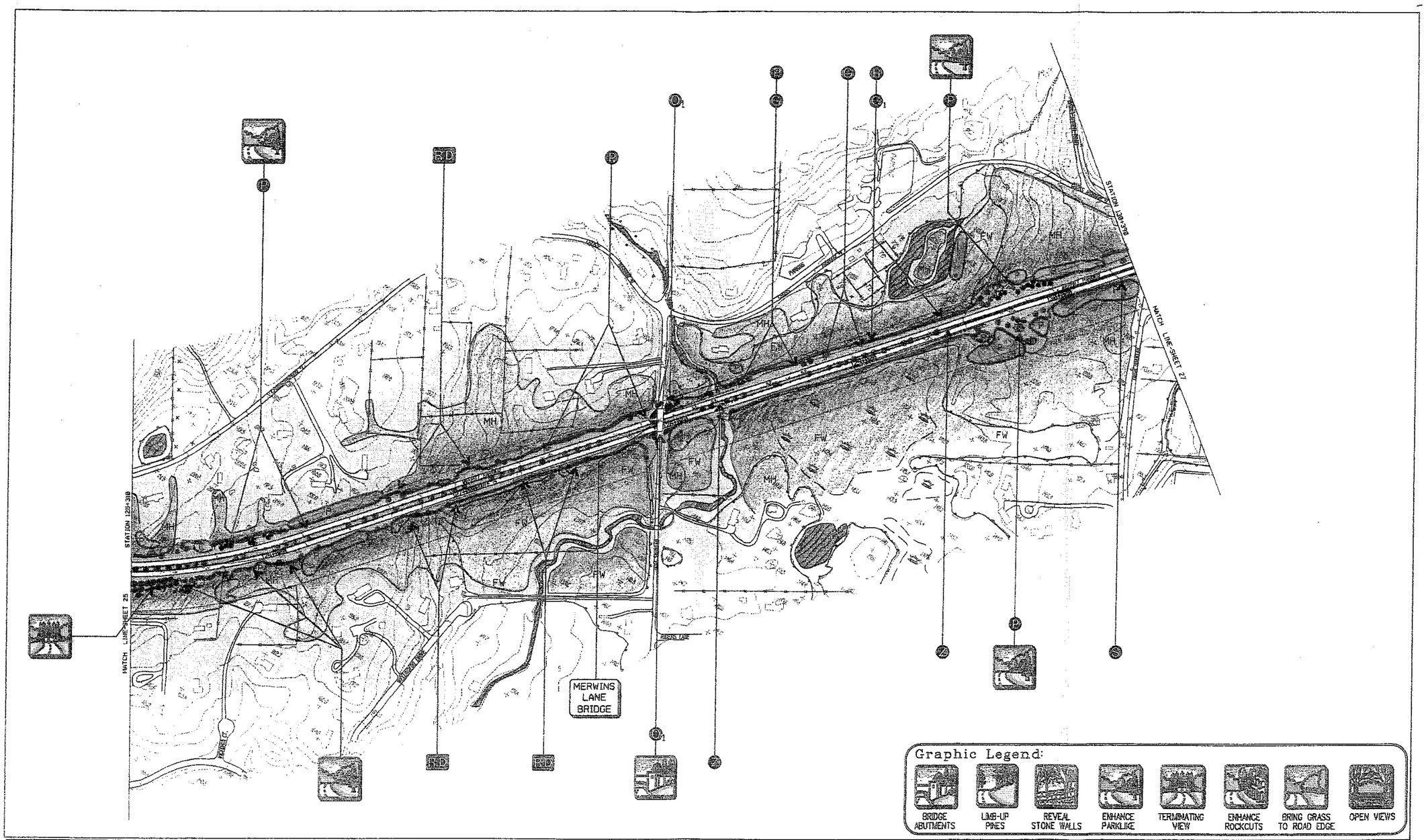
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

25 of 40

Landscape Master Plan

Station 119+340 to Station 125+310

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday



Graphic Legend:

BRIDGE ABUTMENTS | LIMB-UP PINES | REVEAL STONE WALLS | ENHANCE PARKLIKE | TERMINATING VIEW | ENHANCE ROCKCUTS | BRING GRASS TO ROAD EDGE | OPEN VIEWS

Legend:

- Contours
- Spot Elevation
- Buildings
- Right-of-Way
- Townline
- 21+833 Stationing
- Easements
- Catenary Towers
- Poles
- Rock Outcropping
- Stone Wall
- Fence
- Wetland/Water Course
- Body of Water
- Stream or Water Boundary
- Visually Intrusive Sign

Existing:	Proposed:
Mixed Hardwoods	Tree Line
Conifer Stand: C-Cedar P-Pine H-Hemlock	Conifer Stand
Deciduous Tree	Deciduous Tree
Significant Tree	Coniferous Tree
Coniferous Tree Pine/Cedar	Ornamental Tree
Laurel	

Existing:	Proposed:
Forested Wetland	Ornamental Shrub Mass
Scrub Wetland	Laurel Mass
Turf/Lawn	
Meadow	
Ornamental Shrub Mass	
Laurel Enhancement	
Removed Invasive/ New Surface Treatment	

Proposed Treatments

- Guiderail
- Concrete Barrier/Curb
- Sign Relocation
- Guiderail Removal
- Guiderail Relocation
- Slope Stabilization
- Low Maintenance Vegetation Zone
- Release Desirable Vegetation
- Regrading
- Pull-off Area
- Reforestation

Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

26 of 40

Landscape Master Plan

Station 125+310 to Station 130+390

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday

CONGRESS STREET BRIDGE

REDDING ROAD BRIDGE

STATION 130+390

STATION 139+610

MATCH LINE-SHEET 27

MATCH LINE-SHEET 28

Graphic Legend:

BRIDGE ABUTMENTS | LIMB-UP PINES | REVEAL STONE WALLS | ENHANCE PARKLIKE | TERMINATING VIEW | ENHANCE ROCKCUTS | BRING GRASS TO ROAD EDGE | OPEN VIEWS

Legend:

- Contours
- Spot Elevation
- Buildings
- Right-of-Way
- Treeline
- Stationing
- Easements
- Catenary Towers
- Poles
- Rock Outcropping
- Stone Wall
- Fence
- Wetland/Water Course
- Body of Water
- Stream or Water Boundary
- Visually Intrusive Sign

Existing: Proposed:

- MH Mixed Hardwoods
- P Conifer Stand: C-Cedar P-Pine H-Hemlock
- Deciduous Tree
- ST Significant Tree
- Coniferous Tree Pine/Cedar
- Laurel
- Tree Line
- Conifer Stand
- Deciduous Tree
- Coniferous Tree
- Ornamental Tree
- Ornamental Shrub Mass
- Laurel Mass

Existing: Proposed:

- FW Forested Wetland
- SW Scrub Wetland
- Turf/Lawn
- Meadow
- Ornamental Shrub Mass
- Laurel Enhancement
- Removed Invasive/ New Surface Treatment

Proposed Treatments

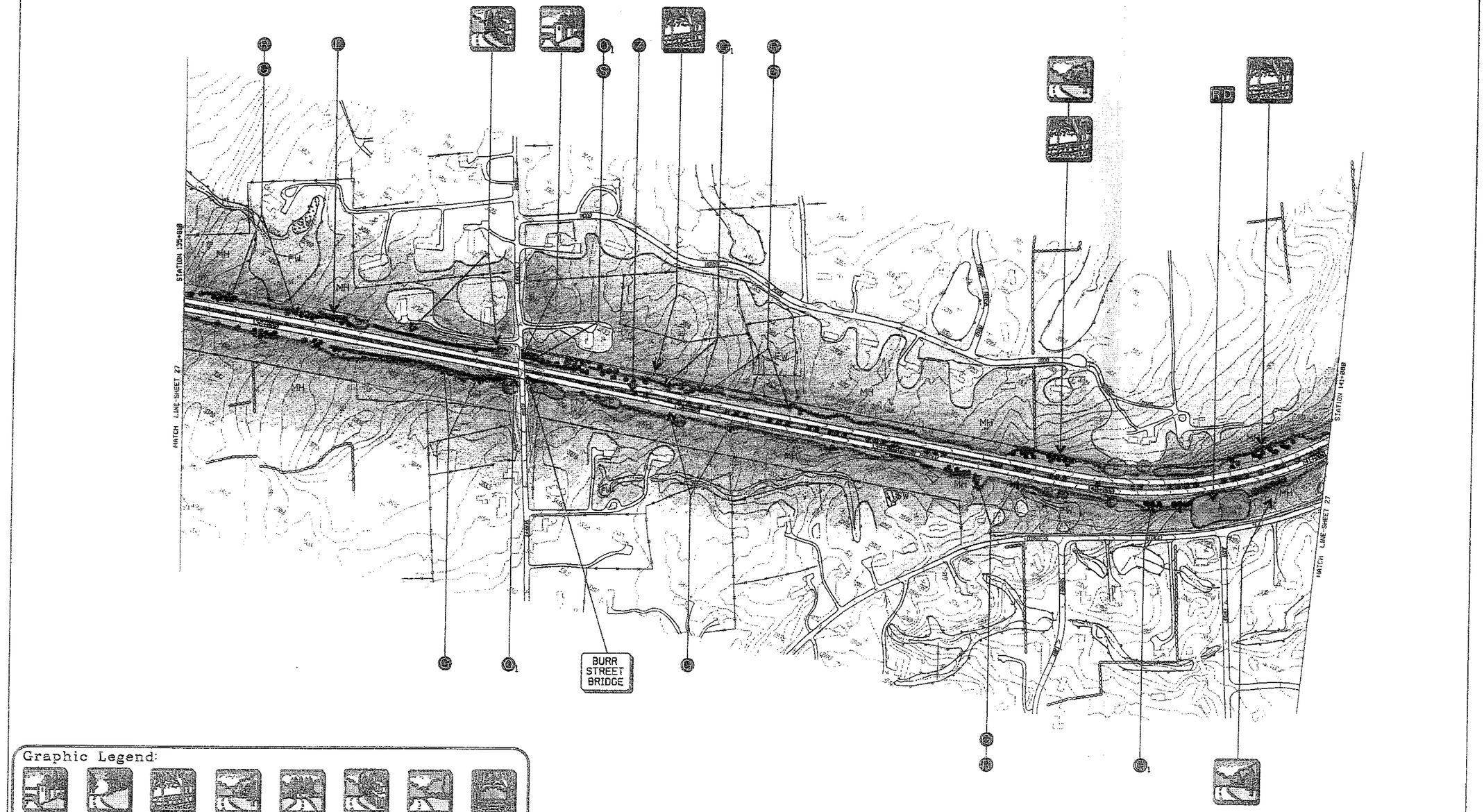
- Guiderail
- Concrete Barrier/Curb
- Sign Relocation
- Guiderail Removal
- Guiderail Relocation
- Slope Stabilization
- Low Maintenance Vegetation Zone
- Release Desirable Vegetation
- Regrading
- Pull-off Area
- Reforestation

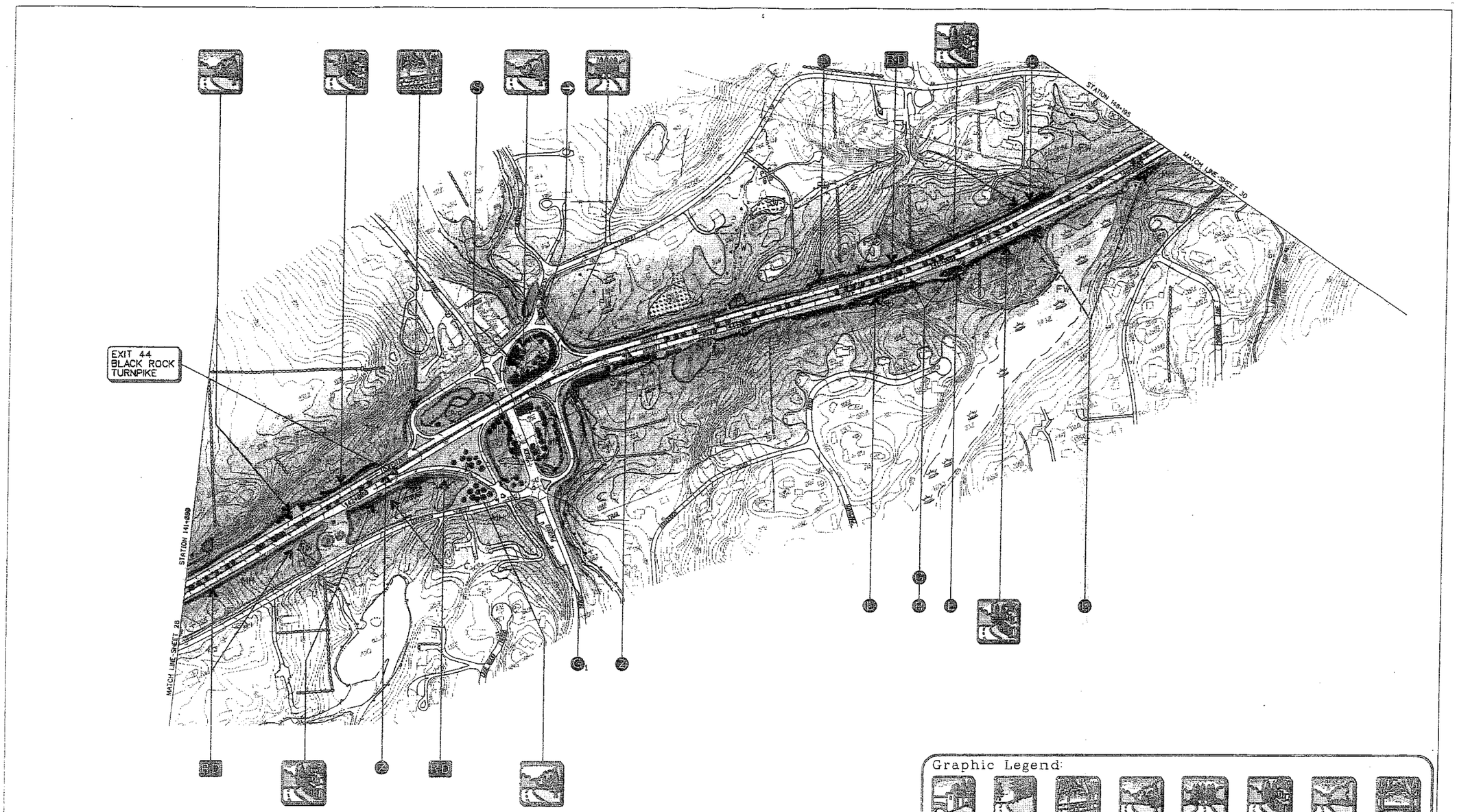
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

27 of 40

Landscape Master Plan
Station 130+390 to Station 135+610

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday


MATCH LINE-SHEET 27
STATION 135+610
STATION 141+080
MATCH LINE-SHEET 27
BURR STREET BRIDGE
MH
FW
Graphic Legend:
BRIDGE ABUTMENTS
LIMB-UP PINES
REVEAL STONE WALLS
ENHANCE PARKLIKE
TERMINATING VIEW
ENHANCE ROCKCUTS
BRING GRASS TO ROAD EDGE
OPEN VIEWS
Legend:
Contours
Spot Elevation
Buildings
Right-of-Way
Townline
Stationing
Easements
Catenary Towers
Poles
Rock Outcropping
Stone Wall
Fence
Wetland/Water Course
Body of Water
Stream or Water Boundary
Visually Intrusive Sign
Existing:
Proposed:
Mixed Hardwoods
Conifer Stand:
C-Cedar P-Pine H-Hemlock
Deciduous Tree
Significant Tree
Coniferous Tree Pine/Cedar
Laurel
Tree Line
Conifer Stand
Deciduous Tree
Coniferous Tree
Ornamental Tree
Existing:
Proposed:
Forested Wetland
Scrub Wetland
Turf/Lawn
Meadow
Ornamental Shrub Mass
Laurel Enhancement
Removed Invasive/ New Surface Treatment
Ornamental Shrub Mass
Laurel Mass
Proposed Treatments
Guiderail
Concrete Barrier/Curb
Sign Relocation
Guiderail Removal
Guiderail Relocation
Slope Stabilization
Low Maintenance Vegetation Zone
Release Desirable Vegetation
Regrading
Pull-off Area
Reforestation
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation
28 of 40
Landscape Master Plan
Station 135+610 to Station 141+080
Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday



Graphic Legend:

BRIDGE ABUTMENTS | LIMB-UP PINES | REVEAL STONE WALLS | ENHANCE PARKLIKE | TERMINATING VIEW | ENHANCE ROCKCUTS | BRING GRASS TO ROAD EDGE | OPEN VIEWS

Legend:

- Contours
- Spot Elevation
- Buildings
- Right-of-Way
- Townline
- Stationing
- Easements
- Catenary Towers
- Poles
- Rock Outcropping
- Stone Wall
- Fence
- Wetland/Water Course
- Body of Water
- Stream or Water Boundary
- Visually Intrusive Sign

Existing:	Proposed:
Mixed Hardwoods	Tree Line
Conifer Stand: C-Cedar P-Pine H-Hemlock	Conifer Stand
Deciduous Tree	Deciduous Tree
Significant Tree	Coniferous Tree
Coniferous Tree Pine/Cedar	Ornamental Tree
Laurel	

Existing:	Proposed:
Forested Wetland	Ornamental Shrub Mass
Scrub Wetland	Laurel Mass
Turf/Lawn	
Meadow	
Ornamental Shrub Mass	
Laurel Enhancement	
Removed Invasive/ New Surface Treatment	

Proposed Treatments

- Guiderail
- Concrete Barrier/Curb
- Sign Relocation
- Guiderail Removal
- Guiderail Relocation
- Slope Stabilization
- Low Maintenance Vegetation Zone
- Release Desirable Vegetation
- Regrading
- Pull-off Area
- Reforestation

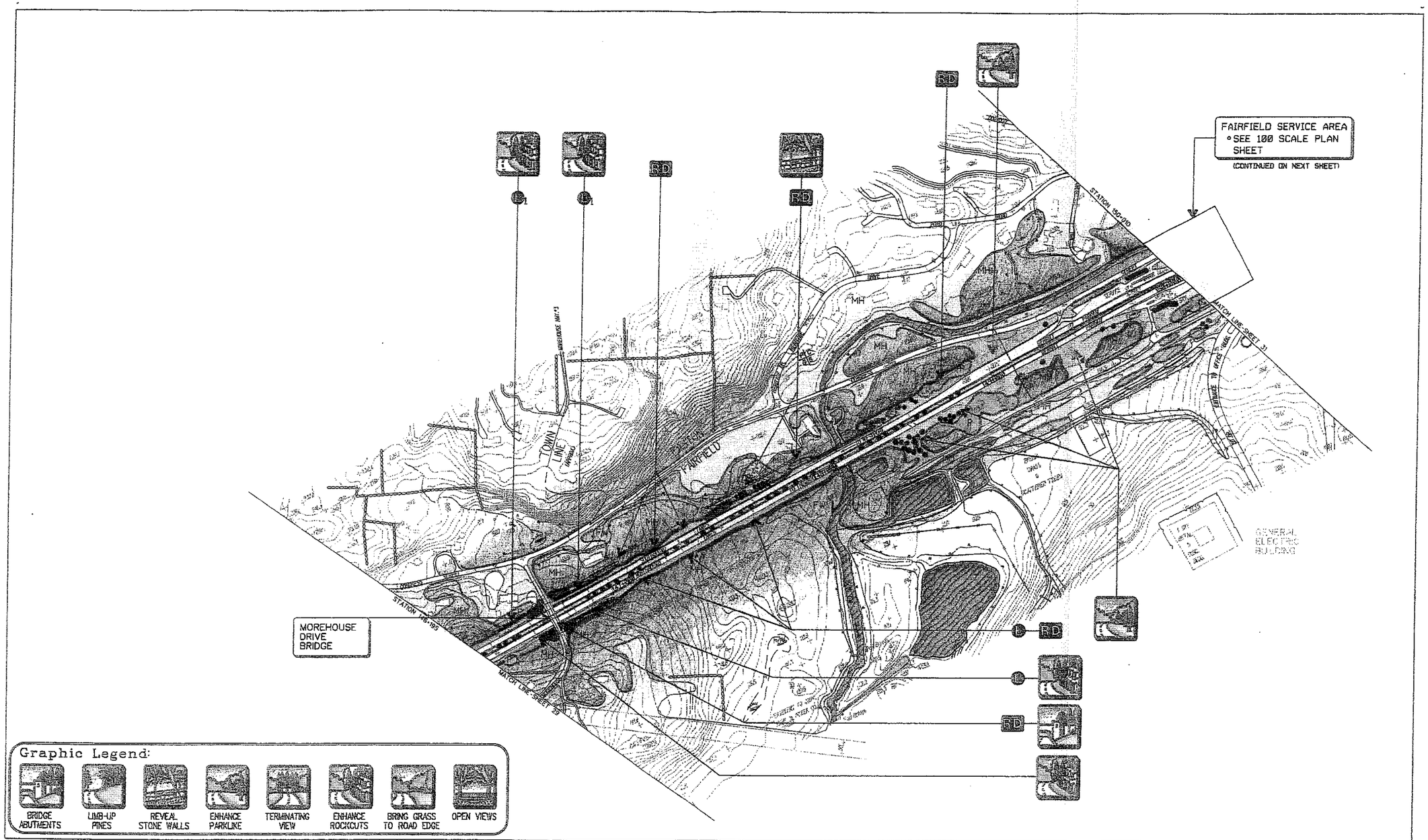
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

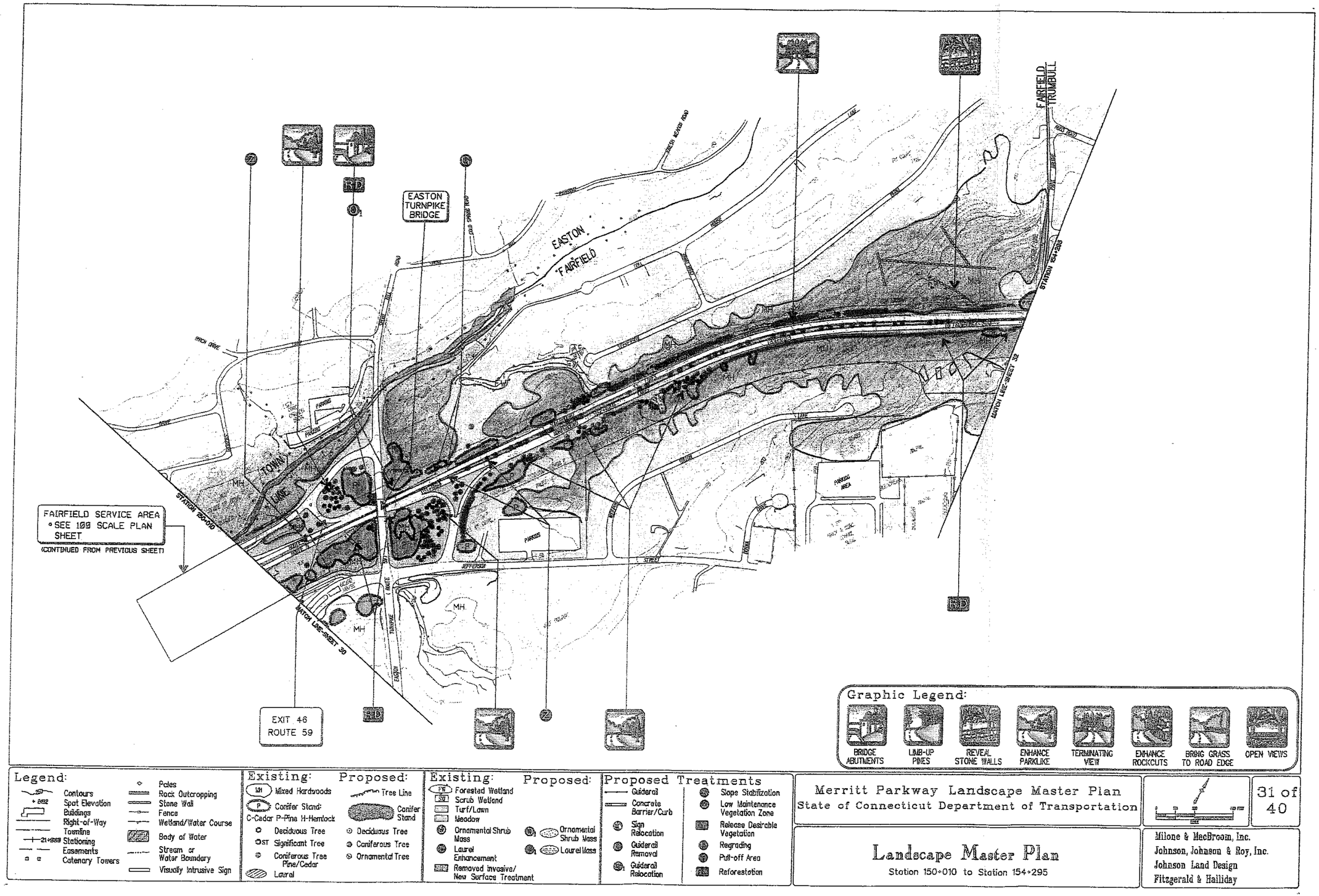
29 of 40

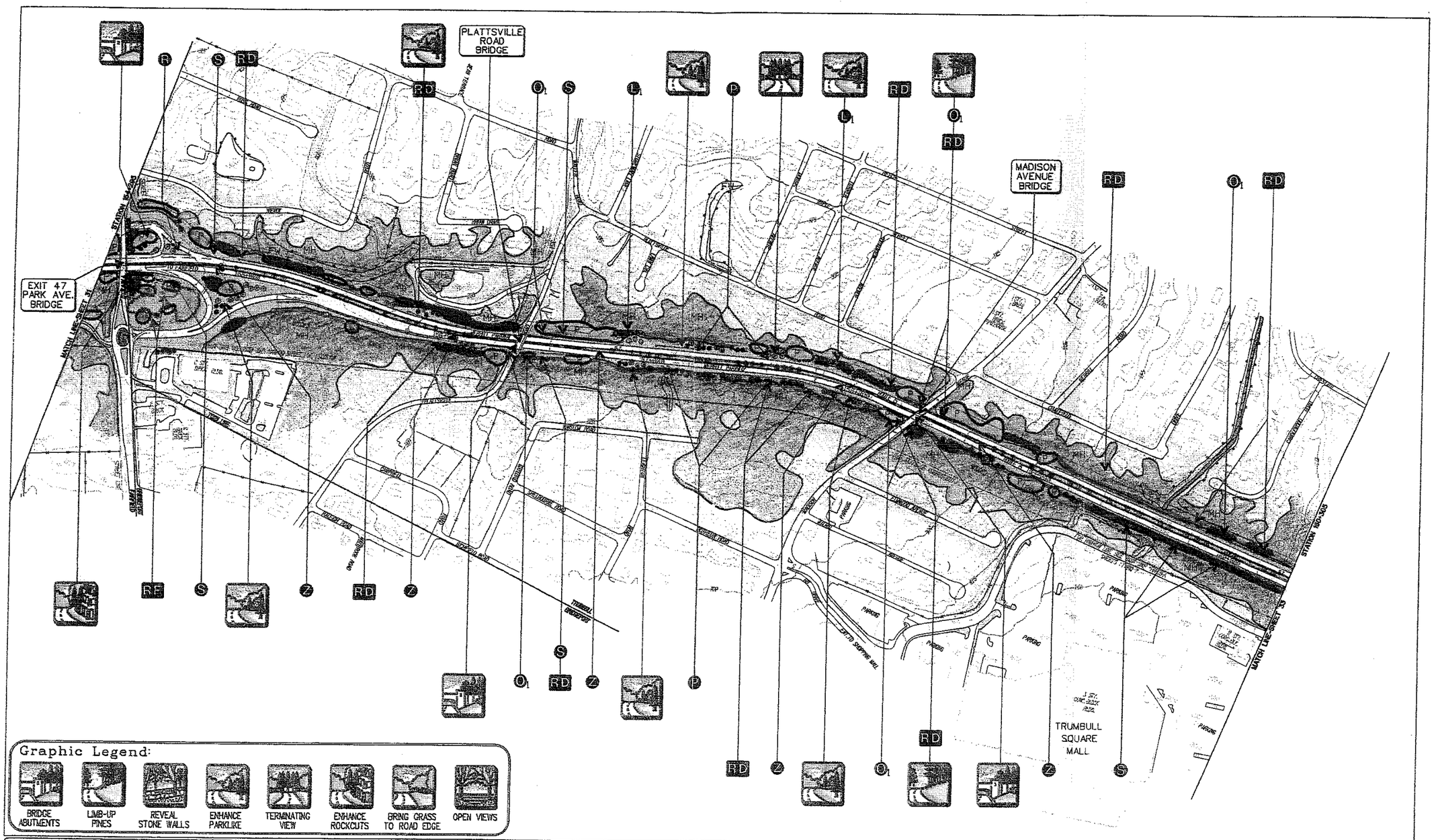
Landscape Master Plan

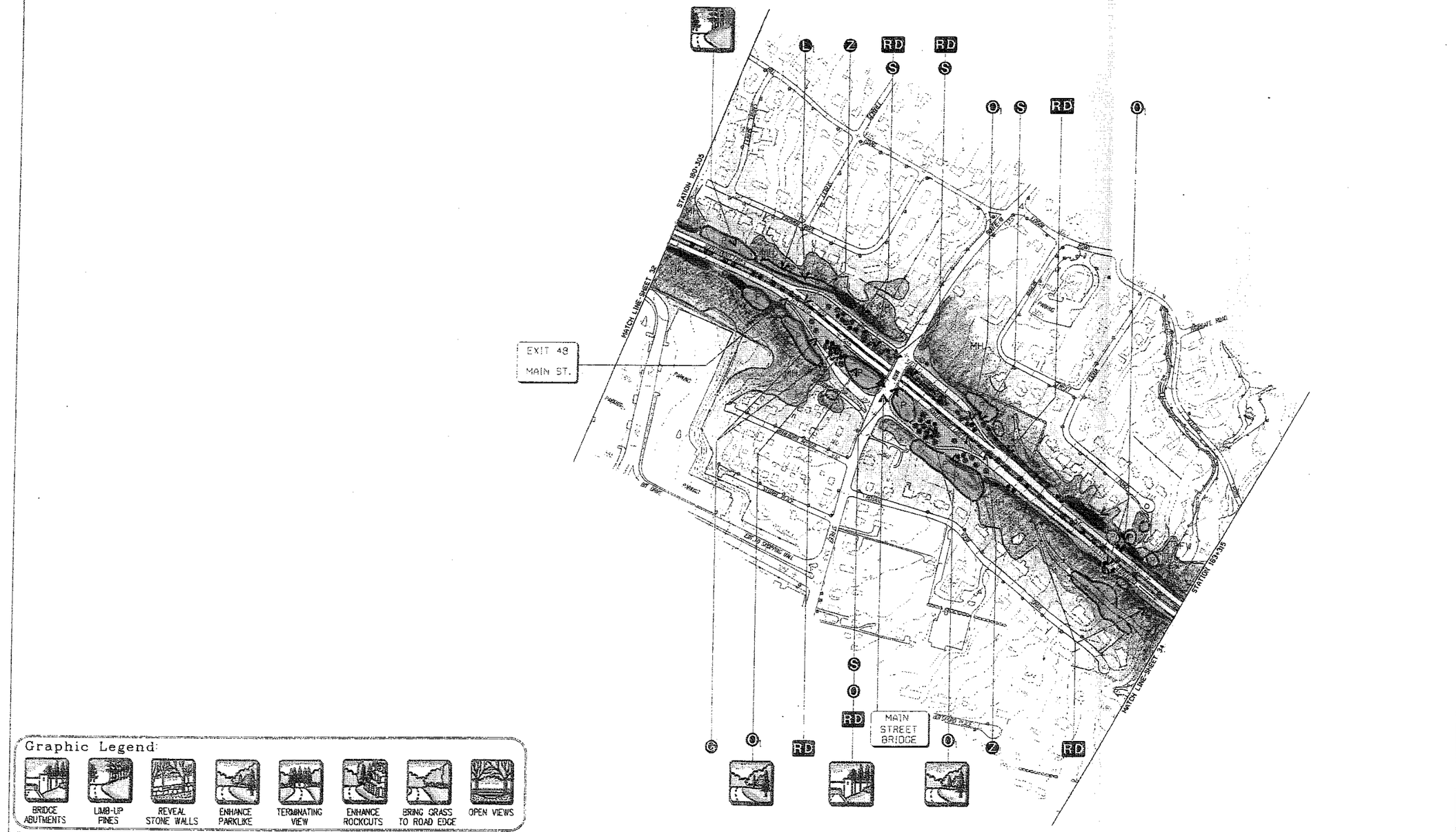
Station 141+080 to Station 145+195

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday


FAIRFIELD SERVICE AREA
• SEE 100 SCALE PLAN SHEET
(CONTINUED ON NEXT SHEET)
MOREHOUSE DRIVE BRIDGE
TOWN LINE
FAIRFIELD
MH
R.D
STATION 150+170
STATION 148+195
MATCH LINE SHEET 31
MATCH LINE SHEET 29
GENERAL ELECTRIC BUILDING
Graphic Legend:
BRIDGE ABUTMENTS
LIMB-UP PINES
REVEAL STONE WALLS
ENHANCE PARKLIKE
TERMINATING VIEW
ENHANCE ROCKCUTS
BRING GRASS TO ROAD EDGE
OPEN VIEWS
Legend:
Contours
Spot Elevation
Buildings
Right-of-Way
Townline
Stationing
Easements
Catenary Towers
Poles
Rock Outcropping
Stone Wall
Fence
Wetland/Water Course
Body of Water
Stream or Water Boundary
Visually Intrusive Sign
Existing: Proposed:
Mixed Hardwoods
Conifer Stand:
C-Cedar P-Pine H-Hemlock
Deciduous Tree
Significant Tree
Coniferous Tree Pine/Cedar
Laurel
Tree Line
Conifer Stand
Deciduous Tree
Coniferous Tree
Ornamental Tree
Existing: Proposed:
Forested Wetland
Scrub Wetland
Turf/Lawn
Meadow
Ornamental Shrub Mass
Laurel Enhancement
Removed Invasive/ New Surface Treatment
Ornamental Shrub Mass
Laurel Mass
Proposed Treatments
Guiderail
Concrete Barrier/Curb
Sign Relocation
Guiderail Removal
Guiderail Relocation
Slope Stabilization
Low Maintenance Vegetation Zone
Release Desirable Vegetation
Regrading
Pull-off Area
Reforestation
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation
30 of 40
Landscape Master Plan
Station 146+195 to Station 150+010
Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday


EASTON TURNPIKE BRIDGE
EASTON
FAIRFIELD
FAIRFIELD
TRUMBULL
STATION 150+00
STATION 154+00
MATCH LINE-SHEET 30
MATCH LINE-SHEET 32
FAIRFIELD SERVICE AREA
SEE 100 SCALE PLAN SHEET
(CONTINUED FROM PREVIOUS SHEET)
EXIT 46
ROUTE 59
RD
MH
PARKING AREA
Graphic Legend:
BRIDGE ABUTMENTS
LIMB-UP PINES
REVEAL STONE WALLS
ENHANCE PARKLIKE
TERMINATING VIEW
ENHANCE ROCKCUTS
BRING GRASS TO ROAD EDGE
OPEN VIEWS
Legend:
Contours
Spot Elevation
Buildings
Right-of-Way
Townline
Stationing
Easements
Catenary Towers
Poles
Rock Outcropping
Stone Wall
Fence
Wetland/Water Course
Body of Water
Stream or Water Boundary
Visually Intrusive Sign
Existing:
Proposed:
Mixed Hardwoods
Conifer Stand: C-Cedar P-Pine H-Hemlock
Deciduous Tree
Significant Tree
Coniferous Tree Pine/Cedar
Laurel
Tree Line
Conifer Stand
Deciduous Tree
Coniferous Tree
Ornamental Tree
Existing:
Proposed:
Forested Wetland
Scrub Wetland
Turf/Lawn
Meadow
Ornamental Shrub Mass
Laurel Enhancement
Removed Invasive/ New Surface Treatment
Ornamental Shrub Mass
Laurel Mass
Proposed Treatments
Guiderail
Concrete Barrier/Curb
Sign Relocation
Guiderail Removal
Guiderail Relocation
Slope Stabilization
Low Maintenance Vegetation Zone
Release Desirable Vegetation
Regrading
Pull-off Area
Reforestation
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation
31 of 40
Landscape Master Plan
Station 150+010 to Station 154+295
Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday


PLATTSVILLE ROAD BRIDGE
MADISON AVENUE BRIDGE
EXIT 47 PARK AVE. BRIDGE
TRUMBULL SQUARE MALL
MATCH LINE-SHEET 35
MATCH LINE-SHEET 34
STATION 160+305
PARKING
Graphic Legend:
BRIDGE ABUTMENTS
LIMB-UP PINES
REVEAL STONE WALLS
ENHANCE PARKLIKE
TERMINATING VIEW
ENHANCE ROCKCUTS
BRING GRASS TO ROAD EDGE
OPEN VIEWS
Legend:
Contours
Spot Elevation
Buildings
Right-of-Way
Townline
Stationing
Easements
Catenary Towers
Poles
Rock Outcropping
Stone Wall
Fence
Wetland/Water Course
Body of Water
Stream or Water Boundary
Visually Intrusive Sign
Existing: Proposed:
Mixed Hardwoods
Conifer Stand:
C-Cedar P-Pine H-Hemlock
Deciduous Tree
Significant Tree
Coniferous Tree Pine/Cedar
Laurel
Tree Line
Conifer Stand
Deciduous Tree
Coniferous Tree
Ornamental Tree
Existing: Proposed:
Forested Wetland
Scrub Wetland
Turf/Lawn
Meadow
Ornamental Shrub Mass
Laurel Enhancement
Removed Invasive/ New Surface Treatment
Ornamental Shrub Mass
Laurel Mass
Proposed Treatments
Guiderail
Concrete Barrier/Curb
Sign Relocation
Guiderail Removal
Guiderail Relocation
Slope Stabilization
Low Maintenance Vegetation Zone
Release Desirable Vegetation
Regrading
Pull-off Area
Reforestation
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation
32 of 40
Landscape Master Plan
Station 154+295 to Station 160+305
Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday



Graphic Legend:

BRIDGE ABUTMENTS | LIMB-UP PINES | REVEAL STONE WALLS | ENHANCE PARKLIKE | TERMINATING VIEW | ENHANCE ROCKCUTS | BRING GRASS TO ROAD EDGE | OPEN VIEWS

Legend:

- Contours
- Spot Elevation
- Buildings
- Right-of-Way
- Townline
- Stationing
- Easements
- Catenary Towers
- Poles
- Rock Outcropping
- Stone Wall
- Fence
- Wetland/Water Course
- Body of Water
- Stream or Water Boundary
- Visually Intrusive Sign

Existing:

- Mixed Hardwoods
- Conifer Stand: C-Cedar P-Pine H-Hemlock
- Deciduous Tree
- Significant Tree
- Coniferous Tree Pine/Cedar
- Laurel

Proposed:

- Tree Line
- Conifer Stand
- Deciduous Tree
- Coniferous Tree
- Ornamental Tree

Existing:

- Forested Wetland
- Scrub Wetland
- Turf/Lawn
- Meadow
- Ornamental Shrub Mass
- Laurel Enhancement
- Removed Invasive/ New Surface Treatment

Proposed:

- Ornamental Shrub Mass
- Laurel Mass

Proposed Treatments

- Guiderail
- Concrete Barrier/Curb
- Sign Relocation
- Guiderail Removal
- Guiderail Relocation
- Slope Stabilization
- Low Maintenance Vegetation Zone
- Release Desirable Vegetation
- Regrading
- Pull-off Area
- Reforestation

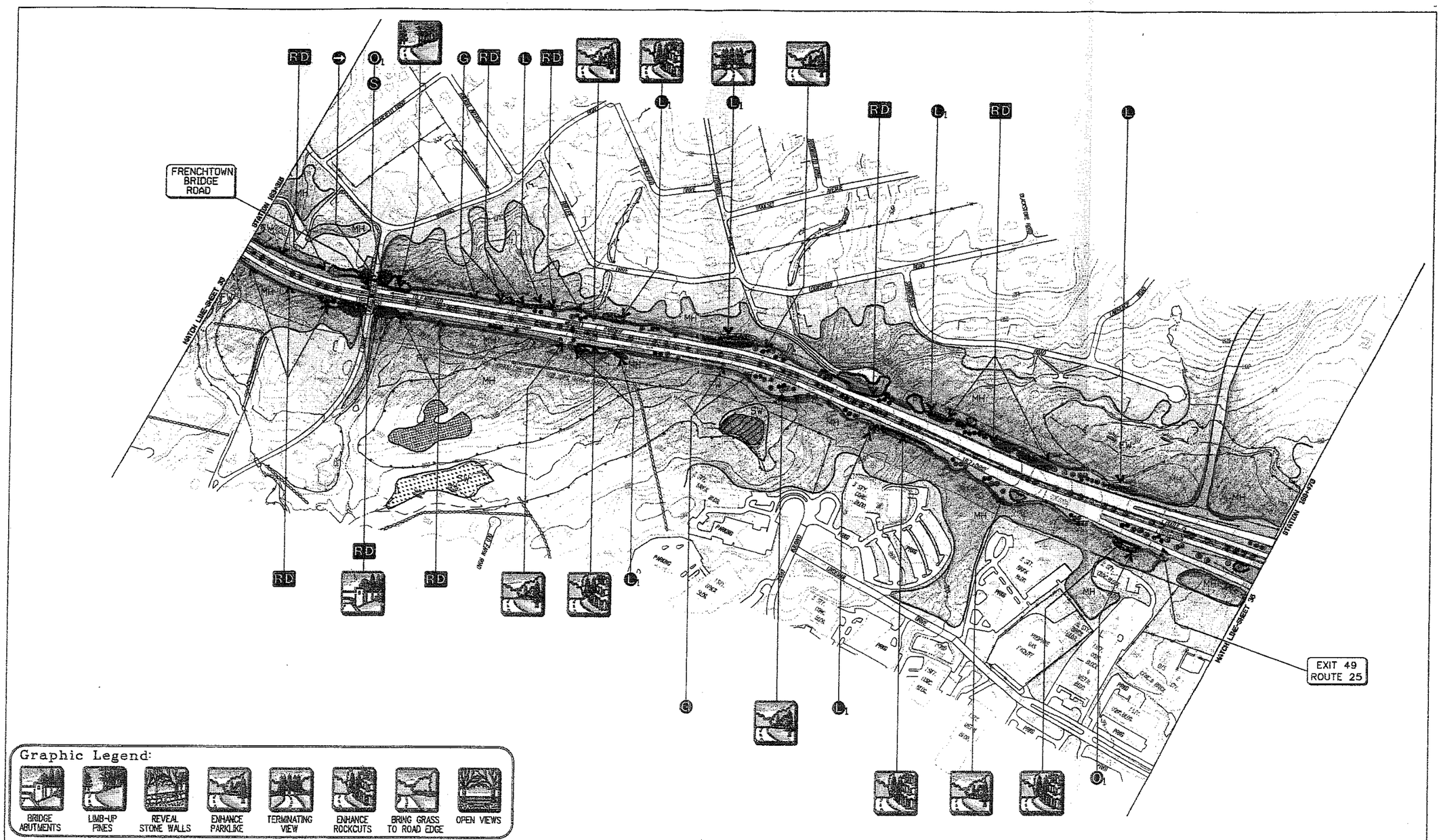
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

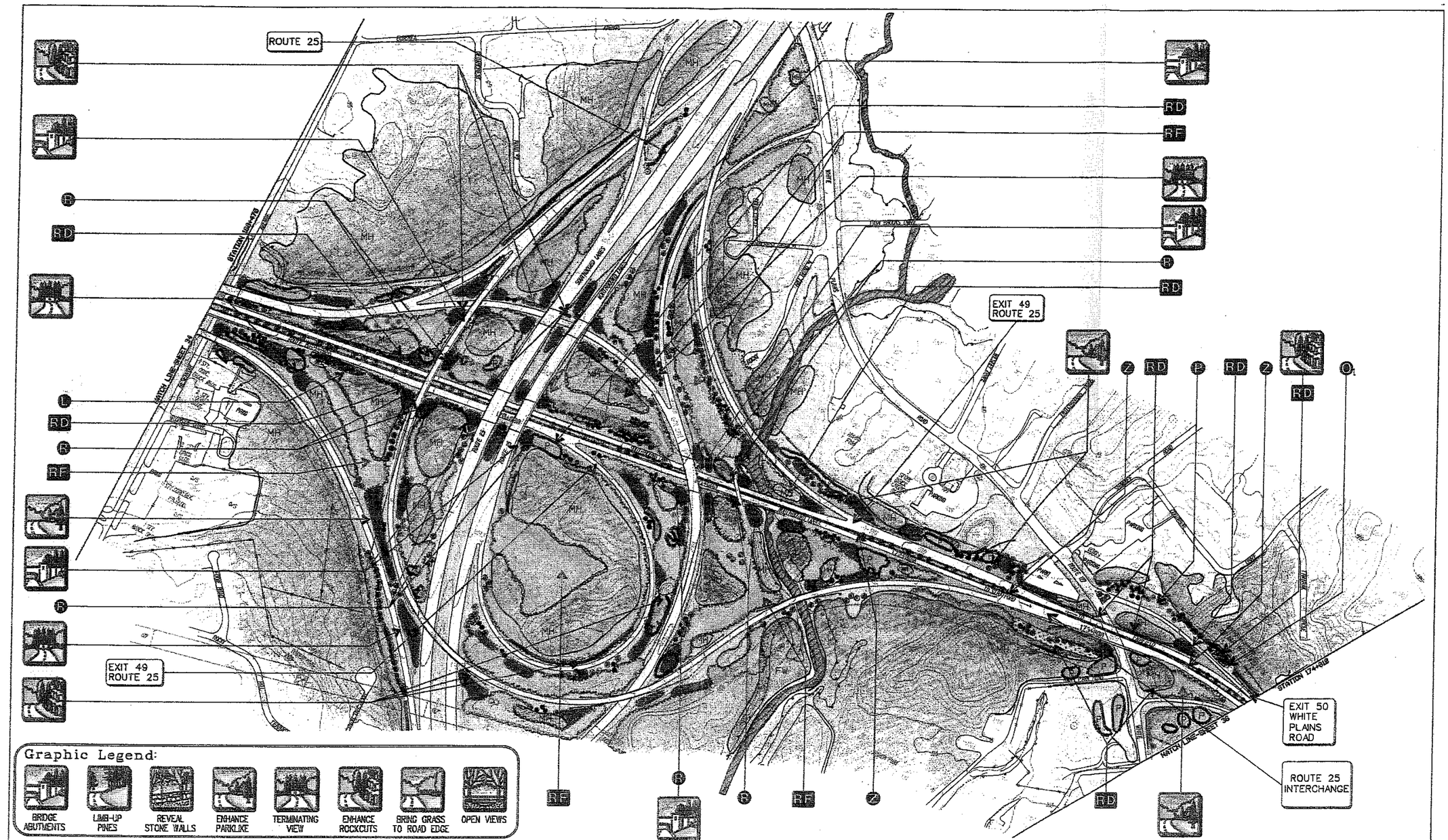
33 of 40

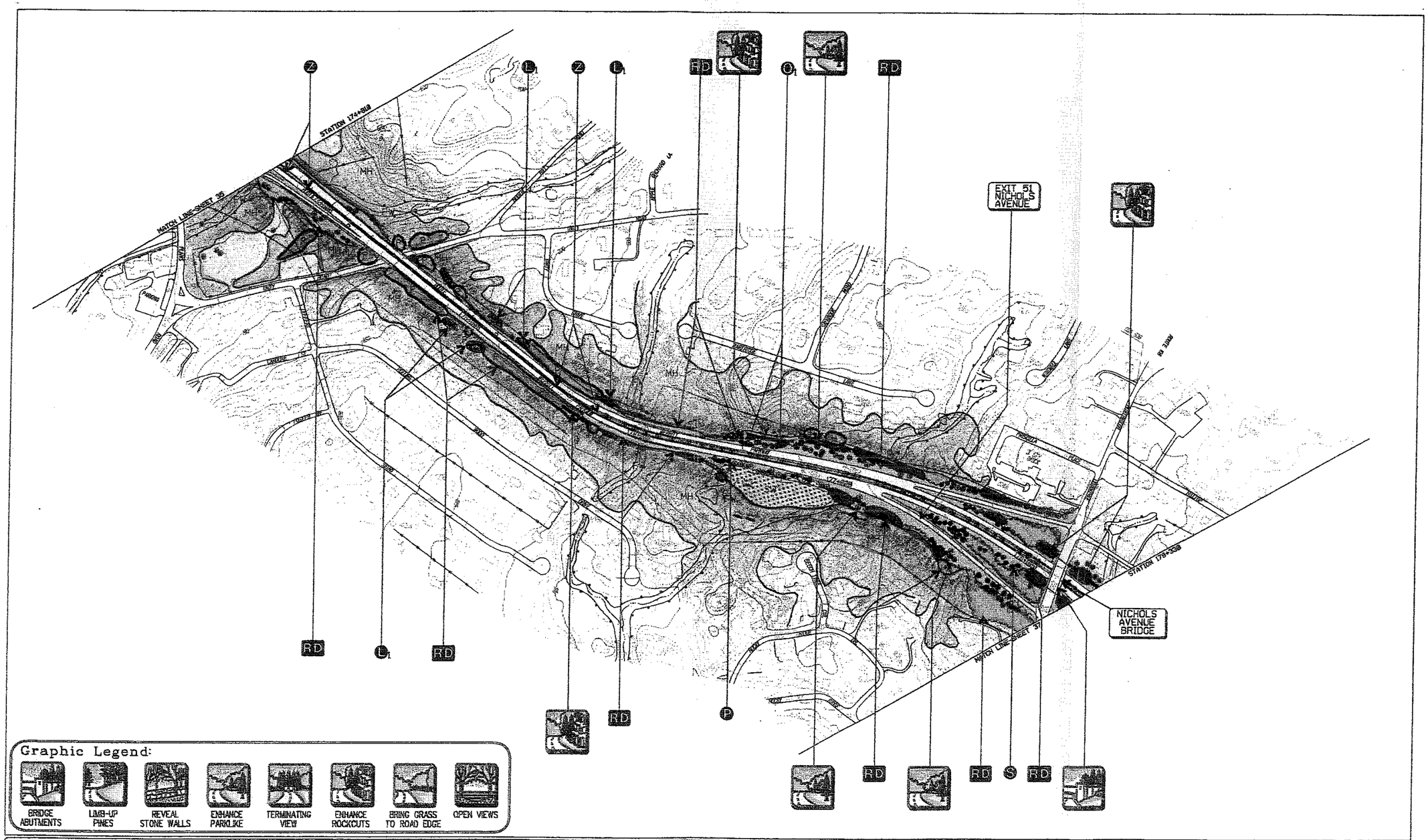
Landscape Master Plan

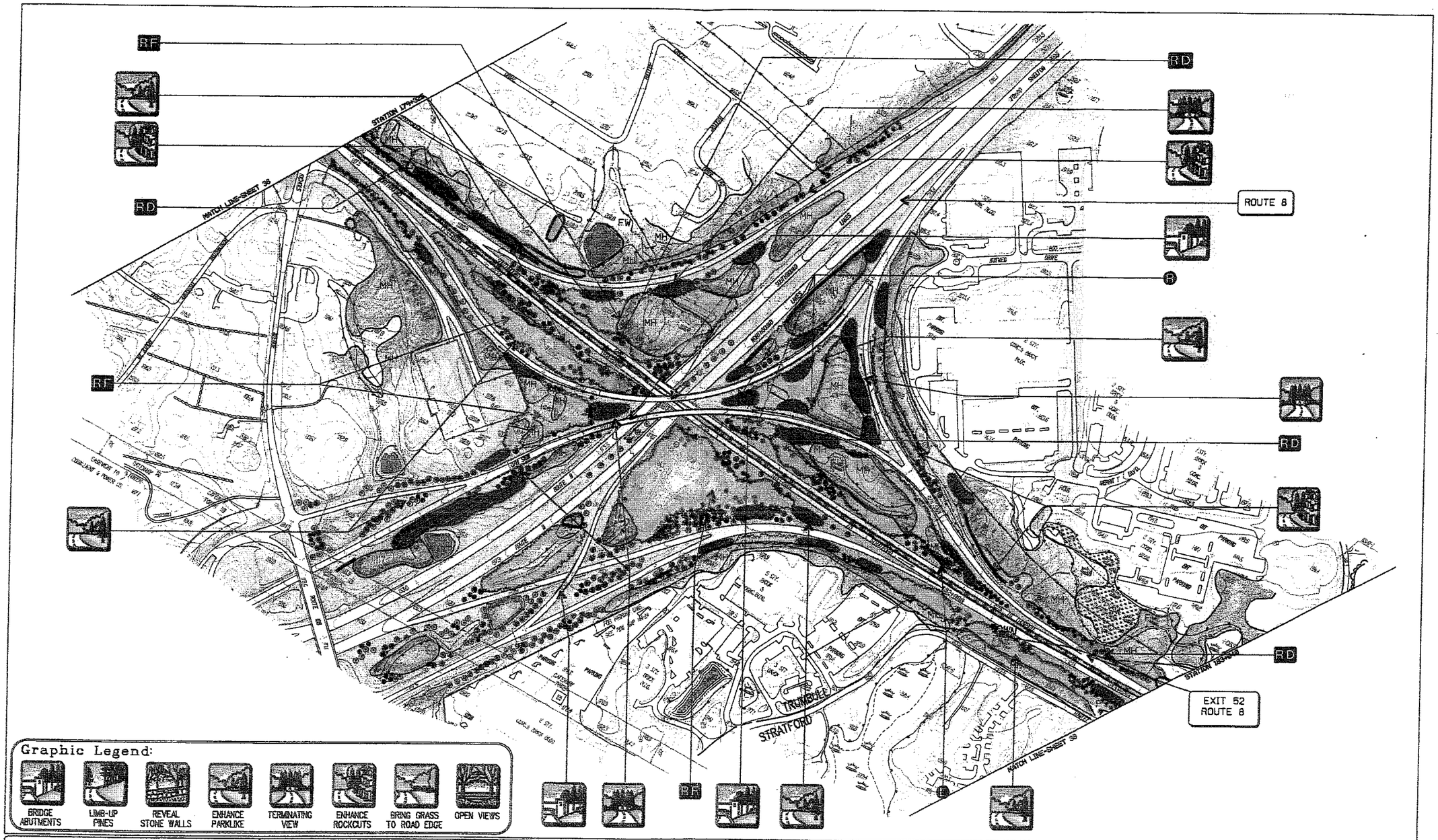
Station 160+305 to Station 163+315

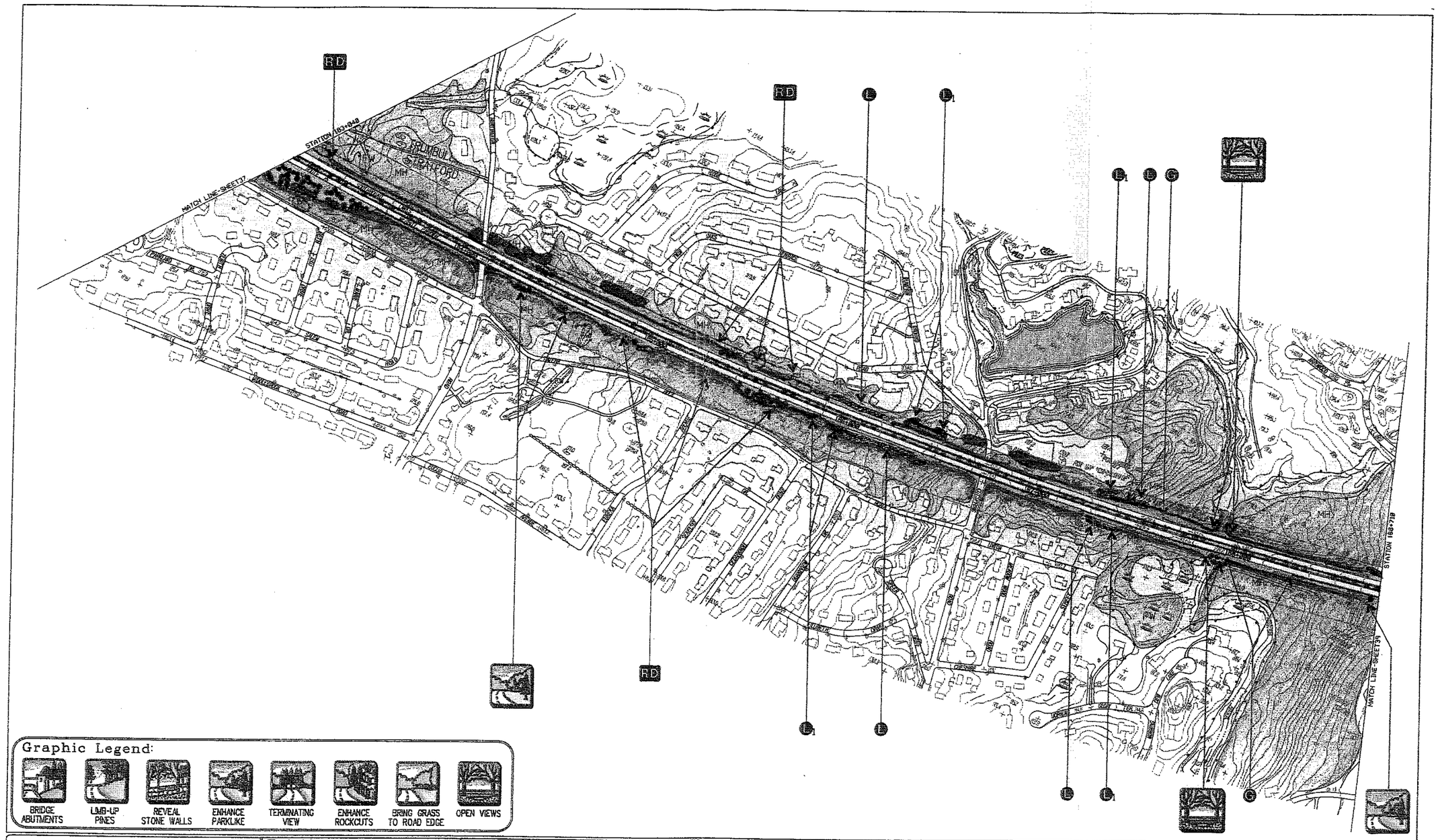
Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday


FRENCHTOWN BRIDGE ROAD
EXIT 49 ROUTE 25
MATCH LINE-SHEET 33
MATCH LINE-SHEET 35
RD
Graphic Legend:
BRIDGE ABUTMENTS
LIMB-UP PINES
REVEAL STONE WALLS
ENHANCE PARKLIKE
TERMINATING VIEW
ENHANCE ROCKCUTS
BRING GRASS TO ROAD EDGE
OPEN VIEWS
Legend:
Contours
Spot Elevation
Buildings
Right-of-Way
Townline
Stationing
Easements
Catenary Towers
Poles
Rock Outcropping
Stone Wall
Fence
Wetland/Water Course
Body of Water
Stream or Water Boundary
Visually Intrusive Sign
Existing: Proposed:
Mixed Hardwoods
Tree Line
Conifer Stand:
C-Cedar P-Pine H-Hemlock
Conifer Stand
Deciduous Tree
Significant Tree
Coniferous Tree
Ornamental Tree
Pine/Cedar
Laurel
Existing: Proposed:
Forested Wetland
Scrub Wetland
Turf/Lawn
Meadow
Ornamental Shrub Mass
Ornamental Shrub Mass
Laurel Enhancement
Laurel Mass
Removed Invasive/ New Surface Treatment
Proposed Treatments
Guiderail
Concrete Barrier/Curb
Sign Relocation
Guiderail Removal
Guiderail Relocation
Slope Stabilization
Low Maintenance Vegetation Zone
Release Desirable Vegetation
Regrading
Pull-off Area
Reforestation
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation
34 of 40
Landscape Master Plan
Station 163+315 to Station 168+470
Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday


ROUTE 25
EXIT 49
ROUTE 25
EXIT 49
ROUTE 25
EXIT 50
WHITE
PLAINS
ROAD
ROUTE 25
INTERCHANGE
STATION 168+470
STATION 174+810
MATCH LINE-SHEET 34
MATCH LINE-SHEET 36
Graphic Legend:
BRIDGE ABUTMENTS
LIMB-UP PINES
REVEAL STONE WALLS
ENHANCE PARKLIKE
TERMINATING VIEW
ENHANCE ROCKCUTS
MOWING GRASS TO ROAD EDGE
OPEN VIEWS
Legend:
Contours
Spot Elevation
Buildings
Right-of-Way
Townline
Stationing
Easements
Catenary Towers
Poles
Rock Outcropping
Stone Wall
Fence
Wetland/Water Course
Body of Water
Stream or Water Boundary
Visually Intrusive Sign
Existing: Proposed:
Mixed Hardwoods
Conifer Stand: C-Cedar P-Pine H-Hemlock
Deciduous Tree
Significant Tree
Coniferous Tree Pine/Cedar
Laurel
Tree Line
Conifer Stand
Deciduous Tree
Coniferous Tree
Ornamental Tree
Ornamental Shrub Mass
Laurel Mass
Existing: Proposed:
Forested Wetland
Scrub Wetland
Turf/Lawn
Meadow
Ornamental Shrub Mass
Laurel Enhancement
Removed Invasive/ New Surface Treatment
Proposed Treatments
Guiderail
Concrete Barrier/Curb
Sign Relocation
Guiderail Removal
Guiderail Relocation
Slope Stabilization
Low Maintenance Vegetation Zone
Release Desirable Vegetation
Regrading
Pull-off Area
Reforestation
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation
35 of 40
Landscape Master Plan
Station 168+470 to Station 174+810
Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday


STATION 174+810
MATCH LINE-SHEET 35
EXIT 51
NICHOLS AVENUE
STATION 178+330
NICHOLS AVENUE BRIDGE
MATCH LINE-SHEET 37
RD
Graphic Legend:
BRIDGE ABUTMENTS
LIMB-UP PINES
REVEAL STONE WALLS
ENHANCE PARKLIKE
TERMINATING VIEW
ENHANCE ROCKCUTS
BRING GRASS TO ROAD EDGE
OPEN VIEWS
Legend:
Contours
Spot Elevation
Buildings
Right-of-Way
Townline
Stationing
Easements
Catenary Towers
Poles
Rock Outcropping
Stone Wall
Fence
Wetland/Water Course
Body of Water
Stream or Water Boundary
Visually Intrusive Sign
Existing: Proposed:
Mixed Hardwoods
Conifer Stand:
C-Cedar P-Pine H-Hemlock
Deciduous Tree
Significant Tree
Coniferous Tree Pine/Cedar
Laurel
Tree Line
Conifer Stand
Deciduous Tree
Coniferous Tree
Ornamental Tree
Existing: Proposed:
Forested Wetland
Scrub Wetland
Turf/Lawn
Meadow
Ornamental Shrub Mass
Laurel Enhancement
Removed Invasive/ New Surface Treatment
Ornamental Shrub Mass
Laurel Mass
Proposed Treatments
Guiderail
Concrete Barrier/Curb
Sign Relocation
Guiderail Removal
Guiderail Relocation
Slope Stabilization
Low Maintenance Vegetation Zone
Release Desirable Vegetation
Regrading
Pull-off Area
Reforestation
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation
36 of 40
Landscape Master Plan
Station 174+810 to Station 178+330
Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday


RF
RD
RD
RF
RD
RD
RD
ROUTE 8
B
EXIT 52
ROUTE 8
STRATFORD
TRUMBULL
MATCH LINE-SHEET 38
MATCH LINE-SHEET 39
STATION 179+325
STATION 183+040
Graphic Legend:
BRIDGE ABUTMENTS
LIMB-UP PINES
REVEAL STONE WALLS
ENHANCE PARKLIKE
TERMINATING VIEW
ENHANCE ROCKCUTS
BRING GRASS TO ROAD EDGE
OPEN VIEWS
Legend:
Contours
Spot Elevation
Buildings
Right-of-Way
Townline
Stationing
Easements
Catenary Towers
Poles
Rock Outcropping
Stone Wall
Fence
Wetland/Water Course
Body of Water
Stream or Water Boundary
Visually Intrusive Sign
Existing: Proposed:
Mixed Hardwoods
Conifer Stand: C-Cedar P-Pine H-Hemlock
Deciduous Tree
Significant Tree
Coniferous Tree Pine/Cedar
Laurel
Tree Line
Conifer Stand
Deciduous Tree
Coniferous Tree
Ornamental Tree
Existing: Proposed:
Forested Wetland
Scrub Wetland
Turf/Lawn
Meadow
Ornamental Shrub Mass
Laurel Enhancement
Removed Invasive/ New Surface Treatment
Ornamental Shrub Mass
Laurel Mass
Proposed Treatments
Guiderail
Concrete Barrier/Curb
Sign Relocation
Guiderail Removed
Guiderail Relocation
Slope Stabilization
Low Maintenance Vegetation Zone
Release Desirable Vegetation
Regrading
Pull-off Area
Reforestation
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation
37 of 40
Landscape Master Plan
Station 179+325 to Station 183+040
Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday



Graphic Legend:

BRIDGE ABUTMENTS | LIMB-UP PINES | REVEAL STONE WALLS | ENHANCE PARKLIKE | TERMINATING VIEW | ENHANCE ROCKCUTS | BRING GRASS TO ROAD EDGE | OPEN VIEWS

Legend:

- Contours
- Spot Elevation
- Buildings
- Right-of-Way
- Townline
- Stationing
- Easements
- Catenary Towers
- Poles
- Rock Outcropping
- Stone Wall
- Fence
- Wetland/Water Course
- Body of Water
- Stream or Water Boundary
- Visually Intrusive Sign

Existing: Mixed Hardwoods; Conifer Stand: C-Cedar P-Pine H-Hemlock; Deciduous Tree; ST Significant Tree; Coniferous Tree Pine/Cedar; Laurel

Proposed: Tree Line; Conifer Stand; Deciduous Tree; Coniferous Tree; Ornamental Tree

Existing: Forested Wetland; Scrub Wetland; Turf/Lawn; Meadow; Ornamental Shrub Mass; Laurel Enhancement; Removed Invasive/ New Surface Treatment

Proposed: Ornamental Shrub Mass; Laurel Mass

Proposed Treatments: Guiderail; Concrete Barrier/Curb; Sign Relocation; Guiderail Removal; Guiderail Relocation; Slope Stabilization; Low Maintenance Vegetation Zone; Release Desirable Vegetation; Regrading; Pull-off Area; Reforestation

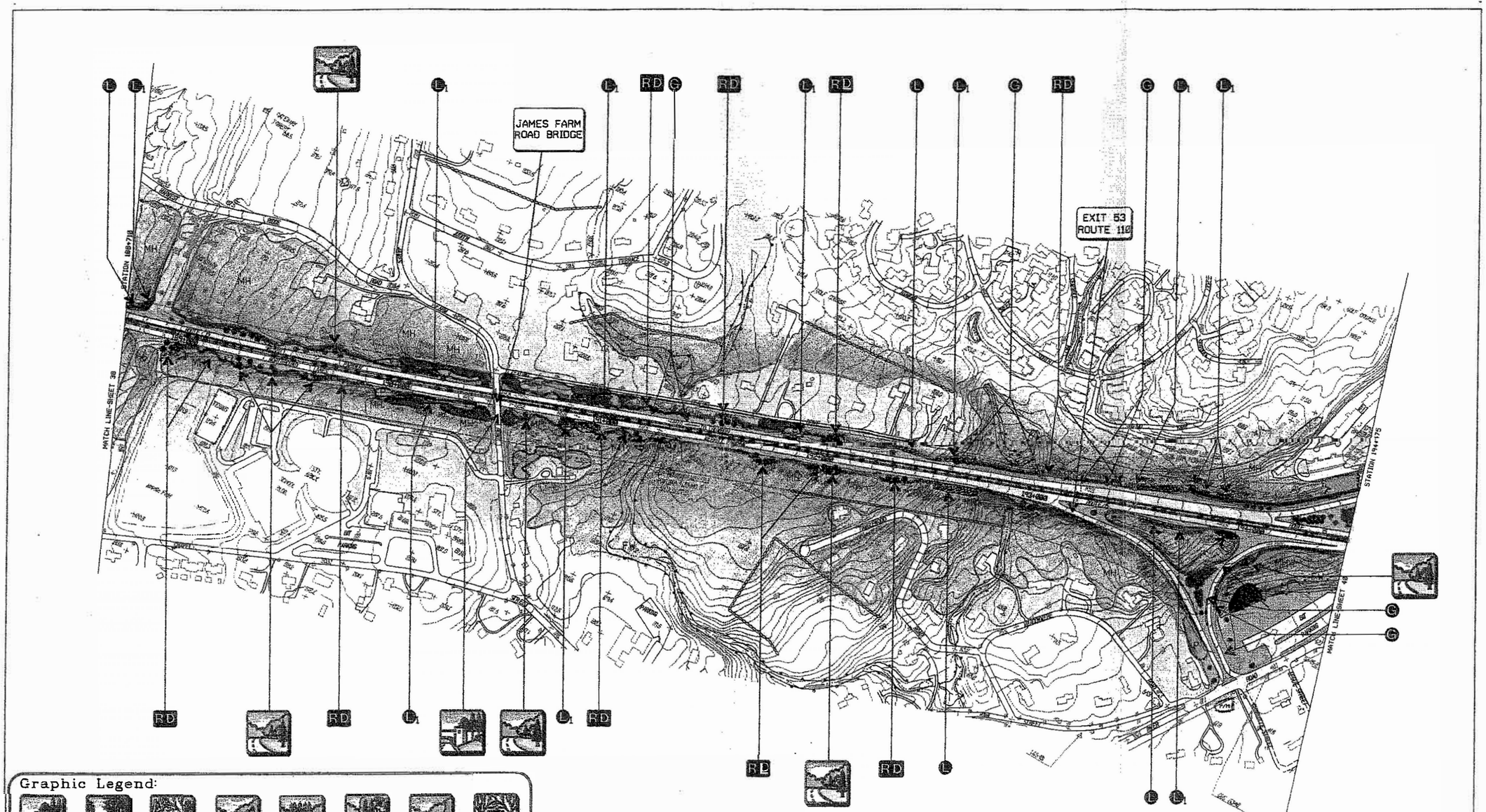
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation

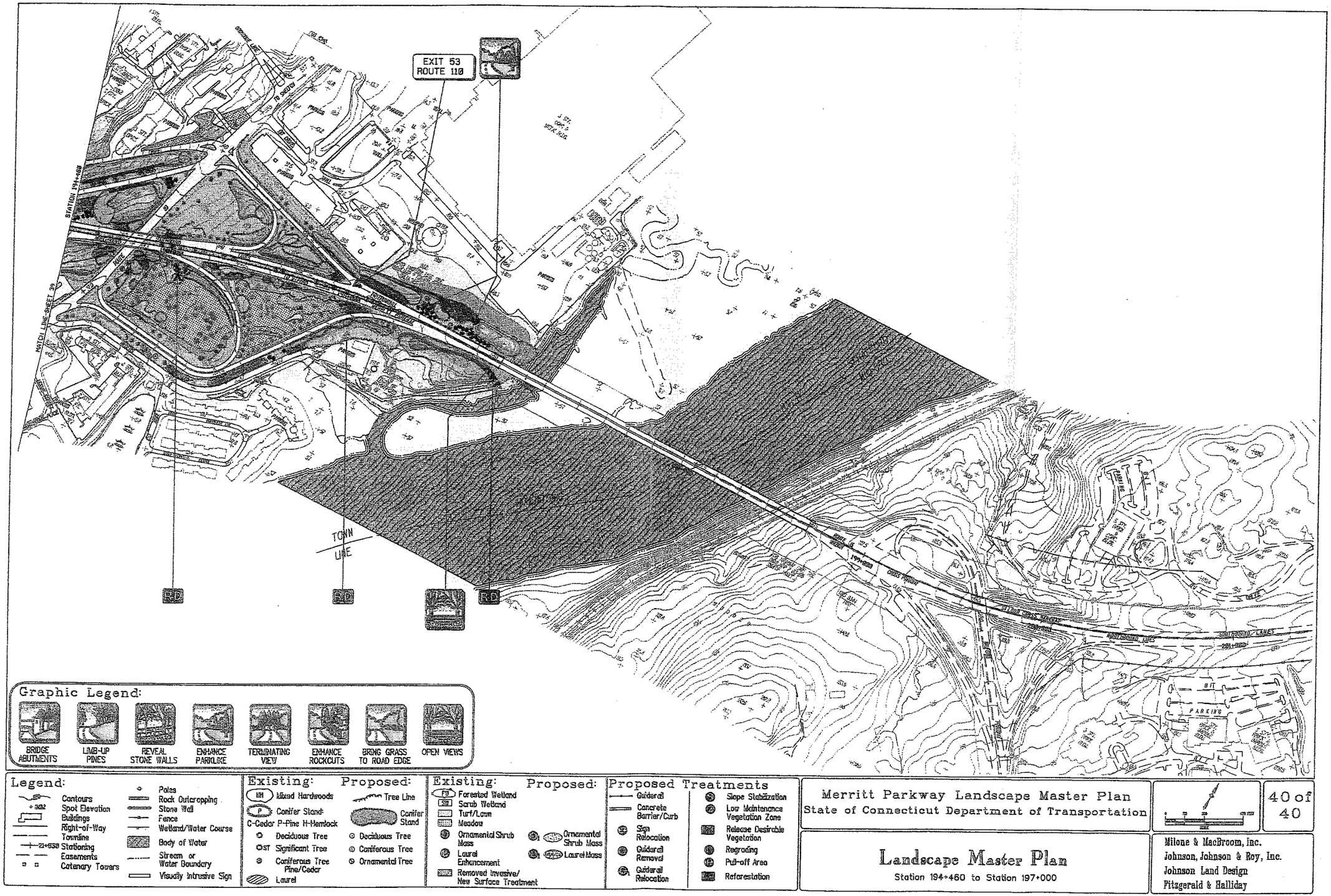
38 of 40

Landscape Master Plan

Station 183+040 to Station 188+710

Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday

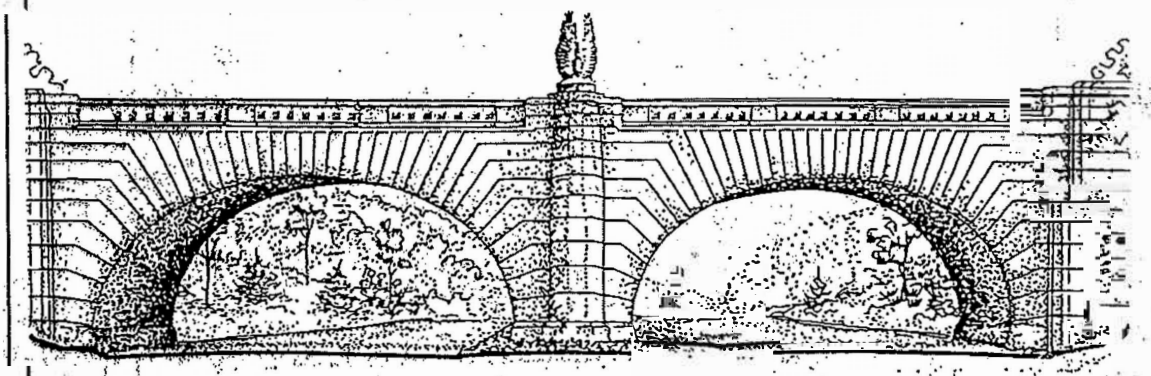

JAMES FARM ROAD BRIDGE
EXIT 53 ROUTE 110
MATCH LINE-SHEET 38
STATION 188+710
STATION 194+475
MATCH LINE-SHEET 40
Graphic Legend:
BRIDGE ABUTMENTS
LIMB-UP PINES
REVEAL STONE WALLS
ENHANCE PARKLIKE
TERMINATING VIEW
ENHANCE ROCKCUTS
BRING GRASS TO ROAD EDGE
OPEN VIEWS
Legend:
Contours
Spot Elevation
Buildings
Right-of-Way
Townline
Stationing
Easements
Catenary Towers
Poles
Rock Outcropping
Stone Wall
Fence
Wetland/Water Course
Body of Water
Stream or Water Boundary
Visually Intrusive Sign
Existing: Proposed:
Mixed Hardwoods
Conifer Stand:
C-Cedar P-Pine H-Hemlock
Deciduous Tree
Significant Tree
Coniferous Tree Pine/Cedar
Laurel
Tree Line
Conifer Stand
Deciduous Tree
Coniferous Tree
Ornamental Tree
Existing: Proposed:
Forested Wetland
Scrub Wetland
Turf/Lawn
Meadow
Ornamental Shrub Mass
Laurel Enhancement
Removed Invasive/ New Surface Treatment
Ornamental Shrub Mass
Laurel Mass
Proposed Treatments
Guiderail
Concrete Barrier/Curb
Sign Relocation
Guiderail Removal
Guiderail Relocation
Slope Stabilization
Low Maintenance Vegetation Zone
Release Desirable Vegetation
Regrading
Pull-off Area
Reforestation
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation
39 of 40
Landscape Master Plan
Station 188+710 to Station 194+475
Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday


EXIT 53
ROUTE 110
TOWN LINE
MATCH LINE-SHEET 39
STATION 194+460
RTE 15
SOUTHBOUND LANES
NORTHBOUND LANES
PARKING
Graphic Legend:
BRIDGE ABUTMENTS
LIMB-UP PINES
REVEAL STONE WALLS
ENHANCE PARKLIKE
TERMINATING VIEW
ENHANCE ROCKCUTS
BRING GRASS TO ROAD EDGE
OPEN VIEWS
Legend:
Contours
Spot Elevation
Buildings
Right-of-Way
Townline
Stationing
Easements
Catenary Towers
Poles
Rock Outcropping
Stone Wall
Fence
Wetland/Water Course
Body of Water
Stream or Water Boundary
Visually Intrusive Sign
Existing: Proposed:
Mixed Hardwoods
Conifer Stand: C-Cedar P-Pine H-Hemlock
Deciduous Tree
Significant Tree
Coniferous Tree Pine/Cedar
Laurel
Tree Line
Conifer Stand
Deciduous Tree
Coniferous Tree
Ornamental Tree
Existing: Proposed:
Forested Wetland
Scrub Wetland
Turf/Lawn
Meadow
Ornamental Shrub Mass
Laurel Enhancement
Removed Invasive/ New Surface Treatment
Ornamental Shrub Mass
Laurel Mass
Proposed Treatments
Guiderail
Concrete Barrier/Curb
Sign Relocation
Guiderail Removal
Guiderail Relocation
Slope Stabilization
Low Maintenance Vegetation Zone
Release Desirable Vegetation
Regrading
Pull-off Area
Reforestation
Merritt Parkway Landscape Master Plan
State of Connecticut Department of Transportation
40 of 40
Landscape Master Plan
Station 194+460 to Station 197+000
Milone & MacBroom, Inc.
Johnson, Johnson & Roy, Inc.
Johnson Land Design
Fitzgerald & Halliday

B

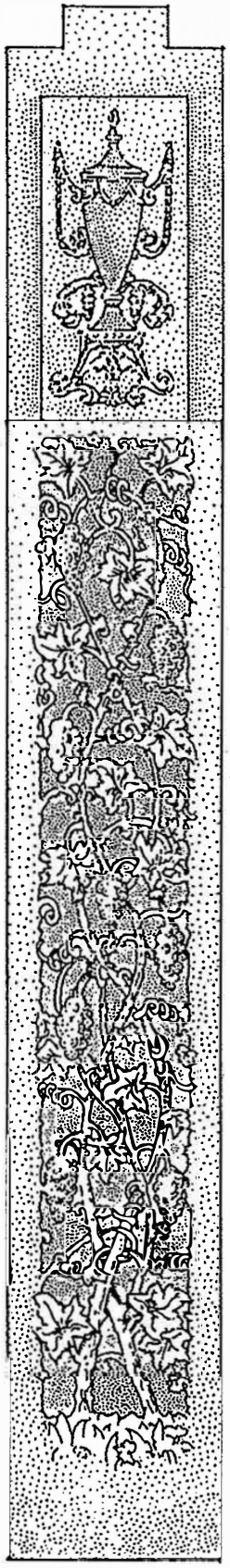
MERRITT PARKWAY GUIDELINES

For General Maintenance and Transportation Improvements



Prepared by:
The Merritt Parkway Working Group
June 1994

TABLE OF CONTENTS



"There is no more beautiful or more scenic parkway in America. See to it that it is preserved in its pristine beauty and glory."

Governor Wilbur Cross
1938

"I would suggest that highways can still be constructed in this way for preserving the natural beauty. There's no reason why they can't be utilitarian and beautiful . . .
Now you answer me honestly, has anything been built in or out of our state as beautiful as the Merritt Parkway? With its lack of advertising, billboards, its plantings, its median strip, with its particular structure and architecture, it's a thing of great beauty."

Governor Lowell Weicker
1993

Introduction

Overview

The Merritt Parkway was constructed in the 1930s to alleviate congestion problems on the Old Post Road (U.S. 1) and to open Fairfield County to broader settlement and development. It was Connecticut's first parkway. When it opened in 1940, the Merritt was noted for the innovative approach used in the engineering of the roadway and for its unique bridge architecture. Today, as in the past, the Merritt Parkway continues to be appreciated for its park-like setting, its majestic bridges, and its scenic landscaping. These are the major elements of its unique character.

The Merritt Parkway, originally constructed through areas which were predominantly farm land, offered a variety of splendid vistas in the early years: rolling hills, sprawling fields, an occasional rustic farm house. Over time, however, the overall landscape of the Parkway has matured and changed. The Parkway's dense tree cover now largely hides the homes, offices, and shopping centers that have developed around it. Traffic on the Parkway, while once relatively light, now averages more than 50,000 cars a day.

In early 1992, Emil Frankel, Commissioner of the Connecticut Department of Transportation, created the Merritt Parkway Working Group. The Working Group is comprised of members from within the Department of Transportation who represent the areas of engineering, traffic, landscape design, maintenance, construction, and planning; and outside experts who represent the fields of architecture, landscape architecture, and preservation.

The overall purpose of the Working Group has been to advise the Commissioner of Transportation of ways in which the unique character of the Merritt Parkway can be preserved and enhanced, while continuing to maintain this important transportation artery as a safe and efficient roadway.

An important goal of the Group has been to establish the premise that the Parkway is a distinct type of roadway, having an aesthetic as well as a transportation function, and should not necessarily receive the same type of treatments as Connecticut's expressways, particularly in the areas of design and landscape. All of the elements of the roadway, including the landscaping, bridge architecture, signs, guiderails, grass shoulders, curbing, rest area lighting, etc., are parts of the Merritt's character and should be viewed in a parkway context.

The Working Group has been meeting on a monthly basis to discuss the major issues facing the Parkway. The exchange of ideas about how aesthetics, safety, and operational efficiency can be balanced within the context of the Parkway has proved to be a learning experience for all the members of the group.

The Working Group has made no review of, nor judgements about, the operational future of the Merritt Parkway. However, the group has observed that the Parkway's future, as it relates to its capacity to carry vehicles, cannot be separated from the land uses that are allowed, or encouraged, by local zoning entities and towns. The Group noted that the pressures for an expanded transportation facility and the desire for increased local development are not separate and unrelated. Quite the contrary: they are inextricably linked. As a result of these factors, the future of the Merritt Parkway will be determined as much by the incremental decisions of the towns through which it passes as by the Department of Transportation and the rest of the State.

A central question raised in any discussion of the Merritt Parkway is whether it should be primarily a transportation artery or primarily a beautiful place. The Working Group strongly supported the view, as did those who had conceived the roadway, that both can be accommodated. The Working Group expects that more attention will be given to enhancing the Parkway as a beautiful place, within the context of what the road and the surrounding areas are today. The Parkway will not be again exactly what it was when it first opened. Too much of the surrounding landscape has changed. However, the Merritt Parkway may be enhanced, if focus is given to the possibilities that do exist to maintain and improve its unique aesthetic character.

The Working Group strongly urges that a deep sense of commitment, a high level of energy, and ample resources be devoted to this end.

Public Review

This document represents the Merritt Parkway Working Group's recommendations on how the Department of Transportation can better manage and enhance this important State resource. The Working Group recognized the importance of public input and encouraged the public's review and comment on the proposals presented in the draft document. In an effort to obtain this public input a draft of this document was made available for public review and comment to an extensive mailing list which included Fairfield County's State Legislators, all first officials and public libraries within Fairfield County and the Towns of New Haven, Orange and Milford, as well as the Greater Bridgeport and South Western Regional Planning Organizations. Copies of the document were also sent to local Historical Commissions within Fairfield County and various other groups and individuals who had previously expressed an interest in the Merritt Parkway.

Two public informational meetings were held to discuss the proposals presented in the draft document. The first meeting was held on October 13, 1993 in Trumbull and the second meeting was held on October 20, 1993 in Stamford. Notification of these meetings was made through news releases and display advertisements in major daily and weekly newspaper publications within Fairfield County. In addition, separate meetings were held to discuss the draft Guidelines, with representatives from the Connecticut Chapter of the American Society of Landscape Architects, the Connecticut Historical Commission and the Connecticut Trust for Historic Preservation.

As a result of this public review process, numerous comments were received regarding the Merritt Parkway. All comments received were reviewed by the Merritt Parkway Working Group and major areas of concern relative to the proposed Guidelines were identified and addressed. The areas of major concern which were expressed by numerous individuals include:

1) The excessive speeds on the Parkway and the need to increase State Police enforcement of the speed limit.

2) The use of the Parkway by trucks and vehicles with combination plates.

3) The need to develop special design standards for Parkways.

4) The need to legislatively establish a Merritt Parkway Commission.

5) The specific plant materials proposed.

6) The guiderail systems being used on the Parkway.

7) The placement, color and size of signs along the Parkway.

8) The need to strengthen the public review and Department decision-making process relative to proposed projects and exceptions to Guidelines.

As these subjects were repeatedly noted, a separate section to address these concerns has been included in this final document (Section VIII. Response to Major Concerns).

Issue Areas

There are several elements of the character of the Merritt Parkway where engineering and operational factors interact with aesthetic enhancement goals. Five broad areas received particular attention from the Working Group. These areas included highway design standards, the landscape, the bridges, the median, and the roadside area. In each of these areas, critical issues were defined and discussed, guidelines were developed, and recommendations were made on how to proceed.

The following are some of the major issues that were identified in these areas:

o Design standards. AASHTO (American Association of State Highway and Transportation Officials) engineering standards for expressways serve as the reference point for the design of all Parkway work, although the Department seeks exceptions on a case-by-case basis. While the National Park Service has developed a draft for park road standards (which have informed the group's discussions), no generally accepted parkway standards currently exist, although many efforts appear to be in the early stages.

o The landscape. The landscape is a central element of the Parkway's unique character. Resources have not been available for some time to afford an overall landscape approach. The original plantings on the Parkway are now more than fifty years old. The bridges have been hidden by overgrowth, and vines have covered trees in many areas. While in stark contrast, portions of the roadway where modern interchanges have been constructed are still largely bare.

o The bridges. The bridges contribute greatly to the aesthetic character of the Parkway. Many of these rigid frame, concrete and/or steel structures are more than fifty years old. Maintaining them, restoring architectural detail, and replicating structures where deterioration is extensive is a great challenge.

o The median. Hazardous traffic conditions limit the maintenance of the grass and plantings in the median areas. The trees in the median have grown to or beyond maturity and have grown into the surrounding beam rail. Cross-over accidents have necessitated the installation of guide rail. A central challenge now is how to maintain a "green" median that is aesthetically acceptable, but which also protects the motorist from median hazards and cross-over accidents.

o The roadside area. Numerous trees have grown to maturity only a short distance from the travelway posing potential hazards. Guide rail has been installed to protect motorists from roadside hazards, including trees and rock ledge. The signing in the roadside area has also been a concern. The grass area

adjacent to the roadway not only creates the park like setting for the roadway, it also provides a safe area for vehicle breakdowns and should be maintained.

These are the major issues in five important areas. In addition, the group spent considerable time discussing the design of signs and facilities.

As stated, most of the Group's work focused on the drafting of these Guidelines which have been recommended to and adopted by the Commissioner as a definitive guide for the Department planners, designers, maintainers, and the construction, traffic, and facilities personnel involved in day-to-day work on the Parkway. The Group also recommended ideas to the Commissioner, for enhancing the Parkway's scenic and historic character over time.

Many of the recommendations for enhancement were approved by the Commissioner and the Department is currently undertaking several activities which may lead to further revision of these Guidelines, including: 1) a Landscape Master Plan (completion anticipated in Fall 94), which may affect the landscape Guidelines; 2) a Bridge Conservation Plan (Spring 95), which may affect the design and bridge sections of the Guidelines; and 3) a study of alternative guiderail systems for scenic and historic roads (Summer 94), which may affect relevant portions of the design Guidelines.

Acknowledgements

Many individuals have contributed to this effort. They include the members of the Working Group from outside State government with various areas of expertise: Nancy Campbell (preservation), Herbert Newman (architecture), Shavaun Towers (landscape architecture), and Jacqueline Salame (preservation); the members of the Working Group from the Connecticut Department of Transportation: Emil Frankel, Commissioner of Transportation; James Sullivan, Deputy Commissioner, Bureau of Engineering and Highway Operations; Peter S. Szabo, Deputy Commissioner, Bureau of Policy and Planning; Carl Bard, Executive Assistant, Bureau of Engineering and Highway Operations; Norman Hanibal, Maintenance District Manager, Bureau of Engineering and Highway Operations; Paul Breen, Assistant District Engineer, Bureau of Engineering and Highway Operations; Brad Smith, Manager of State Design, Bureau of Engineering and Highway Operations; William Bonaminio, Landscape Designer, Bureau of Engineering and Highway Operations; Walter Coughlin, Manager of Traffic Engineering, Bureau of Engineering and Highway Operations; Maribeth Demma, Assistant Planning Director, Bureau of Policy and Planning; Arthur Keating, Director of Property and Facilities Services, Bureau of Finance and Administration; and from the Federal Highway Administration: Gary Hamby, former Division Administrator for Connecticut, and David Price, Assistant Division Administrator.

Important contributions have also been made by others from the Federal Highway Administration, Connecticut Division Office, and from the Federal Highway Administration in Washington, including the Federal Lands Highway Office; the National Park Service; the National Park Service Historic American Building Survey/Historic American Engineering Record team which documented the Merritt Parkway in the summer of 1992; the Merritt Parkway Advisory Committee; the State Historic Preservation Office, the Connecticut Trust for Historic Preservation, and the Connecticut Chapter of the American Society of Landscape Architects.

History

On July 1, 1934, Oscar Tuthill, the First Selectman of Greenwich, turned a spade of earth at King Street near the Connecticut-New York border to begin construction of the Merritt Parkway, which was among the first parkways in the nation and the first median-divided, limited-access highway in Connecticut. (Its name was changed from Merritt Highway to Merritt Parkway one year after construction began.) On September 2, 1940, just over six years later, the final section of the roadway was completed and the entire Parkway opened to traffic.

Built at a total cost of approximately $21 million, the 38-mile roadway stretches across Fairfield County from the Town of Greenwich to the Housatonic River in the Town of Stratford. The stately, and neatly landscaped parkway, connects the Hutchinson River Parkway at the New York state line with the Wilbur Cross Parkway at Stratford. Together, the Merritt and Wilbur Cross Parkways form part of Route 15 in Connecticut.

Described by one historian as "one of the most beautiful and best-engineered highways of the time," the Parkway was named in honor of Schuyler Merritt, the prominent Stamford resident and distinguished nine-term Congressman who spearheaded the drive to get the State Legislature to authorize the financing necessary to build a new inland highway parallel to Route 1. Following World War I, traffic along Route 1 (also known from colonial days as the Boston Post Road) increased at a very rapid pace and caused a related rise in traffic accidents and fatalities. Local motorists and long distance travelers were forced to compete for the same highway space. Drivers could move only at slow speeds. Merchants in communities along the route were upset because their customers were unable to find convenient parking.

The growth of traffic caused by the increased use of passenger cars and trucks created greater traffic problems along Route 1, which had also become the main truck route between the port of New York and the industrial centers of Connecticut and other New England states. A number of plans for alternate routes were implemented or studied by the Regional Plan Association, the Fairfield County Planning Association, and the Connecticut State Highway Department beginning in 1923, in an effort to ease "bottlenecks" and relieve congestion along the Boston Post Road and to spur the development of Fairfield County.

In 1925, the so-called "Parallel Post Road" plan attracted increased public support and won endorsement from Governor John Trumbull. Fairfield County Legislators introduced four bills to the General Assembly that year to build a new highway, but no action was taken. During the next three legislative sessions, several bills were introduced to the General Assembly which dealt with the construction of a highway

General Assembly which dealt with the construction of a highway through Fairfield County. However, no additional State appropriations, beyond those in the yearly budget were made available for the highway's construction. It was the 1930-31 session of the Legislature that passed three key bills affecting the future of what was then know as the Merritt Highway. In early May 1931, Bill 660 was passed which directed the Highway Commissioner to layout a highway from Stratford to Greenwich. Towards the end of May, two additional bills passed, one appropriating $1 million to purchase right-of-way and begin preliminary construction of the highway, and another creating the Merritt Highway Commission. The Commission consisted of nine members which were appointed by the Governor to control the use of the road after its completion.

Despite the $1 million appropriation made in 1931, work on the Merritt proceeded slowly in the following years through "pay-as-you-go" financing. In 1934, the State received two Public Works Administration grants totalling $438,077 for grading and bridges along 7 miles of the highway in Greenwich and Trumbull. The following year, the General Assembly granted authority to Fairfield County to issue $15 million in bonds to complete the highway's construction.

The original plans called for the new highway to tie-in with the widened Route 1 at the Washington Bridge over the Housatonic River between Stratford and Milford. However, further legislation was passed changing the path of the Merritt Parkway to its present course over the Housatonic River Bridge. Access was provided over the length of the Parkway by twenty major roadway crossings with short on/off ramps.

The first construction contract, involving a three and one-half mile section of highway between King Street and Round Hill Road in Greenwich, was awarded to the firm of Peter Mitchell, Inc. of Riverside in Greenwich. The cost was $714,131.

A direct product of a period in American road building history when there was a great deal of interest in linking urbanized regions with graceful highways set in natural surroundings, the Merritt Parkway quickly emerged as a national model. To insure a natural parkway appearance, long, gradual vertical curves were designed with maximum 7 percent grades and forty-six horizontal curves were designed with 1.5 to 7 degree arcs over the length of the Parkway. Rock cuts were rounded and landscaped to produce a natural setting. The Merritt Parkway's designers attempted to integrate the traveled way into the roadside, and its surroundings. The landscaping of the Parkway followed closely upon construction, attempting to heal the scars of construction.

The travel portion of the Merritt Parkway encompasses two lanes in each direction separated by a landscaped dividing strip. Prior to the start of construction, the route was marked by landscape engineers to protect all trees not actually in the path of construction. Trained foresters supervised the logging operations of the road building contractors. Thayer Chase, the Connecticut Highway Department landscape architect for the Parkway, prepared the planting plans, giving primary consideration to the use of plants native to the Connecticut countryside. In his landscape design scheme for the median and side slopes, Chase used mountain laurel, white birch, cedars, dogwoods, oaks, and other native materials. Provisions for proper sight lines and the elimination of cross-headlight glare in the median were given special attention as well. A host of vistas occurred over the length of the Parkway and afforded motorists views of the beautiful countryside.

Six decades later, millions of motorists from all over the nation still enjoy the scenic beauty of the Parkway, especially its brilliant spring displays and its rich autumn foliage.

In addition to the roadside beauty that can be viewed while driving along the Merritt Parkway, motorists also are treated to a unique exhibition of ornamental bridges. These structures were the creation of George Dunkelberger, the innovative bridge designer and architect employed by the Connecticut Highway Department. The bridges originally 72 in number, with 35 carrying the Parkway under intersecting roads and railroad tracks and 37 carrying the Parkway over intersecting roads and rivers, were designed primarily in the Art Moderne and Art Deco styles with no two alike.

It is important to note that while the design schemes were being created for these bridges, the architect was faced with the economic reality of the Depression. Tough times demanded that Dunkelberger control construction costs and heightened the challenge of trying to create a series of bridges that were neither ordinary nor identical. The nature of their rigid frame construction, engineered for strengths far beyond what was needed for commercial loads at the time, accounts largely for the appearance of the bridges. But the variety of individual detail comes from the resourceful architectural talent of the bridge designer.

In the fifty years since the Parkway's completion, three of the original bridges have been replaced and a number of others have been altered in response to needed maintenance and repair.

While over the years the Merritt Parkway has experienced incremental changes, it still remains one of the most stunning of this Department's many achievements. Its constantly changing geometry, its unique and beautiful bridges, and its park-like setting all contribute to the Merritt Parkway's special character. In 1991, the Parkway was listed on the National Register of Historic Places, a statement that it is a nationally recognized cultural resource, in addition to being a valued part of Connecticut's heritage and a critical transportation facility for the southwestern part of the State. In early 1992, the Parkway was designate as a State Scenic Road, further highlighting its importance to Connecticut's character.

In the summer of 1992, a team from the National Park Service came to Connecticut to study and prepare documentation on the history of the Merritt Parkway. The team, from the Park Service's Historic American Building Survey and Historic American Engineering Record (HABS/HAER) offices, carefully documented the planning, politics, bridge and roadway design, landscape design, and construction of the Merritt Parkway. The work of the HABS/HAER team represents the most comprehensive study ever conducted of the Parkway's history.

The completed document which includes numerous historic and contemporary photographs has been placed in the U.S. Library of Congress. A copy of this document is also available for review at the Library of the Department's Administrative Office Building in Newington.

Operational Statistics

Its park like environment and unique ornamental bridges not withstanding, the Merritt Parkway was originally designed and has continued to function as a key component of the State's transportation system, especially within the State's southwest corridor. When the Parkway was conceived and design work undertaken during the early to mid 1930s, design-hour volumes, design speeds, and geometric design standards were significantly different from current American Association of State Highway and Transportation Officials (AASHTO), Federal Highway Administration (FHWA), and Connecticut Department of Transportation (ConnDOT) standards. The original designers engineered the road for a more relaxed time; they never envisioned 70 mile per hour (mph) speeds or Average Daily Traffic (ADT) volumes exceeding 60,000 vehicles per day (vpd) in some sections of the Parkway, or the level of congestion that occurs on a daily basis during the morning and evening peak commuter periods. The following Tables present a statistical sketch of the traffic operations on the Merritt Parkway.

I. Average Daily Traffic Volumes (ADT)*

Year	Greenwich*	Trumbull/Fairfield**
1940	15,422	n.a.
1945	8,081	n.a.
1950	23,713	n.a.
1955	32,041	n.a.
1960	20,781***	n.a.
1965	21,039	n.a.
1970	23,014	n.a.
1972	21,559	35,800
1976	21,500	34,900
1980	22,900	39,300
1984	27,500	47,700
1988	31,100	56,100
1992	39,800	58,900

Percentage increase 1992 over 1972: 85 percent

*Measured at (former) Greenwich toll location

**Measured at Exit 47

***Connecticut Turnpike opened January 1, 1958

II. Speed

Eastbound

	1980		1993	
	Avg.	85%*	Avg.	85%
Greenwich	55.8	59.0	61.8	66.3
New Canaan	55.9	60.8	60.0	64.1
Fairfield	57.8	62.5	62.8	66.7
Stratford	55.1	60.8	64.1	68.4

*85% means that 15% of traffic is travelling faster than the given figure.

Westbound

	1980		1993	
	Avg.	85%	Avg.	85%
Greenwich	55.3	59.8	62.8	66.9
New Canaan	58.5	63.3	63.7	68.0
Fairfield	56.5	62.0	62.5	67.0
Stratford	58.1	63.3	61.5	67.0

III. Accidents and Fatalities

Merritt Parkway

Year	Fatal Accidents	# Fatalities	Injury Accidents	# Injuries	Total Accidents
1989	7	8	366	487	1230
1990	6	6	346	447	1141
1991	6	7	343	483	1070
1992	4	5	363	485	1087
Total	23	26	1418	1902	4528

For 1986 through 1990 there was...

- One accident every eight hours
- One injury every 20 hours
- One fatality every 52 days
- One tree hit every nine days
- One rear-end accident every 14 hours
- One side-swipe accident every three days
- One guide rail hit every 36 hours

IV. Accident and Fatality Rates - Merritt Parkway vs. I-95

	Merritt Parkway		I-95	
	Accident Rate*	Fatality Rate*	Accident Rate	Fatality Rate
1988	199.5	0.81	247.5	0.75
1989	197.8	1.29	200.0	0.74
1990	182.0	0.96	207.8	0.58
1991	169.0	1.10	187.6	0.14
1992	171.5	0.79	169.0	0.57

*Per 100 million vehicle miles of travel

As shown on the preceding Tables, traffic volumes on the roadway have increased significantly since its opening in 1940. While the opening of the Connecticut Turnpike in 1958 stemmed the growth in traffic, volumes expanded rapidly in the 1980s. Prevailing speeds also increased in the 1980s. Both speeds and volumes exceed what originally anticipated by the Parkway's designers. While the Department continually attempts to address dangerous conditions on the Merritt, accidents and fatalities are still numerous: for the period 1986 through 1990 there was one fatality every 52 days and one accident every eight hours. Accident rates are lower on the Merritt Parkway than on I-95, however, fatality rates are higher.

In addition, in evaluating the design of the Merritt Parkway, it becomes clear that the standards employed by the Connecticut Highway Department (predecessor to the Connecticut Department of Transportation) in designing the Merritt Parkway were significantly different than the currently used 60 mph minimum and 70 mph desirable design speed that is generally used for most current upgrading of limited access highways, including the Merritt Parkway. While some of the main-line geometry of the Parkway approaches current minimum design standards relative to general horizontal and vertical alignment, there are numerous sections of the Parkway that fall short of these standards, most notably, the median design, lateral clearances, and many of the unimproved interchanges.

The Guidelines articulated in the following sections of this document will allow the unique character of the Merritt Parkway to be preserved and enhanced while continuing to improve the safety and efficiency of this important transportation artery.

Guidelines

I. Landscaping

Objective: The natural landscape is a central element of the unique character of the Merritt Parkway. The objective for landscaping the Parkway is to restore and maintain a naturalistic and park-like landscape within the entire right-of-way that is consistent with the vision of the Parkway's original landscape architect: Integrating the Parkway into the surrounding landscape and creating a progression of individual and changing vistas.

A. General

1. All landscape work shall follow the design and maintenance practices outlined in this Section until such time that the Merritt Parkway Landscape Master Plan, which is currently being undertaken, is adopted. Adoption of the Landscape Master Plan is anticipated by the Fall of 1994. Upon adoption of the Landscape Master Plan, these Guidelines will be revised to reflect its recommendations.

2. Landscaping plans shall be required as part of any improvement project and must be compatible with Landscaping Guidelines for the Parkway.

3. Landscape design shall be approved by the Facilities and Landscape Design Unit.

B. Plant Materials and Installation

1. All new plantings shall be sited naturalistically, in small groups or clumps, with occasional single specimens, not in straight lines. Materials of varying height shall be used.

2. Plant materials to be used along the Parkway shall be selected from the recommended species list contained in Appendix A.

3. Use species selected for site specific soils, micro climate, exposure and ecosystem association.

4. Use a full pallet of understory plants.

5. Use chloride and ozone-tolerant plants close to the roadway.

6. Use wood chip or shredded bark mulch on all initial plantings to retard weed growth and retain moisture, but such mulch shall not be renewed.

7. Prior to new planting, remove weed trees and volunteer growth.

C. Roadside

1. Combine large shrubs, flowering trees, shade trees, low growing grasses and wildflowers to reduce mowing.

2. Ornamental and small flowering trees should be planted in non-linear groups for maximum effect.

3. Shade trees should be planted in groups of mixed species as they might naturally grow. These trees shall be planted beyond a safe distance from the travelway or the deflection distance of guide railing.

4. Unless a view corridor is specifically desired, use landscaping to screen buildings adjacent to right of way from Parkway travelers.

D. Median

1. The planted median is an important element of the Parkway's design. Use plantings, such as shrubs and ground cover, for headlight screening and reduced maintenance, particularly in center island areas. Retain originally designed scheme of understory and canopy trees. When deflection distances require, plant with multi-stemmed and/or small calipered species.

E. Bridge Abutments

1. The entire bridge structure is an important element of the Parkway's character. Design and maintain plantings so they do not obstruct views of the structure's abutments. For example, use larger type species at top of slope and lower species for toe of slope and continually remove volunteer growth.

II. Design

Objective: The Merritt Parkway is one of Connecticut's most important cultural and historic resources. The character of this roadway is defined by the aggregation of numerous elements. While safety of travel must be insured, designers should view the details of design decisions as opportunities to maintain and enhance the Parkway's aesthetics.

A. Design Approach

1. Design for projects on the Parkway will respect the scenic and historic character of the road by following the various Guidelines in this document, as well as established AASHTO standards, and by documenting and seeking exceptions to AASHTO standards on a case-by-case basis.

B. Roadside and Median Areas

1. Protection devices to guard against collisions with man-made fixed objects, such as bridge piers and abutments and culvert endwalls, and to prevent vehicle crossover accidents shall follow guidance on guiderail treatments contained in Section II.C.

2. Trees. An adequate vehicle recovery area should be provided adjacent to the travelway. Review of run-off-the road accidents is required before trees are removed. The position of the tree to other surrounding trees and obstacles, as well as the condition and species of the tree should also be considered. After a careful review of accident history, roadway alignment, embankment geometry, etc., trees may be retained without guide rail. A tree, or group of trees, in a vulnerable location which aesthetically cannot be removed, can be protected by a properly designed barrier provided the severity of striking the barrier is less than striking the tree. Within median area sufficient deflection distance shall be provided between guiderail and any tree.

3. Pull-off areas. The provision of pockets of clearing to allow grass areas for disabled vehicles and enforcement actions to pull safely off the travelway are highly desirable. There are many such areas presently on the roadway. They should be maintained.

4. Rock ledge. Rock cuts close to the travelway must be evaluated, and shielded if their potential for snagging, pocketing, or overturning a vehicle is high. Guiderail or concrete barriers should be used only after a careful analysis of all other methods of protection, including careful, naturalistic cut back of rock face. If rock face is cut back, every effort should be made to make drill markings indiscernible. Where concrete barrier is required, it should be tinted to more nearly match the color of the surroundings (i.e., dark brown or grey).

C. Guiderail

1. The Department is presently studying various alternative guiderail systems for possible use on scenic or historic roads. The Department will consider using such a system on the Merritt Parkway. Alternatives being considered include: 1) "rusted" metal/rail on "rusted" metal posts, 2) "rusted" metal rail on wood posts, 3) painted rail (green) on painted posts (green), 4) painted rail (brown) on wood posts, 5) painted box beam (gray) on metal posts, 6) galvanized box beam on metal posts, 7) steel-backed wooden rail on wood posts, and 8) steel-backed wooden rail on "rusted" metal posts. The Department has also initiated formal testing of the steel backed wooden rail on metal posts with curbing options.

   For the narrow median areas of the Merritt Parkway additional barrier options are being studied, including a concrete barrier with architectural treatment and a concrete barrier with a stone fence-like facade.

2. Until the studies and testing noted above are completed and these Guidelines are revised to reflect the recommendations, galvanized Box Beam guiderail on metal posts or standard precast concrete barriers shall be used on the Parkway.

3. Along roadside areas, galvanized Box Beam on metal posts shall be utilized where guiderail is required.

4. In median areas of sufficient width galvanized Box Beam guiderail shall be utilized. This guiderail shall be placed along both edges of median rather than a single run down the center of the median. In narrow median areas, standard precast concrete barriers shall be used.

D. Curbing and Drainage

1. Park curbing shall be utilized where required for drainage purposes. The curbing will have a maximum height of 4" and shall be concrete. Curbing along the edges of the median is desirable as it serves to delineate median from travelway.

2. Many of the existing catch basins are offset from the curb line which, along with the narrow one foot gutter strip causes flooding in the travelway during heavy rainfalls. These inlets should be reset and the curbing and pavement extended in a smooth transition to include the setback basins.

3. Hydraulic capacities of existing cross culverts should be analyzed as part of any improvements to prevent flooding.

E. Pavement

1. It is important that uniform support be provided beneath any type of pavement structure.

2. Paving is to be accomplished in accordance with current Department standards. The drainage appurtenances and curbing installation will be accomplished as required by these Guidelines. Care shall be taken, during repaving operations, not to increase the width of the existing paved surface.

F. Shoulders

1. The present Parkway consists of 26 feet of concrete pavement, or bituminous overlay, and grass shoulders in most areas. In several areas, the paved shoulders were widened to open up the inlets to the catch basins in conjunction with resurfacing improvements. In the interest of safety and improved incident management, consideration should be given to providing additional grass shoulder areas.

G. Utilities

1. Whenever bridge reconstruction or rehabilitation projects are undertaken, utilities should be relocated underground or in the structure.

H. Noise Walls

1. Noise abatement structures shall not be constructed along the Parkway.

I. Right of Way

1. The Department shall maintain ownership of all land within the current Parkway right of way, including interchange areas.

2. All lease and/or easement requests for property within the Parkway right of way shall be reviewed by the Scenic Road Advisory Committee, the Merritt Parkway Advisory Committee, and the Department's Chief Engineer to determine whether proposed action associated with such request will have an impact on the character of the Parkway. Requests which will have an impact shall not be approved by the Department.

III. Bridges

Objective: The bridges, both overpasses and underpasses, are a central component of the unique character of the Merritt Parkway. While the bridges on most other parkways are made of stone, those on the Merritt are nearly all made of concrete, employing Art Moderne, Art Deco and other styles, and often making playful and celebratory statements with their details. The bridges are a unique man-made resource and represent one of this Department's greatest achievements in design and construction. Designers should use bridge projects as opportunities to restore and maintain original treatments of the bridges.

A. General

1. All work undertaken on the Parkway's bridges shall follow the design and rehabilitation principles and practices outlined in this section, until such time that the Merritt Parkway Bridge Conservation Plan is completed. The Bridge Conservation Plan should be completed by Spring 1995, at which time these Guidelines will be revised to reflect the Plan's recommendations.

2. Prior to any bridge rehabilitation/replication actions, designers shall review in detail the bridge's original construction plans and the bridge reports developed by the Historic American Buildings/Historic American Engineering Record (HABS/HAER) study team. These documents shall direct the project's development. The original construction plans are on file in the Department's Map File Section located at Pascone Place in Newington and the HABS/HAER documentation on the Merritt and its bridges can be reviewed in the Library of the Department's Headquarters in Newington.

3. All work undertaken on the bridges shall be performed in accordance with the Secretary of Interior's "Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings." (See Appendix B).

4. Preservation of original material/details shall always first be considered.

5. When preservation of original materials and details is determined not feasible, replication of forms, textures, colors and other visual qualities is mandated.

6. The spatial relationship and proportions between bridge and roadways shall be maintained under any bridge rehabilitation/replication plan.

7. Temporary removal of ornamental features shall be considered prior to rehabilitation. Record photos and field measurements shall be performed prior to removal to assure correct replacement.

8. Metal surfaces shall be kept painted to minimize rust. When painting of a structure's entire metal surface is proposed, efforts to determine original color(s) shall be undertaken. These efforts shall include review of HABS/HAER documentation and, if necessary, material analysis. If treatment is required to remove rust and prior paint, techniques which would be the least damaging to the surfaces shall be used and the adjacent concrete sections shall be protected.

9. Removal of graffiti from bridges shall be accomplished within a two week time period. The removal method shall be the least destructive to the original fabric. If covering the graffiti with a coating is required, the coating shall match the color and texture of the existing finish of the bridge.

B. Patch and Repair of Concrete and Metal Surfaces (Minor Rehabilitation)

1. Minor repair and cleaning of concrete should follow accepted historic masonry guidelines.

2. Cleaning of concrete should avoid using high-pressure water spray and strong chemicals (acidic cleaning agents will affect the surface of limestone, marble, and concrete).

3. Abrasive cleaning techniques such as sand-blasting, surface grinding, or wire brushes are destructive and should not be used.

4. Moisture problems should be addressed by insuring adequate roadway drainage, well-maintained pointing, and repair of surface cracks.

5. The use of waterproof coatings shall be avoided.

C. Parapet Replacement/Replication (Intermediate Rehabilitation)

1. The designed effect of light passing through bridge parapets is an important aesthetic element and should be preserved.

2. When preservation of existing parapets is not feasible, the original design and effect shall be replicated. If required, the parapets shall be protected with the least visually obstructive guiderail system, keeping in mind the volume and speeds of traffic crossing the bridge and the need for safe transitions with any existing rail systems on the approach roadways to the structure.

D. Deck or Superstructure Replacement/Replication (Major Rehabilitation)

1. Structural forms, such as the shape of an arched opening, shall be carefully repaired or remolded, including all details such as scoring and bevels.

2. The proper concrete color for surfaces, including decorative mixes, shall be determined through well-cured test batches using different mineral pigments.

3. The proper concrete texture for surfaces, including decorative treatments, shall be determined through float sampling.

4. The replacement superstructure shall replicate the dimension and appearance of the original bridge from all views. This does not preclude the use of pre-cast concrete sections. If pre-cast sections are used, they shall be cast to conform to the shape and dimension of the original superstructure and **leave no evidence of false work.**

E. Total Bridge Replacement

1. Original architectural fabric or ornamentation shall be salvaged and reused in the new structure's design.

2. When the total replacement of a bridge is required, the new structure shall maintain the appearance of the original structure's proportion, horizontal and vertical dimension, as well as its forms, textures, colors and architectural detail.

F. New Bridge Construction

1. The design of any new bridge on the Merritt Parkway should be as unobtrusive as possible, and complement the Parkway's aesthetic character.

2. The State Historic Preservation Officer (SHPO) and the Advisory Council On Historic Preservation (ACHP) shall be consulted with in determining the appropriate design for any new bridge.

3. Early in the preliminary design phase, bridge concepts under consideration shall be reviewed by the Scenic Road Advisory Committee and the Merritt Parkway Working Group.

IV. Facilities

Objective: Facilities on the Merritt Parkway include service areas, maintenance garages and salt sheds. As this is a parkway, it is important that these structures blend in with the natural environment. Designers should seek to preserve, restore and enhance the historic and/or aesthetic appearance of these facilities and to insure that any new facilities are compatible with the character of the Merritt Parkway. It is noted that the primary purpose of the Merritt Parkway service areas is to provide necessary services to motorists using the Parkway.

A. General

1. Any structural improvements or additions to existing historic buildings must be accomplished in accordance with the Secretary of Interior's "Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings." (See Appendix B).

2. All site plans for improvements shall incorporate the same roadway appurtenances specified in the Design Section of this report, unless deviation results in a more aesthetically compatible treatment.

B. Service Areas

1. When alterations or expansion of a service area is determined necessary by the Department, architectural plans shall be compatible with the original design for the facility. Particular attention shall be given to the treatment of architecturally sensitive features, such as canopies.

2. When expansion of parking areas is determined necessary, the design for such improvements shall be accomplished in a manner which will shield these areas from the view of the motoring public.

3. Improvements to the illumination of the service areas shall incorporate lighting fixtures which are compatible with the character of the Parkway, and designed to minimize glare to motorists.

C. Maintenance Garages and Salt Sheds

1. The architectural design of new maintenance garages and any auxiliary buildings shall be compatible with the overall character of the Parkway.

2. Rehabilitation of existing maintenance garages shall employ architectural features which enhance the facility's compatibility with the Parkway's character.

3. The Department's standard architectural design for salt sheds shall be enhanced to be less visible/intrusive and more compatible with the Parkway's character and the character of existing neighborhoods.

4. Maintenance Facilities shall be appropriately screened from the view of the Parkway and adjacent residential areas.

5. Landscaping plans shall be required as part of any major improvement project. These plans must be compatible with the Landscaping Guidelines for the Parkway.

V. Traffic Control

Objective: Traffic controls on the Merritt Parkway include numerous elements, from signs and sign supports to delineators and pavement markings to signals at the end of exit ramps. Together, these elements have a significant impact on the unique character of the Parkway. Choices with respect to traffic control treatments on the Merritt Parkway should be made with the goal of enhancing the Parkway's aesthetics in mind. Functional needs must be met in the process.

A. General

1. Traffic control devices will respect the scenic and historic character of the road, while following the guidance of the Manual on Uniform Traffic Control Devices and other Federal standards.

2. No new signs shall be added to the Merritt Parkway until after a review for appropriateness is undertaken by the Department's Division of Traffic Engineering.

B. Guide Signs

1. The background color for guide signs shall be Middle Brunswick Green.

2. All signs shall be side-mounted except when specific field conditions absolutely mandate overhead mounting, such as closely spaced successive exits or limited sight distance, or where the impact of the removal of vegetation or rock ledge is not acceptable.

3. All guide sign supports, and the backs of all new guide signs, shall be painted charcoal grey.

4. Legend size shall be 13.33"/10" (u.c./l.c.) in the Stone type face.

5. Side borders of all guide signs shall have a white uniform saw-tooth pattern, with a standard white border at the top and bottom. (See Appendix C).

6. Guide signs will not be mounted within 500 feet prior to a bridge, unless field conditions make this not feasible.

7. Signs for attractions of recreational, cultural or historical interest shall be brown.

C. Regulatory and Warning Signs

1. Regulatory and warning signs shall be mounted on standard galvanized steel sign posts and neither the posts nor the sign backs will be painted.

2. Speed limit signs shall be installed after each entrance ramp and repeated at approximately two-mile intervals.

3. Only special-purpose signs may be installed in the median, e.g., signs warning of median side-depressed catch basins.

4. Signs not directly related to the driving task will not be installed on the Parkway, e.g., Ride Together, sports recognition, town promotional signs.

D. Service Area Signs

1. The background color for service area signs shall be Interstate Blue.

2. Service area signs shall be side-mounted.

3. The signs supports and the backs of the service area signs shall be painted charcoal grey.

4. Legend size shall be 10" capital letters in the Stone type face.

5. Side borders of the service area signs shall have a white uniform saw-tooth pattern, with a standard what border at the top and bottom. (See Appendix C).

E. Town Line Signs

1. The color for town line signs shall be Middle Brunswick Green.

2. All signs shall be side mounted and the backs of all signs and sign supports shall be painted charcoal grey.

3. Signs shall contain only the town's name with a legend size of 8"/6" (u.c./l.c.) in the Stone type face.

4. Side borders of these signs shall have a white uniform saw-tooth pattern. (See Appendix C).

F. Merritt Parkway Trail Blazer and Route Marker Signs

1. The Merritt Parkway Trail Blazer sign will be in the shape of the official State shield (22" x 22").

2. The shield will have a dark blue background with white borders and legend.

3. The shield will feature the words Merritt Parkway with legend size 2"/1½" (u.c./l.c.) in the Stone format, and a stylized white Mountain Laurel, with pink and red highlights and green leaves. (See Appendix C).

4. The standard route marker sign shall be placed below the trail blazer sign.

5. The trail blazer and route marker signs shall be side mounted on standard galvanized steel sign posts, and shall be placed approximately 500 feet after every on-ramp.

6. The trail blazer signs shall be manufactured by the Department's Sign Shop. The Sign Shop should be contacted if specifications are required.

G. Bridge Overpass Signs

1. Signs identifying overpass structures will be mounted adjacent to the roadway immediately prior to the bridge and will not be mounted on the bridge.

2. The color of these signs shall be Middle Brunswick Green.

3. Depending upon length of the overpass or street name, the signs shall be 12" x 60" or 24" x 60".

4. The standard Federal alphabet shall be used as type face.

5. Standard white borders will be used on these signs. (See Appendix C).

H. Variable Message Signs

1. As part of the Department's corridor incident management program, variable message signs are scheduled to be installed by September 30, 1994 at the following five locations along the Merritt Parkway: 1) Northbound west of Silvermine Avenue in Norwalk, 2) Southbound east of Route 33 in Westport, 3) Northbound west of Frenchtown Road in Trumbull, 4) Northbound west of Huntington Road in Stratford and 5) Southbound east of Cutspring Road in Stratford. Beyond the sites noted above, no additional variable message signs will be installed along the Parkway.

2. The variable message signs to be installed shall be approximately 4.5 feet high set on a single post making the maximum height of signs approximately 11.5 feet above the pavement. These signs shall be mounted on the side of the road. The post and the sign shall be colored charcoal grey and the sign shall utilize a glare minimizing plastic covering. The signs shall be positioned among existing plant material and if necessary, landscaping will be employed to soften the visual effect of the signs. The signs shall be operated only when conditions, such as a traffic management situation, dictate.

3. The Office of Traffic shall continue to review new incident management technologies as they are developed to determine if a system, more suitable to the aesthetic character of the Parkway, can be obtained. If a technology develops that would eliminate the signs or further minimize the visual impact on the Parkway, the feasibility of replacing the existing system shall be investigated.

I. Illumination

1. The Parkway is not currently illuminated. Some interchanges have intersecting roads and connecting roadways that are lighted, but the Parkway is unlighted except at ramps at modern interchanges. Service areas are illuminated.

   a. The Parkway, including interchange areas not currently illuminated, will not be illuminated.

b. Signs on the Parkway will not be illuminated.

c. Service areas will continue to be illuminated.

J. Pavement Markings

1. Pavement markings will follow normal state practice.

K. Delineation

1. Roadside delineators will be placed at normal freeway intervals.

2. Colors shall be standard.

3. Recessed retro-reflective pavement markers will be used for lane lines only.

L. Traffic Signals

1. Green signal heads will be used for all signals installed or replaced at Parkway interchanges.

2. Span poles will be selected to be as unobtrusive as possible. Existing utility poles will be used for supports where feasible. Galvanized steel poles will be the standard pole when utility poles are not available and depending upon the setting, either charcoal grey or dark green painted poles will be used when galvanized poles are not appropriate for the environment.

VI. Maintenance

Objective: Over time, daily maintenance decisions and activities can have the most significant influence on the overall character of the Merritt Parkway. Maintenance activities should strive to maintain and enhance the naturalistic character of the Parkway.

A. General

1. Annual and routine maintenance on the Parkway shall follow the maintenance practices outlined in this Section, and as appropriate, those contained in the Landscape and Bridge Sections (Sections I and III) of this document until such time that the Merritt Parkway Landscape Master Plan and Bridge Conservation Plan, which are being undertaken, are completed. The Landscape Master Plan is anticipated by the Fall 1994 and the Bridge Conservation Plan is anticipated by Spring 1995. Upon adoption of these Plans the appropriate section of the Guidelines will be revised to reflect the recommendations of these Plans.

2. Unless directed otherwise by these guidelines, annual and routine maintenance on the Merritt Parkway shall be undertaken in accordance with the Manual of Organization Function and Procedures Policy.

B. Inspection of the Merritt Parkway

1. A maintenance supervisor will regularly patrol the entire Parkway (in each direction) a minimum of once a week. The supervisor shall make observations and note on his or her Weekly Supervisor Report on Deficiencies all deficiencies observed as to location of damaged guide rail, pavement conditions, pavement markings, graffiti, damaged or destroyed signs, brush, grass, tree growth or other obstructions which interfere with a clear view of highway signs and sightlines on curves and ramps.

2. After any adverse weather condition the Parkway will be inspected for washout of shoulders or slopes, blockage of drainage systems and structures, fallen trees or limbs, and during the winter season, sightline problems created by windrows of snow or by drifting.

3. After each inspection, the supervisor shall arrange for immediate corrections on all hazardous conditions. Other defects recorded will be addressed at the following bi-weekly scheduling meeting for repairs.

4. Care shall be taken by the supervisor on this regular patrol to detect any potential situation that could develop into a hazardous or dangerous condition.

C. Cleaning

1. Maintenance crews shall keep the travelway, shoulders, drainage system and structures, and roadside areas clean and free of debris and/or obstruction. This shall include, but not be limited to, branches, dead animals, litter, and any foreign material.

D. Sweeping

1. Immediately after the winter season, roadway sweeping will be performed. Emphasis will be placed on pollution control by applying sufficient moisture so as not to produce dusty conditions and to properly dispose of sand and foreign debris before it can be washed in water courses or become airborne.

E. Drainage

The drainage lies within three main categories:

1. Free flow of natural watercourses through the Parkway right-of-way.

2. Collection of surface runoff to prevent flooding and erosion of shoulders and slopes.

3. The control of subsurface flow to maintain the stability of the roadway.

All three categories will be maintained, cleaned, and/or replaced in like, in an environmentally sound manner to preserve the existing character of the Parkway.

F. Mowing

1. Mowing will be a continuing seasonal activity in strict adherence to the statewide mowing policy

(revised 1991), unless otherwise dictated by the Landscape Master Plan.

G. Graffiti

1. Graffiti will be eradicated from structures within a reasonable time frame, generally a two-week period, except during extended adverse weather conditions. In removal procedure, the least destructive method to original fabric will be used. Every effort will be made to match both color and texture to the existing condition.

H. Tree and Vegetation Removal

1. The District Landscape Technician, or equally qualified person, will develop an annual vegetation control program. The program will address weedy and volunteer undergrowth at the following:

   a. Median areas.

   b. Structure abutments, wingwalls and piers.

   c. Area from ROW line to roadway shoulder line.

2. Selected tree removal or pruning of woody vegetation will only be permitted after being reviewed by the District Landscape Technician, or equally qualified employee, as outlined in the following guidelines:

   a. The roadway users' sightline is obstructed to warning, regulatory, or directional signs.

   b. Limbs or branches overhanging the travelway encroach upon the minimum vertical clearance requirement of 16 feet.

   c. Dead limbs or branches are found on State or privately-owned trees whose limbs overhang the travelway and are deemed hazardous.

   d. The standard sightline is restricted on the inside of horizontal curves, vertical curves, ramp intersections, or approved crossovers.

   e. When free flow of water is restricted in drainage channels.

f. Dead, dying or structurally impaired major trees that are hazardous to the motoring public.

I. Snow and Ice Control

1. The main objective of snow and ice control is to provide an acceptable standard of winter maintenance that will provide reasonably safe roads during and after adverse weather conditions, as outlined in the current Snow and Ice Control Policy. Under no condition will the use of chlorides be allowed other than as specified by policy.

J. Bridge Maintenance

1. Merritt Parkway bridges will be inspected annually by the District Bridge Section and bi-annually by Bridge Safety Unit in accordance with Federal Regulations. The identified deficiencies shall be placed in three categories:

   a. Corrective maintenance.

   b. Preventative maintenance.

   c. Cosmetic treatments.

2. In addressing any of the three categories, Bridge Maintenance will follow Bridge Guidelines (Section III of this document) and standards and procedures articulated in the Bridge Conservation Plan (Spring 1995). No visual changes to the architecture or character of the structure will be made. Every effort will be made to match color and texture and duplicate all falsework or cosmetic work to the structure's original condition.

K. Adopt A Ramp

1. The continuation of the Adopt-a-Ramp Program is temporarily interrupted pending the completion of the Landscape Master Plan for the Parkway.

2. Thereafter, the Adopt-a-Ramp Program shall again be fully encouraged, consistent with the enhanced Guidelines.

3. Existing adopted ramps shall be required to conform to the enhanced Guidelines.

VII. Review Process

Objective: To insure that Department activities on the Merritt Parkway are carried out in accordance with the Guidelines presented in this document, and to provide the many stakeholders in the future of the Parkway the opportunity to be informed about, comment on, and affect improvements proposed for this facility.

A. General

1. The Commissioner shall designate an individual within the Department who shall be assigned the responsibility to review and monitor all work proposed for the Parkway.

2. These Guidelines do not preclude the Federal requirements of project review and coordination with the Office of the State Historic Preservation Officer (SHPO), and if necessary, the Advisory Council on Historic Preservation, during the early stages of project development.

3. The Commissioner of Transportation shall reorganize the membership structure and duties and responsibilities of the existing Merritt Parkway Advisory Committee (MPAC). The membership of the MPAC shall be expanded and the responsibilities to review and comment on significant Department activities on the Parkway shall be strengthened.

   a. The membership on the MPAC shall include a representative from each of the Parkway's corridor towns, a representative from the Greater Bridgeport and South Western Regional Planning Organizations, a representative from the Connecticut Trust for Historic Preservation, and the Connecticut Chapter of the American Society of Landscape Architects and a representative from the Federal Highway Administration and the Connecticut Historic Commission. Representation of the Connecticut Society of Architects shall also be considered. In addition, the Commissioner of Transportation or his/her designee as well as representatives from the Department's offices of Traffic, Design, Bridge, Maintenance, Facilities, Planning, Construction and Landscape Design shall be members of the MPAC.

b. The Commissioner of Transportation shall serve as Chairperson of the MPAC.

c. The MPAC shall meet at least four times a year to review and discuss topics relative to the Parkway including the Department's planned and current projects and practices.

B. Internal Review

1. Requests for exceptions from the Guidelines established in the Landscaping, Design, Bridge, Facilities, or Traffic Control Sections of this document must be approved in writing by the Department's Chief Engineer. These requests must detail the reasons why Guidelines cannot be followed.

2. Requests for exceptions from the Guidelines established in the Maintenance Section of this document must be approved in writing by the Maintenance Manager of District III, the Director of Maintenance and the Department's Chief Engineer. These requests must detail the reasons why Guidelines cannot be followed.

C. Review by Advisory Committees

1. Preliminary concept plans and written documentation for requests for exceptions from Guidelines for all proposed construction projects and maintenance procedures shall be forwarded for review and comment to the Scenic Roads Advisory Committee and the Merritt Parkway Advisory Committee.

2. All concerns raised and mitigation measures suggested by these advisory groups must be addressed prior to project advancement.

D. Public Review

1. The Department will at a minimum, hold a public informational meeting for the following types of improvements proposed for the Parkway:

a. Major expansion,

b. Interchange modifications including the provisions of acceleration and deceleration lanes,

c. Bridge reconstruction,

d. New bridge construction,

e. Major safety improvements which involve the removal of significant amounts of vegetation, installation of extensive guiderail systems, and/or substantial increases in pavement width for drainage purposes,

f. Expansion of existing Service Areas and/or Maintenance Facilities, and

g. Construction of new maintenance facilities and/or salt sheds.

2. The informational meeting shall be held in the town affected by the proposed project. The meeting shall be scheduled early in the project's preliminary design stage.

3. Notification of public informational meetings shall be made through display advertisements and news releases in major newspaper publications serving the appropriate corridor towns.

4. Copies of news releases and display advertisements shall also be forwarded to the first officials and legislators of affected corridor towns, the South Western and Greater Bridgeport Regional Planning Agencies, and local Historic District Commissions, members of the Merritt Parkway Advisory Committee and special interest groups including but not limited to the Connecticut Trust for Historic Preservation and the Connecticut Chapter of American Society of Landscape Architects.

5. Input received at the public informational meeting shall be evaluated in writing and forwarded to the Commissioner of Transportation for a determination relative to the project's advancement.

E. Revisions to Guidelines

1. When considering revisions to the Guidelines for the Merritt Parkway, the Commissioner shall consult first with the State Historic Preservation Office, the Scenic Roads Advisory Committee, and the Merritt Parkway Advisory Committee.

VIII. Response to Major Concerns

In an effort to obtain the public's views on the measures being considered by the Working Group, for preserving and enhancing the character of the Merritt Parkway, a draft of the Guideline document was made available for public review and comment to an extensive mailing list. In addition, two public informational meetings were held to discuss the proposals presented in the draft document.

As a result of this public review process, numerous comments were received regarding the Merritt Parkway. All comments received were reviewed and discussed by the Working Group, and many revisions were made to this final document based upon the public's comments. Several areas of concerns were repeatedly noted by numerous individuals. These areas of major concern expressed by the public and the Working Group's response to them follows:

1. The excessive speeds on the Parkway and the need for increased enforcement of the speed limit.

   The responsibility for speed enforcement lies with the State's Department of Public Safety and the concerns raised relative to the excessive speeds on the Parkway have been brought to that Department's attention. However, excessive speeds of motorists is not unique to the Merritt Parkway. This is a problem which has been identified on all major roadways within the State. Unfortunately, this is a problem which is not easily addressed. To more effectively address the problem of speeding would require an almost constant patrol of the Parkway by numerous State Police Troopers. Given the fiscal constraints of the State, it is doubtful that the additional resources necessary to provide for the tremendous increase in manpower which would be required to resolve the problem of speeding will be made available.

   Another problem which hampers the ability of the State Police to enforce speed on the Parkway is that there are limited areas where State Troopers can safely set up radar units and ticket violators. This problem may be lessened with the completion and implementation of the Merritt Parkway Landscape Master Plan. As part of the Master Plan's development, provisions for areas where enforcement actions can safely be undertaken will be considered.

2. The use of Parkway by trucks and vehicles with combination plates.

The State Traffic Commission (STC) is overseeing a review of the use of both the Merritt and Wilbur Cross Parkways by vehicles which include small trucks and vans, bearing combination plates. Currently, STC regulations allow such vehicles on the Parkways, providing their weight does not exceed 7,500 pounds, and their dimensions do not exceed one of the following: length - twenty-four feet, width - seven feet, six inches and height - eight feet.

Preliminary meetings have been held between representatives from the STC, the Department of Motor Vehicles and the Department of Public Safety, to discuss the concerns being expressed by the public regarding this issue. There are several interrelated statutes and regulations which must be addressed uniformly in order to arrive at a recommendation which will protect the integrity of the Parkways, yet deal with issues such as the tremendous increase in the use of utility vehicles and small pick-up trucks as personal vehicles.

Meetings between the STC, DMV and DPS will continue in an effort to resolve outstanding issues and to finalize a recommendation.

3. The need to develop special design standards for Parkways.

In designing roadway improvements, engineers are guided by current American Association of State Highway and Transportation Officials (AASHTO) and State design standards. These standards represent nationally accepted design principles which are intended to provide operational comfort, safety and convenience for the motorists. AASHTO has developed specific standards for various classifications of roadways. These classifications are based upon the operating characteristics of the roadway. Since there are no specific design standards for Parkways, due to the speeds and volume of traffic carried on the Merritt the AASHTO design standards used for this facility are those specified for limited access expressway type facilities. In designing improvements for the Merritt, the Department does, on a case by case basis, seek exceptions to the AASHTO standards.

However, the Department is extremely supportive of the development and approval of specific design standards for Parkways. On April 11, 1994, the AASHTO Board of Directors approved Policy Resolution PR-2-94 (See Appendix D) in which it was recommended that design standards for National Highway System (NHS) routes which includes the Merritt Parkway be delegated to each State and that the member Departments of AASHTO will work through AASHTO's design standards committees, with DOT, and with interested parties on design criteria and a design process for NHS routes that integrate safety, environmental, scenic, historic, community and preservation concerns.

The Connecticut Department of Transportation strongly supports this resolution and is committed to work through AASHTO's design standards committees to develop special design standards which provide design solutions that respect the integrity and value of historic Parkways such as the Merritt.

4. The need to legislatively establish a Merritt Parkway Commission.

The Merritt Parkway is a major component of the State's transportation system and the ultimate decisions relative to maintaining it as a safe and efficient roadway must remain with the Commissioner of Transportation. As such, this document does not recommend the establishment of a Merritt Parkway Commission.

However, recognizing that there are numerous stakeholders concerned with the future of the Merritt Parkway, the Working Group has recommended the expansion of the Merritt Parkway Advisory Committee (MPAC) membership and the strengthening of their responsibilities to review and provide input on Department activities relative to the Parkway. Section VII. of this document outlines the structure and project review responsibilities of the reorganized MPAC whose membership will include not only Department staff but also local officials from the Parkway's corridor towns, and individuals with expertise in landscaping and historic preservation.

It is felt that this group, working together will provide the Commissioner of Transportation with the advise needed to preserve and enhance the character of the Merritt Parkway, while maintaining this important transportation artery as a safe and efficient roadway.

5. The specific plant materials proposed.

Numerous comments were received from the public concerning the types of plant materials which the draft of this document proposed for use on the Parkway. Based upon these comments, Section I. Landscaping and the recommended list of plant materials contained in Appendix A has been revised to strengthen the objectives of restoring and maintaining a naturalistic setting and to use species selected for site specific soils, exposure and ecosystem association.

It is also anticipated that the Landscaping Section will be revised again once the Merritt Parkway Landscape Master Plan is completed in the Fall of 1994.

6. The guiderail systems being used on the Parkway.

Presently, various types of metal guiderail systems and concrete barrier treatments are used along the Parkway. While the use of guiderail is necessary to guard against collisions with fixed objects, such as trees, bridge piers and abutments and to prevent vehicle crossover accidents, the conglomeration of the different types presently being used detracts from the Parkway's aesthetic character.

The Department is currently studying and/or testing various alternative guiderail systems for possible use along the Parkway and other scenic roads. However, pending the completion of these studies, and in an effort to provide a more consistent approach to the guiderail systems use on the Parkway, any new guiderail systems installed shall be either galvanized Box Beam on metal posts or standard precast concrete barriers. Section II.C. of this document has been revised to provide guidance on guiderail treatments.

7. The number, placement, color and size of signs along the Parkway.

During the initial meetings of the Working Group, all types of traffic control devices placed along the Merritt Parkway were reviewed for efficacy and those deemed unneeded were removed.

The Working Group also consulted with a graphic designer hired by the Department to develop prototype signs specifically for the Merritt Parkway. These signs were presented at the informational meetings where they were well received. Section V. of this document outlines the recommendations of the Working Group relative to signs along the Parkway. These recommendations include the usage of Middle Brunswick Green for the background color for all signs except for regulatory and warning signs. This color is a darker green than what is currently used. In addition, the lettering on the signs will be reduced 16%, the minimum which will meet Federal standards, and will use the Stone type face format. These design changes in the signs will result in smaller signs with a more refined and distinctive look.

The graphic designers also developed a new trail blazer sign. This sign which is in the shape of the Connecticut shield features a white stylized mountain laurel on a dark blue background.

8. The need to strengthen the public review and the Department decision-making process relative to proposed projects and exceptions to Guidelines:

As a result of the public comments received, the Review Process Section proposed in the draft document was completely revised. These revisions which are outlined in Section VII. include specific requirements and procedures for project reviews by Department staff, Advisory Committees, and the general public.

CTDOT MS4 Project Design
Maximum Extent Practicable (MEP) Worksheet

Section 1: Project Information	**Project #:**	
	Title:	
	Location:	

Section 2: Existing Conditions

EC1	Total Project Area			acres	
EC2	Pre-construction Directly Connected Impervious Area (DCIA):			0.00 acres	%
EC3	Soil Infiltration Potential	Data Source: ☐Existing Report / Soils Map ☐Field Verified		0.00 ☐Good/Fair	☐Poor ☐Mixed
EC4	Depth to Maximum Groundwater		☐TBD	to	ft below grade
EC5	Depth to Bedrock		☐TBD	to	ft below grade
EC6	Aquifer Protection Area? (from PNDF)			☐Yes	☐No
EC7	MS4 Priority Area? (from PNDF)			☐Yes (See Below)	☐No
	Check All That Apply	☐Urbanized Area	☐DCIA >11%	☐Impaired Waterbody (See Below)	
	Select All Impairments That Apply	Choose an Item	Choose an Item	Choose an Item	
EC8	Contamination known or suspected to be present? (From Environmental Compliance)			☐Yes	☐No
EC9	Adjoining DOT ROW beyond project limits available for stormwater quality management			acres	

Section 3: Designed Conditions

	Water Quality Calculations		**30% Design**	**60% Design**	**90% Design**	**FDP**
DC1	WQV retention design goal	☐Full ☐1/2"-WQV	ac-ft ☐TBD	ac-ft	ac-ft	ac-ft
DC2	WQV goal ***retained*** (refer to page 2)		ac-ft	ac-ft	ac-ft	ac-ft
DC3	WQV goal ***treated*** (refer to page 2)		ac-ft	ac-ft	ac-ft	ac-ft
DC4	Total WQV *retained and treated*		0 **ac-ft**	0 **ac-ft**	0 **ac-ft**	0 **ac-ft**
DC5	Post-construction DCIA(acres)		ac. ☐TBD	ac.	ac.	ac.
DC6	Pre-construction DCIA (refer to EC2 above)		0 ac.	0 ac.	0 ac.	0 ac.
DC7	Change in DCIA from pre- to post-construction *Can be positive (DCIA gained) or negative (DCIA lost)*		**ac.** ☐ **TBD**	**ac.**	**ac.**	**ac.**
	Date completed					
	Completed by (initials)					
	Reviewed by (initials)					

Notes:

Worksheet users should refer to the *CT DOT MS4 Project Design MEP Worksheet Instructions*

Section 4: Stormwater BMP Selection Summary						
Design Phase ☐30% ☐60% ☐90% ☐FDP	**WQV Retained (ac-ft)**	**WQV Treated (ac-ft)**	**DCIA Captured (Acres)**	**DCIA Disconnection Credit (%)**	**DCIA Disconnection Credit (acres)**	**Site Constraints**
Disconnection (Dispersion) ☐						
						Choose an Item.
						Choose an Item.
Conveyance (Swales / Channels)						Choose an Item.
						Choose an Item.
						Choose an Item.
						Choose an Item.
Infiltration / Retention						
						Choose an Item.
						Choose an Item.
						Choose an Item.
						Choose an Item.
						Choose an Item.
						Choose an Item.
						Choose an Item.
Treatment						Choose an Item.
						Choose an Item.
						Choose an Item.
	0	0	0	0	0	
TOTAL						
Notes:						

Worksheet users should refer to the *CT DOT MS4 Project Design MEP Worksheet Instructions.* Refer to the 2004 CT Stormwater Quality Manual for more information on BMP criteria and limitations.

SECTION 9.49
FURNISHING, PLANTING and MULCHING
TREES, SHRUBS, VINES and GROUND COVER PLANTS

9.49.01—Description: The work under these items shall consist of furnishing trees, shrubs, vines and ground cover, preparation of planting areas, plant layout, planting, staking and guying, fertilizing, watering and mulching, as indicated on the plans or in the Contract. It shall also include all incidental procedures, such as the care of the living plants, securing a DOT Encroachment Permit and Permit Bond as specified in 9.49.03-15, and the replacement of dead and unsatisfactory plants or unsatisfactory materials before final acceptance of the Contract.

9.49.02—Materials: The materials for these items shall meet the requirements of M.13.

9.49.03—Construction Methods: Construction methods shall be performed in accordance with the details shown on the landscape plans.

At the discretion of the Engineer, a pre-planting meeting may be held to discuss the source of supply, location of plantings, preparation of soil, time frame of delivery, temporary storage location, Contract specifics and any other incidental procedures relating to this item.

The Contractor is cautioned that within the limits of any project, buried cable for illumination or utilities, which may be energized may be present on Site. The requirements of 1.05.15 shall apply.

1. Planting Season: The planting seasons shall be those indicated below, as specified in the Contract or directed by the Engineer. Planting shall not be done if the ground is frozen, covered in snow, or if the soil is in an unsatisfactory condition as determined by the Engineer.

Deciduous Material

Spring: March 1st to May 31st (inclusive), except for balled and burlapped material. Balled and burlapped material may be planted any time from March 1st to June 15th (inclusive).

Fall: From October 15th until the ground freezes.

Evergreen Material

Spring: March 1st to May 31st (inclusive).

Fall: August 15th to October 31st (inclusive).

2. Delivery and Storage of Plants: The Contractor shall ensure that plants arrive to the Project location undamaged. The following care shall be taken during transport from the nursery through final planting location:

a. Plants shall have mulch and water as necessary to keep moist and fresh at all times.
b. Plants shall be protected against overexposure to sun, wind and freezing temperatures at all times.
c. Bare-root plants, if not planted immediately upon receipt, shall be separated upon delivery and stored in an area where their roots are kept covered to keep air away until they are ready for planting.
d. Balled and burlapped plants shall be stored with their earth balls covered by soil, wood chips, cloth, straw or other suitable material and kept moist until planting.
e. Unless specified, all plants shall be stored in a shady location until planted.

3. Field Coordination: The Contractor shall submit a Source of Supply per M.13.07-4 to initiate the inspection and approval of all material. The Contractor shall review Site conditions and inform the Engineer of any conflicts. The Contractor shall coordinate planting layout with the Engineer for approval. The Contractor must notify the Engineer no less than 48 hours in advance, excluding weekends and holidays, of the completion of layout for approval. The planting layout must be approved by the Engineer prior to the commencement of work. The installation of plant material shall occur only after the completion of paving, the installation of footings or other operations which could damage the plants or alter the finished grades.

4. Planting Layout: Plant material locations and bed outlines shall be staked in the presence of the Engineer before any plant pits or beds are excavated. Labor, equipment and new, smooth stakes of approved quality are to be furnished by the Contractor for this purpose.

5. Preparation of Planting Areas: Planting areas shall be prepared by use of approved tools. All undesirable vegetation, roots or other obstructions shall be removed from the planting areas. Any

unsuitable material shall be removed from the Site and disposed of by the Contractor in a manner satisfactory to the Engineer.

If backfill is required, as determined by the Engineer, it shall meet the planting soil requirements of M.13.01-2.

In planting areas, but not less than 14 day before the installation of plant material, the remaining turf grasses and unwanted vegetation may be sprayed at the Contractor's expense, unless otherwise directed by the Engineer, with Glyphosate or approved equal at the manufacturer's recommended rate.

6. Pit Excavation: Planting pits may be excavated or hand dug at the discretion of the Engineer. Suitable excavated soil may be set aside to be incorporated into the planting mix. The planting pit shall be excavated so that the horizontal dimension of the hole is twice the diameter of the root ball, container, or bare root spread, as shown on the plans. The depth of the plant pit excavation shall be 2 inches less than the distance between the bottom of the root ball, container, or bare root mass, and the location of the root flare or top of the root structure. It may be required to remove the burlap and some soil from the top of the root ball to expose the root structure. Care must be taken so that soil will not loosen from the roots inside the ball.

Any rock or underground obstruction shall be removed to the depth necessary for planting as specified, unless other locations for the planting are approved by the Engineer. If removal of obstructions results in a deeper hole than needed for planting, or if the pit is overexcavated, backfill shall be added, and must be thoroughly compacted to the proper depth prior to setting plants. If backfill is required, it shall meet the planting soil requirements of M.13.01-2.

7. Setting Plants: The Contractor shall move the plants from storage to the planting location, retying any untied burlap to prevent shifting while placing the plant into the planting pit. Carefully place the plant into the center of the pit. Ensure that the root flare or the top of the root system is 2 inches above finished grade. Correct pit depth if the plant is less than 2 inches, or more than 4 inches above finished grade. All plants shall be set plumb. Backfill with planting soil to 1/2 the depth of the planting pit and thoroughly tamp around the ball. Fill the remaining area of the pit with water. Once water has completely drained, fill the remainder of the pit with planting soil. Water the planting area, re-tamp, and add additional planting soil to correct any low spots. Saucers shall be formed outside of individual plants (exclusive of plant beds) by placing ridges of planting soil around each, or as directed by the Engineer. In addition, the following shall be completed for each respective type of plant:

a. **Balled and Burlapped Plants (B&B):** If wire baskets are used, the Contractor shall cut all of the horizontal wires in the top 2/3 of the rootball and bend down or remove the top 1/3 of the wire basket. Remove excess soil from the top of the root ball to expose the root structure, and cut away any small feeder or girdling roots. Roots that have been wrapped around the ball within the burlap shall be straightened.
b. **Container Grown Plants (CG)**: Carefully remove the plant from the container over the prepared pits. Gently loosen the soil and straighten all roots as naturally as possible. It may be required to cut and remove excessive amounts of root mass if roots are tightly wrapped or bound.
c. **Bare-roots Plants (BR):** Carefully spread roots as naturally as possible and place into the bottom of the pit. All broken or frayed roots shall be cleanly cut off**.**

8. Fertilizing: All plants shall be fertilized at the rate of 3 lb. per 100 s.f. of surface area (broadcast). The fertilizer shall be uniformly applied to the surface of the beds and worked into the upper 2 inches of soil. Individual trees shall be fertilized at the rate of 2 lb. per inch of trunk diameter, and the fertilizer shall be mixed into the upper 2 inches of soil.

A second application of fertilizer shall be applied to all plant items at the same specified rates over the wood-chip mulch at the end of the period of establishment.

9. Watering: All plants shall be watered upon setting and as many times thereafter as conditions warrant. The following is a guide for minimum requirements per application:

Trees: 2 1/2 inch Caliper and less – 15 gal. each.
3 inch to 5 inch Caliper – 20 gal. each.
5 1/2 inch Caliper and above – 25 gal. each.
Shrubs: 24 inches and less – 6 gal. each.
More than 24 inches - 10 gal. each.
Vines, Perennials, and Ornamental Grasses – 3 gal. each.
Groundcovers and Bulbs – 2 gal. per s.f.

Water shall be applied at a controlled rate and in such a manner to ensure that the water reaches the root zone of each plant and does not run off to adjacent areas. Watering shall be applied in a manner that does not dislodge plants, erode soil or mulch, or cause damage to saucer.

The Contractor may use slow-release, drip irrigation bags for watering at the Contractor's expense in accordance with manufacturer's instructions.

Overhead hydro-seeder spray nozzles shall not be used as watering devices.

10. Guying and Staking: Immediately after planting, trees shall be guyed or staked as shown on the plans. Guy wires, hose and tree support stakes shall be removed after the initial establishment period.

11. Pruning: As directed by the Engineer, plants shall be pruned before or immediately after planting. No leader shall be cut unless directed by the Engineer. Broken, or badly bruised branches, sucker growth, etc., shall be removed with clean cuts.

12. Spraying: Spraying with antidesiccant shall be at the Contractor's discretion and as approved by the Engineer, at the Contractor's expense.

13. Mulching: After installation of the plantings, the type of mulch specified in the Contract shall be hand placed and spread to a depth of 3 inches and raked to an even surface over all saucer areas for individual trees and shrubs and over the entire area of shrub beds and elsewhere as directed.

14. Repair: Repair of existing grass areas damaged by the Contractor in the progress of the work shall be the responsibility of the Contractor, who shall restore the disturbed areas to their original condition at the Contractor's expense.

15. One-Year Establishment Period: All plant material shall be subject to a One-Year Establishment Period. During this time, the Contractor shall use currently accepted horticultural practices to keep all plant material installed in a healthy, vigorous growing condition at the date of final acceptance. The date of final acceptance shall be 1 full calendar year following the satisfactory completion of the planting activities as confirmed by the Engineer. The Contractor shall secure a Permit Bond in the amount of $10,000 or 20% of the sum of all plant items, whichever is greater, along with an Encroachment Permit from the Department in order to guarantee the One-Year Establishment Period.

The Permit Bond shall be provided to the Department at the completion and acceptance of all planting. A final inspection will be held 1 year from the date of installation, with the Contractor, Engineer, and Landscape Designer in attendance, to determine the acceptability of the plant establishment. An inventory of losses and rejected materials will be made by the Department and corrective clean up measures will be determined. After the Contractor completes all corrective actions, the DOT Encroachment Permit and Permit Bond will be released by the Department.

9.49.04—Method of Measurement:

1. Planting: The quantity for which payment will be made will be the number of each size and kind of plant counted in place, planted and accepted.

2. Mulching: This work will be measured for payment by the number of square yards surface measurement of the specified thickness for the area on which the type of mulch specified in the plans has been completed and accepted.

9.49.05—Basis of Payment:

1. Planting: Payment for this work will be made at the Contract unit price each for the kind and size of plant and method of planting, as the case may be, completed and accepted in place. The cost of the Performance Bond and Encroachment permit will be included

2. Mulching: This work will be paid for at the Contract unit price per square yard for mulch complete in place.

3. The unit prices shall include all materials, equipment, tools, labor, transportation, operations and all work incidental thereto, including the removal of guy wires, hose and tree support stakes after the initial establishment period, except that payment for excavation of solid ledge rock, concrete pavement and boulders 1/2 cubic yard in volume or greater will be made under 9.51, "Rock Excavation for Planting."

Pay Item	Pay Unit
(Plant Name) (Caliper)	ea.
(Plant Name) (Height)	ea.
(Plant Name) (Size)	ea.
(Vine Name) (Size)	ea.
(Ground Cover Name) (Size)	ea.
Wood Chip Mulch	s.y.
Gravel Mulch	s.y.

ITEM #0952051A - CONTROL AND REMOVAL OF INVASIVE VEGETATION

Description: This work shall include the development and implementation of an Invasive Vegetation Removal Plan (IVRP) to outline the identification and treatment methods for the control of invasive vegetation, including trees if present, as directed by the Engineer or their authorized delegate. This work will also include the removal and off-Site disposal of invasive vegetation from within the Project limits in accordance with the accepted IVRP.

The list of invasive vegetation to be controlled, removed, and disposed off-Site under this item can be found on the following websites:

- Connecticut Invasive Plant Working Group (CIPWG) Invasive Plants Council (http://cipwg.uconn.edu/invasive_plant_list/)
- US Army Corps of Engineers (ACOE) New England District Compensatory Mitigation Guidance Appendix K (http://www.nae.usace.army.mil/portals/74/docs/regulatory/Mitigation/2016_New_England_Compensatory_Mitigation_Guidance.pdf)

Materials: The herbicide shall be formulated as applicable for target-species foliar treatment or a flush cut/stump treatment. All herbicide applications shall be in accordance with Product label rates and in conjunction with Sections 22a-46 to 22a-66z of the Connecticut General Statutes (CGS).

Flagging tape, if used, shall be fluorescent, 'All-Weather' type, resistant to UV and water damage.

Stakes shall be survey-grade, as specified under Article 9.80.02.

Construction Methods: The Contractor shall be responsible to identify invasive vegetation at all times of the year and to prepare a plan for its control, removal, and off-Site disposal without assistance.

1. IVRP: Prior to any ground disturbance within the Project limits, the Contractor shall submit a proposed IVRP to the Engineer or their authorized delegate for review and comment. The Contractor shall address any comments to the satisfaction of the Engineer and resubmit their revised IVRP for review and acceptance.

The IVRP shall include the following information:

1) Proposed dates for the initial walk through of the invasive vegetated areas to be controlled and removed for off-Site disposal.
2) Schedule identifying specific dates when herbicide treatment or mechanical excavation or removal of invasive species is to occur for the life of the Contract, including the 1-year warranty period that begins at Substantial Completion. The treatment schedule shall coincide with the Contractor's schedule.
3) Plan sheets identifying the species of invasive vegetation and trees within the Project limits showing the total square yards proposed to be controlled and removed for off-Site disposal. For each species of invasive vegetation present on-Site, the following shall be described:
   a. Types and concentrations of any herbicides to be used to control the identified species

for the life of the Contract, including any adjuvants, SDS sheets, types of tools, equipment, or machinery to be used.

b. Mechanical excavation and removal methods including the type of machinery to be used.

4) Provide proof of DEEP Pesticide Application Business registration pursuant to CGS Section 22a-66b, and certifications for each supervisor and operational commercial applicator on-Site or as required under CGS Sections 22a-54 to 22a-58. All Contractors physically applying pesticides on Department construction Projects to treat invasive vegetation in the State highway right-of-way must ensure that the "6 Rights-of-Way Pest Control" certification is held by at least one Commercial Supervisory Pesticide Applicator employed at the Pesticide Application Business. If the applicator does not have a commercial supervisory certificate, then the applicator must have a junior operator certificate in "6 Rights-of-Way Pest Control" and operate under the written or in-person directions of the supervisor who is certified in "6 Rights-of-Way Pest Control." More information on DEEP certifications and permits for applying pesticides is available at the Pesticide Management Program page website. The Department reserves the right to require additional DEEP certifications based on Project Site specific requirements.
5) A description of safety equipment required.
6) Procedures for handling chemical spills.
7) Proposed disposal methods:
   a. Procedures for off-Site removal of invasive vegetation including trees.
   b. Provide address of disposal location, current permits / letters from the town authorizing such activity and a Site map (showing regulated areas).
   c. Invasive vegetation shall not be buried on-Site.

If changes are required to the accepted IVRP during the life of the Contract (including registration/certification changes for the personnel applying pesticides or new invasive species not previously identified in the original IVRP submission) or additional invasive vegetation control and/or removal are ordered by the Engineer, these changes shall be documented by the Contractor and resubmitted to the Engineer or their authorized delegate for review and acceptance. Only those changes recommended by the appropriately licensed supervisor/ applicator will be considered. At no time shall the Contractor direct or advise workforces on the pesticide treatment. All direction must be generated from the licensed Pesticide Application Business and approved by the Engineer.

The IVRP or any amended version must be accepted by the Engineer or their authorized delegate prior to beginning of any mechanical excavation or herbicide treatment in the areas which require invasive species control, removal and off-Site disposal as identified Contractor's marked up plan sheets. The accepted methods must be capable of total control and removal of all identified invasive species in the identified areas throughout the life of the Contract and the 1-year warranty period.

2. Special Handling of Invasive Species Vegetation: The Contractor will be allowed to mechanically excavate invasive vegetation and underlying soils using the accepted methods in the IVRP. The accepted methods must be capable of the removal of all soil to a depth where invasive plant material and root system is no longer evident, to the satisfaction of the Engineer or their authorized delegate. Suitable material shall be provided and placed to final grade as shown on the plans or as directed by the Engineer.

All excavated invasive vegetation and underlying soils shall be considered an unsuitable material and must be removed separately from clearing and grubbing operations and disposed of off-Site at an approved location as described in the Contractor's IVRP.

Whether the Contractor's method of removal is by flush cutting/stump treatment or spraying of herbicides, invasive species, including trees identified as invasive in the above websites or IVRP, must be removed separately from clearing and grubbing operations and disposed of at an approved location as described in the Contractor's IVRP.

The Contractor will not be allowed to strip/cut topsoil from any location and reuse this material within the Project limits identified within the IVRP as an area requiring treatment. The stripped/cut material is considered unsuitable material and is to be taken off-Site to an approved disposal facility as described in the Contractor's IVRP.

Wood chips from invasive species are not allowed to be stockpiled or reused on-Site. Wood chipping on-Site may be allowed to remain on-Site if temporarily stored in a properly contained enclosure and removed off-Site at the end of the treatment cycle, to the satisfaction of the Engineer or their authorized delegate.

No equipment or vehicles other than those required to complete the work as described in the Contractor's IVRP will be permitted in the areas designated for invasive vegetation removal. Any equipment used to process invasive vegetation, such as chippers and transport vehicles, must be cleaned prior to further use.

3. Site Maintenance: Broadcast or uncontrolled spray application will not be permitted, and care must be taken to avoid contacting non-target native species. If any non-target native species to remain within the Project limits are inadvertently treated with herbicide and perish, they shall be replaced with in-kind species at the Contractor's expense.

Vines shall be cut from the ground to the tree canopy. Twining vines within a tree canopy shall be removed to the greatest extent possible without damaging the existing tree to remain. Should branches be damaged, the Contractor shall prune damaged limbs at their expense. All corrective pruning shall meet the requirements of the National Arborists Association Pruning Standards. Note: Use of aerial equipment is encouraged; use of a pole saw to cut vines leaving unsightly debris hanging from the trees will not be allowed.

Flush cutting/stump treatment of brush and trees shall not be more than 2 inches above the ground line.

Any invasive species control and removal work performed throughout the duration of the Contract that causes damage or soil disturbance shall be repaired at the Contractor's expense within 7 days. Disturbed areas shall be vegetatively stabilized with the appropriate seed mix and protected with hay mulch, cellulous fiber mulch, or erosion control matting.

Limits for control and removal of invasive vegetation shall be maintained for the life of the Contract. Should stakes or flagging be damaged during the course of construction, the Contractor shall re-establish limits. Use of reference staking is permissible.

4. Field Meetings: The Contractor's IVRP must receive acceptance from the Engineer, or their authorized delegate and have the Site surveyed, staked, and flagged prior to any field meeting.

The Contractor shall provide at least 10 working days' notice to the Engineer for any scheduled field meeting(s) as described in the IVRP. During the meeting, the Contractor's IVRP shall be reviewed to verify the identified invasive species and to review the square yardage on the marked-up plan sheet(s). At this time, the Engineer or their authorized delegate may identify additional invasive species or designate additional areas for removal that are not included within the Contractor's submitted IVRP.

Additional field meetings may be warranted at any time, as directed by the Engineer or their authorized delegate, to ensure the Contractor is compliant with the IVRP or amended versions.

5. Treatment: The treatment schedule as identified in the IVRP may be modified based on changes to the Contractor's construction schedule or based on existing field conditions. The Contractor shall provide at least 10 working days' notice to the Engineer or their authorized delegate prior to proceeding with each treatment.

Treatment of invasive species will not be permitted without notifying the Engineer or their authorized delegate prior to activity and such personnel shall be on-Site to observe the work, unless specifically authorized otherwise. Treatment shall not be permitted outside of normal working hours, unless specifically authorized.

Prior to any herbicide treatment on-Site, the Contractor shall provide proof of DEEP Pesticide registration/certification, as specified above in **1. IVRP**. The Contractor shall not perform, nor allow subcontractors to perform, any treatment work at any time unless proof of current registration/certification for the actual supervisor and operator conducting or overseeing the herbicide application is available to the Engineer, upon request.

At a minimum, the Contractor shall treat all areas within the optimal growing season between April 15 and October 15. Additional spot treatment measures may be warranted within the same optimal growing season in any year throughout the life of the Contract if full control and removal of the invasive species is not achieved within the Project limits as outlined in the IVRP or as identified by the Engineer or their authorized delegate. When herbicide is used, a minimum of 10 working days is required prior to clearing and grubbing, planting, and seeding operations, so the herbicide application can take effect.

Mechanical excavation and disposal may occur at any time of the year as specified above in **2. Special Handling of Invasive Species Vegetation**.

If rain or windy conditions are anticipated on the day of the scheduled treatment, the Contractor will not be allowed to proceed, unless authorized by the Engineer or their authorized delegate.

Method of Measurement: The work to remove invasive vegetation, as defined above, will be measured for payment by the number of square yards of invasive vegetation surveyed, treated, and removed as required, including any required re-treatment of any regrowth or new growth. This work shall also include the removal of invasive trees, if present. No additional payment will be made for subsequent treatments.

All areas for removal shall be surveyed, flagged, and measured prior to treatment. After a review of the surveyed limits during the field meeting(s), the Engineer may designate additional areas for removal not indicated on the plans which will be measured for payment by the number of square yards treated.

Basis of Payment: The work for the removal of invasive vegetation and trees will be paid for at the Contract unit price per square yard for "Control and Removal of Invasive Vegetation." Payment shall include all labor, surveys, materials, tools, and equipment necessary for limits of the invasive area(s); development and required revisions of the IVRP; maintenance of the limits throughout the Project; species identification; proof of DEEP pesticide registration/certification; and cutting, excavation and replacement of in-kind material, treating, re-treating, removal, and off-Site disposal of designated invasive plant and tree material. Off-Site disposal of residue shall include the loading, transport, dumping, and fees associated with legal off-Site disposal.

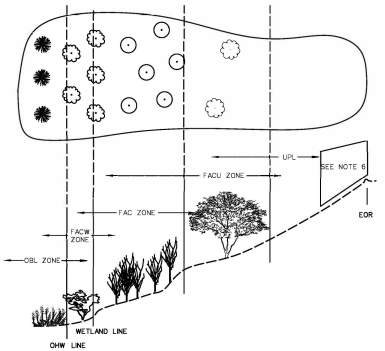
- Upon Engineer's acceptance of the required IVRP, the Contractor will receive payment equal to 10% of the estimated Contract Item value.
- Upon completed initial herbicide or mechanical removal treatment methods as described in the IVRP, the Contractor will receive payment equal to 20% of all areas receiving treatment.
- The Contractor will receive incremental payments for each additional treatment throughout the duration of the Project of all areas receiving treatment. The total of incremental payments will not exceed 40% of the Contract item value.
- Upon successful completion of the 1-year warranty period covering all treated areas on the Project, the Contractor will receive final payment.
- Any fines levied against the Department due to the Contractor's or Subcontractor's failure to comply with the specifications or applicable regulations will be deducted from the monies due the Contractor.

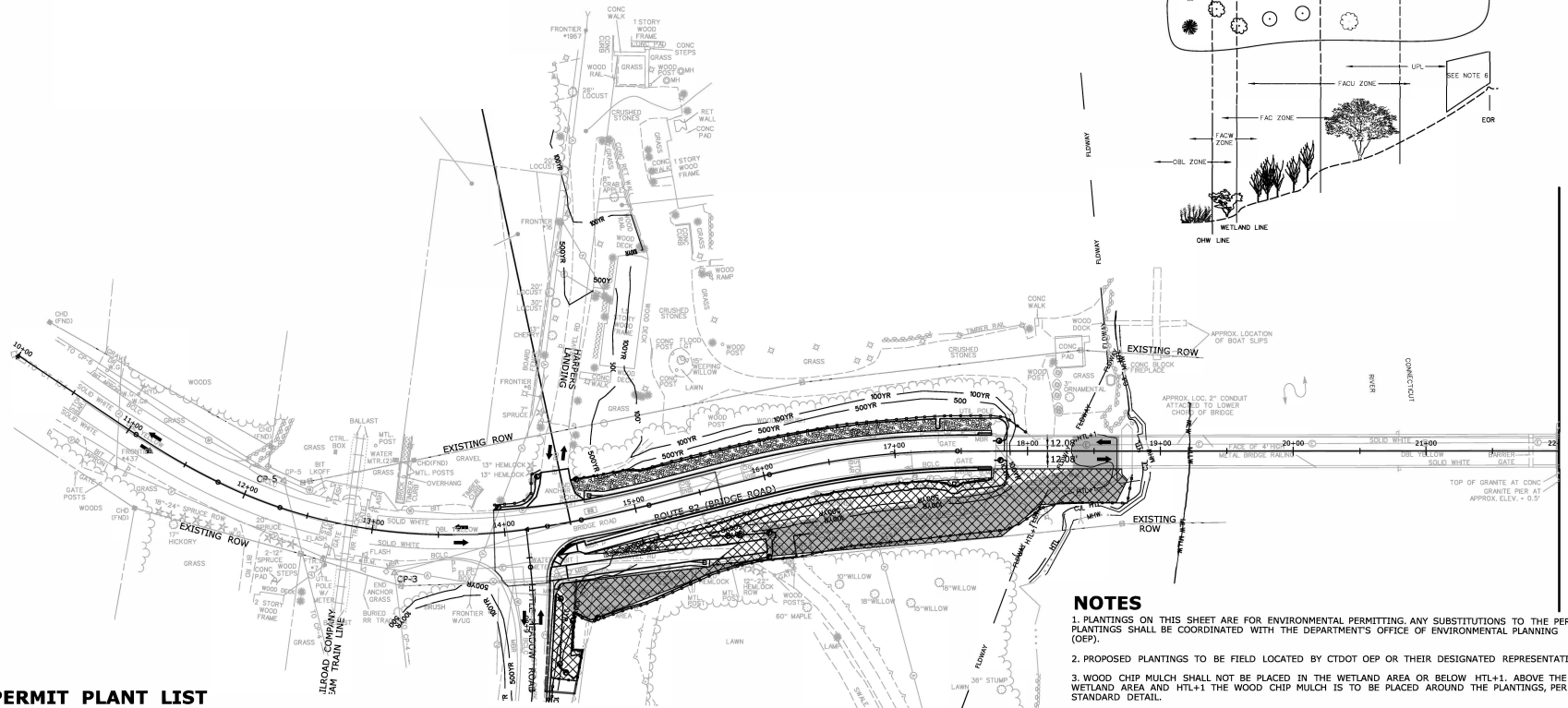
All other vegetation to be removed which is not designated as invasive vegetation or invasive tree shall be removed in accordance with the Item "Clearing and Grubbing" or other Contract items. Vegetative stabilization of disturbed areas will be paid for under the respective Contract items.

Pay Item	Pay Unit
Control and Removal of Invasive Vegetation	s.y.

APPENDIX M - SAMPLE CONSTRUCTION PLANTING PLAN

SCHEMATIC PLANTING





PERMIT PLANT LIST

BOTANICAL NAME	COMMON NAME	SIZE	QTY.	SPACING	WETLAND INDICATOR
Cornus sericea	Red osier Dogwood	3-4' Ht. B.B.	60	4' On Center	FACW
Cornus amomum	Silky Dogwood	3-4' Ht. B.B.	60	4' On Center	FACW
Clethra ainifolia	Coastal Sweet Pepperbush	2-3' Ht. B.B.	60	4' On Center	FAC
Acer rubrum	Red Maple	2"-2½" Cal. B.B.	8	Field Locate	FAC
		TOTAL	188		
Control and Removal of Invasive Vegetation					
Conservation Seeding for Slopes					
Wetland Grass Establishment					
Wood Chip Mulch					

CONTROL AND REMOVAL OF INVASIVE VEGETATION - 1,777 S.Y.

AREA TO BE RESTORED WITH PLANTINGS

TOTAL PLANTS = 188
TOTAL PLANTING AREA = 1,165 S.Y.

NOTES

1. PLANTINGS ON THIS SHEET ARE FOR ENVIRONMENTAL PERMITTING. ANY SUBSTITUTIONS TO THE PERMIT PLANTINGS SHALL BE COORDINATED WITH THE DEPARTMENT'S OFFICE OF ENVIRONMENTAL PLANNING (OEP).

2. PROPOSED PLANTINGS TO BE FIELD LOCATED BY CTDOT OEP OR THEIR DESIGNATED REPRESENTATIVE.

3. WOOD CHIP MULCH SHALL NOT BE PLACED IN THE WETLAND AREA OR BELOW HTL+1. ABOVE THE WETLAND AREA AND HTL+1 THE WOOD CHIP MULCH IS TO BE PLACED AROUND THE PLANTINGS, PER STANDARD DETAIL.

4. DISTURBED AREAS BELOW THE WETLAND LIMIT AND HTL+1 SHALL BE SEEDED WITH WETLAND GRASS ESTABLISHMENT. DISTURBED AREAS ABOVE THE WETLAND LIMIT AND HTL+1 SHALL BE SEEDED WITH CONSERVATION SEEDING FOR SLOPES, OR OTHER SEED MIX AS SPECIFIED. ALL AREAS SHALL BE RESTORED.

5. ALL PLANT MATERIAL SHALL BE NURSERY STOCK MEETING ANSI STANDARDS. ALL PLANT MATERIAL SHALL BE STRAIGHT SPECIES. NO VARIETIES OR CULTIVARS WILL BE ACCEPTED.

6. NO PLANTINGS TO BE PLACED IN MOW AREA

7. AREA TO BE TREATED FOR INVASIVES AND PROPERLY REPARED FOR FINAL PLANTING, SEEDING, AND RESTORATION.

ENVIRONMENTAL PERMIT PLANS
PLAN DATE: JULY 14, 2021

REV.	DATE	REVISION DESCRIPTION	SHEET NO.
1	10/18/2021	NEW SHEET	12.02

THE INFORMATION, INCLUDING ESTIMATED QUANTITIES OF WORK, SHOWN ON THESE SHEETS IS BASED ON LIMITED INVESTIGATIONS BY THE STATE AND IS IN NO WAY WARRANTED TO INDICATE THE CONDITIONS OF ACTUAL QUANTITIES OF WORK WHICH WILL BE REQUIRED.

Plotted Date: 7/4/2021

DESIGNER/DRAFTER: MR
CHECKED BY: MV
SCALE IN FEET
0 SCALE AS NOTED 80
SCALE 1"=40'

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: ...\40-141_LSD_Permit.dgn

SIGNATURE/ BLOCK: OFFICE OF ENGINEERING
APPROVED BY:

PROJECT TITLE:

TOWN:

DRAWING TITLE: PERMIT PLANTING PLAN

PROJECT NO.
DRAWING NO. PMT-29
SHEET NO. 12.02.A1