

Master Development Plan for the TxDOT North Tarrant Express Project Segments 2-4

Chapter 11: Conceptual Operations & Maintenance Management Plan



© Copyright 2010, NTE Mobility Partners Segments 2-4, LLC

Revision:	0	Revisions	
Effective Date:	12/06/10	Number	Date
Prepared by	NTE Mobility Partners Segments 2-4, LLC	0	12/06/10
Reviewed by	<i>[Signature]</i>		
Approved by	<i>[Signature]</i>		



Table of Contents

- 11.1 Organization..... 1
- 11.2 Performance Standards 2
- 11.3 Life-Cycle Maintenance Schedule..... 6
- 11.4 Major Maintenance Requirements 6
- 11.5 Environmental 20
 - 11.5.1 Storm Water Pollution Prevention Plan (SWPPP) Implementation 20
 - 11.5.2 Spill Prevention and Countermeasures Plan (SPCC) and Hazardous Materials Management Plan (HMMP) Implementation..... 21
 - 11.5.3 Pollution Prevention Plan (P2), Recycling Plan and Waste Management Implementation..... 21
 - 11.5.4 Environmental Protection Training Plan (EPTP) 21
- 11.6 Maintenance Reserve 21
- 11.7 Handback Standards and Procedures 22
- 11.8 Emergency Response..... 22
- 11.9 Quality Control 24
 - 11.9.1 Examinations and Audit of O&M Work..... 24
 - 11.9.2 Test Observation and Reporting 24
 - 11.9.3 Integrating the Comprehensive Environmental Protection Program into O&M Quality Management..... 25
 - 11.9.4 Ensuring Quality of Submittals to TxDOT, Governmental Entities and Third Parties..... 26
 - 11.9.5 Continuous Improvement..... 26
- 11.10 Document Management..... 27

List of Figures

- Figure 11-1: Approach to Meeting Performance Requirements 3

11. Conceptual O&M Management Plan

The intention of this document is to describe the conceptual approach to accomplishing the requirements related to Operations and Maintenance (O&M) of the Facilities making up NTE Segments 2-4.

The operation and the maintenance of a toll road are two different but complementary activities with the same goal: to ensure a safe and satisfactory driving experience for customers. This holistic approach is best served through a common organizational structure that allows Operations and Maintenance personnel to work cooperatively.

The O&M approach described in this document is directed toward accomplishing the following goals:

- a smooth transition in maintenance responsibilities from TxDOT while minimizing any potential disruptions to users;
- continuous and safe operation of the Facility;
- continuous full compliance with the Concessionaire's obligations under a Facility Agreement; and
- maximized serviceability of the Facility during the construction stage.

The Concessionaire will retain responsibility for the O&M of each Facility and may subcontract some tasks required by the Facility Agreement to qualified subproviders in order to accomplish the goals set out above.

The Concessionaire shall inspect and monitor the different elements of the Facility to ensure that the assets' conditions meet the Performance Requirements established in the Facility Agreement. If action is deemed necessary as a result of the inspections, the Concessionaire shall mobilize the required resources, in-house or outsourced, to maintain the Facility in accordance with the requirements of the Facility Agreement.

Following execution of a Facility Agreement for a Facility, the Concessionaire shall develop detailed Facility-specific procedures for O&M activities as part of a Facility Management Plan. The goal of these procedures shall be to ensure a high standard of maintenance and service and to preserve and improve the condition of the Facility from the beginning of the Operating Period through Handback to TxDOT.

11.1 Organization

The Concessionaire shall establish an O&M sub-organization to operate and maintain the Facility. This sub-organization will be responsible for maintaining continuous 24/7 year-round operations, consistent with standard toll road management practices and the requirements of the Facility Agreement.

The O&M sub-organization will:

- manage the overall operation of the Facility;
- respond to Incidents, Emergencies and inclement weather on the Facility;
- identify maintenance needs and carry out routine and preventive maintenance and renewal work;
- ensure that O&M activities are carried out in conformance with the environmental plans and applicable laws; and
- manage traffic on the Facility to maximize mobility and operational performance.

The O&M sub-organization will be comprised of a dedicated in-house staff and specialized external resources. This strategy will ensure a stable and long-term process to operate the Facility at peak efficiency.

External resources will be subject to a rigorous evaluation system prior to being appointed to ensure that the most suitable and competent resources are used.

The Concessionaire shall carry out all work and services (1) in compliance with all pertinent laws and regulations, (2) on time (3) in accordance with the required quality standards, (4) in a fashion that is compatible with TxDOT practices (as set out in the Facility Agreement), and (5) in accordance with the specific needs of the Facility. The Concessionaire shall work in partnership with suppliers and subcontractors to accomplish common goals, benefitting from their efforts and creativity to provide the best possible quality service. Long-term relationships with suppliers and subcontractors are desirable when possible.

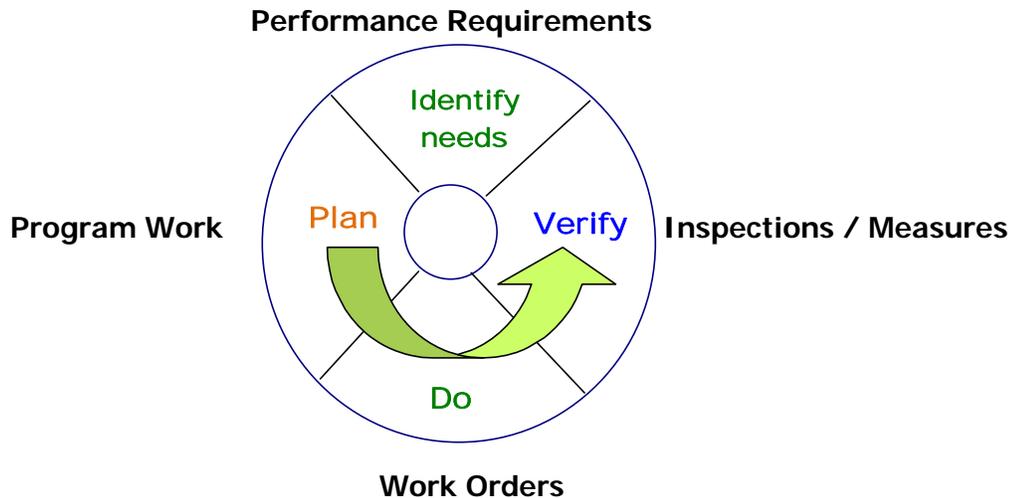
11.2 Performance Standards

The detailed procedures to be developed as part of the Facility Management Plan will be written to ensure that the Performance Requirements defined in the Facility Agreement are met or exceeded.

Each Element listed in the Performance Requirements will have an associated maintenance work activity that will be initially programmed in a work program according to experience and life expectancies. Work orders will then be assigned to the appropriate work crews at the specific time and work activities performed according to Good Industry Practice. Subsequent inspections will be performed to measure and ensure the effectiveness of the work performed. Program adjustments will be made accordingly.

As shown in Figure 11-1, the approach to meeting Performance Requirements is based on a cyclical process of identifying needs, planning ahead to meet the requirements, implementing activities and verifying performance through inspections and audits.

Figure 11-1: Approach to Meeting Performance Requirements



A. Inspections

Various inspections will audit the effectiveness of routine and cyclical maintenance strategies and intervention timeframes. The references and standards to be used in carrying out inspections include, but may not be limited to, the following:

- TxDOT Maintenance Standards
- TxDOT Manuals:
 - *Maintenance Management Manual*
 - *Pavement Management Information System Rater's Manual*
 - *Bridge Inspection Manual*
 - *Structure Maintenance Manual*
 - *Herbicide Manual*
 - *Roadside Vegetation Manual*
- *FHWA Bridge Inspector's Reference Manual*
- *AASHTO Manual for Bridge Evaluation*
- *AASHTO Manual for Condition Evaluation of Bridges*

Inspectors will identify sites where increased levels of maintenance are required and the Maintenance Manager will adjust the maintenance program accordingly.

A.1 General Inspections

General inspections are regular visual inspections conducted with the goal of identifying any Category 1 Defects (major, safety-threatening defects, as defined in the Performance Requirements). Trained personnel operating from a slow-moving vehicle will carry out these inspections. In certain circumstances, such as at pedestrian bridges or complex interchanges, inspection personnel may proceed on foot, either to confirm suspected defects or to examine the Facility more thoroughly. It may be appropriate to undertake general inspections during off-peak hours or at night to minimize traffic disruption and maximize the safety of both the inspectors and the public. The Concessionaire anticipates carrying out most general inspections without the need for lane closures or other traffic management provisions.

A.2 Detailed Inspections

The purpose of detailed inspections is generally to identify defects in all Facility Elements except structures. For structures, general and specialist inspections are used. Arrangements for detailed inspections will seek to minimize disruption to traffic while providing adequate access for proper inspections and maintaining a safe working environment for inspectors.

A.3 Specialist Inspections

A specialized testing subconsultant will undertake general surveys and the results will drive ongoing development of the maintenance renewal program. These tests may include:

- National Bridge Inspection System (NBIS): NBIS bridge inspections as well as load rating calculations.
- Electrical: including lighting, signs, traffic signals, and communication systems.
- Pavement: pavement inspections will be performed only in the sections of new road when all construction activities have been completed. Specialist inspections will be used for continued pavement analysis and reporting to TxDOT.

A.4 Audit Inspections

Audit inspections will consist of detailed inspections of randomly Auditable Sections on a quarterly basis with the Independent Engineer.

B. Non-Performance

Non-performance applies to all non-conformities such as defects, damage, errors or omissions that result in not meeting the Performance Requirements set out in the Facility Agreement. Minor non-conformities that can be readily remedied at the time of discovery shall not be recorded as Non-Conformity Reports.

B.1 Non-Conformity Reports (NCR)

The Concessionaire will issue an NCR to report items or parts of the work that do not meet the maintenance Performance Requirements. The NCR notifies all relevant maintenance personnel of the time, date, location and nature of the non-conformity. The person responsible for resolving the NCR will agree to the proposed solution and make the adjustments necessary to the satisfactory resolve the NCR.

C. Corrective and Preventive Action

C.1 Corrective Action

Corrective action is taken to:

- review and investigate the cause of non-conforming products or work by analysis of all relevant processes, work operations, quality records, audit observations, complaints and initiate corrective action to prevent recurrence;
- initiate preventive actions to deal with potential future non-conformities and other problems including complaints from the travelling public, to a level corresponding to the risks encountered;
- apply controls to ensure that corrective actions are taken and are effective; and
- implement, record and review changes resulting from corrective and preventive actions in the procedures, and for general improvement of the O&M Management Plan.

To record and track comments and concerns from the public, the Developer shall implement an Audience & Stakeholder. Comments from all sources, including public meetings, calls, e-mails, letters, etc. shall be recorded in the database. The database will provide an auditable trail of contacts made, minutes of meetings and details of concerns and issues as well as a register of inquiries and complaints. The database will contain an Electronic Comment Management System, which will record actions taken and correspondence with the public.

C.2 Preventive Action

While systems exist to rectify non-conforming materials and workmanship, proactive steps may be taken to reduce the occurrence of non-conformities. Suggested future preventive action may be included as part of a non-conformity investigation.

Preventive action, such as competency requirements, additional training and audits, all contribute to the reduction in errors, omissions and non-conformities.

11.3 Life-Cycle Maintenance Schedule

Maintenance of the Facilities shall begin following construction completion and service commencement. To achieve the Performance Requirements set out in the Facility Agreement, the Concessionaire shall carry out an annual overall inspection and assessment of the Facility's condition. Rehabilitation and replacement schedules will be established to sustain and improve the condition of the Facility and meet the Handback requirements.

An example of life-cycle maintenance schedules for structures, pavements, and systems elements is summarized as follows:

- Structures: the major structures such as bridge slab and bridge joint seal would be repaired / replaced every 20 years, while other minor structures such as retaining walls and culvert repairs would be conducted every 15 years in general.
- Pavements: flexible pavement is assumed to be used for the entire limit of the facility. Resurfacing of the pavement would be conducted based on the schedule below for different lanes throughout the concession period.
 - General Purpose Lanes – every eight years
 - Managed Lanes – every 13 years
 - Frontage Roads and Cross Streets – every 11 years
- Systems: the renovation of the tolling system will be conducted every 10 years.

11.4 Major Maintenance Requirements

The Concessionaire's maintenance crews will perform minor repairs, guardrail or pothole patching utilizing materials previously approved. Specialized subcontractors will perform major maintenance activities such as repaving or structural repairs in accordance with a pre-approved quality control and acceptance plans.

The maintenance approach shall follow the following general principles:

- pavement preservation rather than reactive maintenance.
- general inspections performed by maintenance staff during routine patrols as well as during assigned work trips.
- identifying any defects not addressed by routine maintenance.
- evaluating and assessing maintenance priorities.
- monitoring works completed by subcontractors to ensure conformance with the Facility Agreement.
- monitoring effectiveness with respect to performance measures.

- maintaining the Maintenance Management Inventory System.

Although specific maintenance requirements have not yet been defined for NTE Segments 2-4, the sections below summarize the general maintenance activities that shall be conducted, assuming similar requirements to those provided in the CDA Documents for NTE Segments 1 and 2W.

A. Pavement

Pavement conditions that require consistent monitoring and repair to meet the performance requirements include:

All Traffic Lanes

- differences in level between items such as covers, gratings, frames and boxes and the abutting roadway pavement, or differential levels between different components;
- parallel drainage channels and other gratings in the roadway, with gaps parallel to the normal line of movement of motorcycles and bicycles; and
- overgrown vegetation that is causing a hazard by encroaching on sight lines.

Flexible Surfacing

- localized cracking or breakage (including edge deterioration) confined to a discrete area of the roadway, or around a repaired trench or patch and not associated with structural maintenance activities;
- cracking or breakage around ironwork;
- difference in level between a repaired trench or patch and the surrounding roadway;
- potholes;
- depressions;
- fretting, or loss of material from the pavement surface, or around a repaired trench or patch; and
- open or excessive surfacing joints.

Concrete Surfacing:

- spalling at joints and cracks, opening of longitudinal joints, failure of sealed cracks or vertical movement resulting in stepping at a joint or crack;
- dynamic movement under traffic at joints and cracks caused by lack of support from the sub-base or lack of, or ineffective, load transfer dowels or tie bars at joints;

- dynamic movement associated with mud pumping, the usual signs of which are muddy stains on the surface of the slab;
- vertical movement of slabs, observed in the form of slab settlement;
- crazing or scaling of surface and a loss of texture; and
- failed repairs, such as failure of overbanding or sealed cracks.

Potholes and other localized pavement defects on traveled lanes will receive particular attention since they often constitute an immediate or imminent hazard. Maintenance crews will promptly repair such localized roadway defects to protect road users and minimize traffic delays.

Routine and structural maintenance activities that are similar in nature will overlap to some extent. Before carrying out surface dressing or resurfacing, it is typical to ensure that the underlying road structure is sound. This often requires repair of defects such as potholes, rutting and open joints that would otherwise occur as routine activities.

Repair of defects reported from inspections may be absorbed into Renewal Work already due to occur in the planned maintenance program. Renewal Work refers to maintenance, repair, reconstruction, rehabilitation, restoration, renewal or replacement of any Element of a type that is not normally included as an annually recurring cost in highway maintenance and repair budgets.. Renewal Work will generally be contained within the planned maintenance program, determined based on overall Facility priorities. If the Concessionaire defers any planned maintenance activities, separate routine maintenance may be necessary on relatively short notice.

B. Drainage

Adequate drainage facilities must be present and operate correctly to:

- avoid accumulation of water on the traveled surfaces of the highway, which greatly reduces the safety of the road user;
- adequately drain the road pavement structure to reduce maintenance liabilities and help realize the design life of the road;
- avoid traffic flow disruptions due to flooding;
- prevent nuisance to adjoining landowners due to flooding; and
- avoid discharges of polluted storm water from highway drainage facilities into surrounding watersheds.

Conditions that require consistent monitoring and repair to meet the performance requirements include:

- full or partial blockages;
- standing water;

- debris, weed growth and roots that are likely to reduce flow, damage the structure and may appear unsightly;
- cracking or deformation of components of the drainage system adversely affecting the structural or hydraulic performance or durability of its components;
- complete structural failure of components of the drainage system;
- scour that adversely affects the hydraulic or structural performance or durability of components of the system;
- removal of material in sides, banks or walls by erosion;
- complete or partial blocking of filter material;
- displacement of surface filter material;
- inadequate water flow preventing self-cleaning;
- failure or incorrect operation of equipment associated with outfall regulating devices, which allow water to flow through more evenly;
- damage to grassed surface water channels, such as by vehicles;
- looseness, rocking, ridges, sharp edges, cracks and gaps; and
- flooding of the highway, adjoining property or services caused by inadequate provision or operation of highway drainage facilities, or other facilities.

C. Structures

Many of the maintenance activities for structures are minor in themselves, but failure to carry them out may lead to deterioration of the structure and the need for more serious and costly repair operations in the future. Generally, it is cost-effective, in whole-life cost terms, to undertake timely cyclical maintenance and repair activities. These form an important component in the development of a coherent ongoing bridge management strategy.

Crews will perform cyclical maintenance activities relating to servicing structures rather than repairing them at regular predetermined intervals. Routine activities do not cover the repair or renewal of structural elements or components, which have become unserviceable due to general wear and tear, or have deteriorated for other reasons. The Concessionaire shall identify such work during the regular inspection process and include it in a planned structural maintenance program.

Cyclical Maintenance

Routine Service Schedules for the cyclical maintenance required to meet the Facility Agreement requirements, including:

- graffiti removal;

Chapter 11: Conceptual O&M Management Plan

- removal of undesirable vegetation, such as vegetation blocking drainage inlets, impairing visibility, causing structural damage or restricting access;
- removal of debris, bird droppings and other detritus that blocks drainage and promotes corrosion or other deterioration;
- clearance and operational checks of drainage inlets, culverts, channels and systems;
- application of gap sealant to movement joints;
- operational checks of flap valves and grease;
- inspection, tightening and replacement, if necessary, of any loose nuts and bolts to expansion joints, guardrail supports and gantry assemblies;
- replacement of expansion joint gaskets;
- removal of general dirt and debris from bearings, cleaning sliding and roller surfaces if accessible and re-grease;
- operational checks of ancillary equipment, such as drainage pumps and associated sumps and pipe work, and maintenance of lifting device certification (lifting device certification will be maintained through regular inspection of the lifting equipment for legislative or health and safety reasons);
- bridge painting;
- cleaning expansion joints;
- maintenance of neoprene bearings
- inspection and rectification, where necessary, of seating of drainage gratings or covers, replacing any missing or defective items;
- inspection, cleaning and replacement of pedestrian security measures such as mirrors, handrails and non-slip surfaces;
- scour damage inspections around drainage channels;
- repair of superficial defects in surface protection systems; and
- inspections of special finishes to ensure that they are clean and will perform to the appropriate standards.

D. Pavement Markings and Delineators

Road Markings

Conditions that may affect the performance of pavement markings (paint or thermoplastic) and require inspection include:

- erosion;
- spread (deformation);

- discoloration and reduction in the luminance factor;
- reduction in the skid resistance of pavement markings;
- reduction of retro-reflective properties; and
- reduction in audible or tactile characteristics when these are required.

Delineators (Object Markers) and Raised Reflective Markers

Conditions that may affect the performance of delineators and require inspection include:

- wear, corrosion or damage;
- loose and missing delineators and/or inserts;
- loss of or damage to retro-reflective lenses;
- sinkage or settlement;
- accumulation of detritus, especially on lenses;
- integrity and security of embedded delineator (housings);
- loss of adhesion or breakup of surface-mounted delineators;
- loss of adhesion or breakup of raised reflective markers attached with epoxy or bituminous materials.
- misalignment with existing pavement markings;
- failure to meet requirements for color and type;
- failure to meet requirements for luminous intensity; and
- failure to meet requirements for reflective conspicuity.

E. Guardrails, Safety Barriers and Impact Attenuators

Conditions that may affect the performance of vehicle restraint systems and pedestrian restraint systems include:

- rotten wooden elements affecting the function of the restraint system (wooden-post safety barriers must be replaced);
- corroded metal that affects function or promotes deterioration;
- concrete cracking, spalling or reinforcement corrosion that affects the function or promotes deterioration;
- missing elements;
- broken, deformed or cracked components that affect function or promote deterioration;

- loose nuts, bolts and other components may represent a hazard or promote deterioration;
- lack of tension on tensioned systems;
- incorrect height; and
- excessive undergrowth, weeds or buildup of detritus in verge or median.

The Concessionaire shall check for adequate and appropriate fixings and connections, such as correct bolt types. The Concessionaire shall also check the advance length of any safety barrier system provided in front of or around an obstruction because of the possibility that someone might have moved either the barrier system or obstruction for some reason, such as for repair. In the process of tensioning, crews will inspect anchorages in case they have moved.

The Concessionaire shall repair safety barrier systems for relatively minor vehicle impacts, and comprise repairs to flattened posts and superficially damaged barriers.

The Concessionaire shall consider each occurrence on its merits but, generally, damage resulting in the barrier lying on the ground or being no longer continuous will be repaired immediately following the incident that has caused the damage, before the road is fully reopened to traffic. In this case, the permanent repair shall take place immediately and the Concessionaire shall control traffic surrounding the repairs according to its Traffic Management Plan and the Texas Manual on Uniform Traffic Control Devices (MUTCD). In some cases, it will be necessary to make temporary repairs to the safety barrier in order to open lanes to traffic. In these cases, the Concessionaire shall follow the traffic control standards established in the its Traffic Management Plan and the MUTCD for temporary safety barriers and related signing as well as any necessary lane closures during installation of temporary barriers.

F/G. Traffic Signage and Signals

Elements of signals to be inspected generally include overall condition/damage, timing, contingency plan records, structural and electrical soundness, pedestrian elements, vehicle detectors and identification marking. The exact elements to be inspected and the frequency of inspections shall be refined during the development of Facility Agreements.

Conditions that may affect the performance of traffic signs and signals include:

- reduced visibility due to dirt, graffiti, foliage or other signs and structures;
- incorrect orientation, damaged or missing;
- loss of surface/paint/legend from peeling, damage or vandalism;
- reduction in retro-reflectivity of white sign face materials;
- degradation of colored sign face materials;

- lamp failure, mistimed lamp timer, photoelectric circuit or time switch failure, electricity supply failure, missing fuses, lamp dirty or output low;
- malfunction in moving parts of variable message signs;
- incorrect placement of pedestrian signals or AVI elements;
- lack of, or insufficiency of signal contingency plans;
- wiring deterioration, discontinuity of protective conductors, earth electrode failure, earth loop impedance failure, inadequate insulation resistance, missing drawings, condition of sealant, polarity failure, residual current device failure;
- wiring in hazardous condition;
- access for maintenance blocked or equipment security breached;
- corrosion/deterioration or damage to plate, fittings, frame or post; and
- corrosion/destabilization of cantilever structure.

H. Illumination

In general, lamp replacement provides safety, service and value for money. However, the Concessionaire shall consider other aspects of illumination maintenance to ensure minimization of overall whole-life maintenance costs.

- components will be standardized whenever possible to ensure maximum compatibility;
- replacement and repair materials and equipment will have the same physical, photometric and aesthetic characteristics as existing materials, except where the existing part is obsolete;
- lights will be maintained in a way that enables a continuing rapid and cost-effective maintenance response including replacement of power factor correction capacitors; and
- the Concessionaire shall use lamps containing materials that can be recycled, with the goal of achieving 70 percent recycling – including mercury-free lamps where practicable.

Conditions that require continuous monitoring to achieve the performance requirements for illumination in the Facility Agreement include:

- lamp failure, photoelectric circuit or time switch failure, electricity supply failure or lamp damage;
- low lamp output due to dirt, age or voltage drop;
- lamp illuminated during the day due to photoelectric circuit or time switch failure;
- lamp blockage by foliage or other signs and structures;
- incorrect lamp orientation due to damaged or misaligned mountings;

- wiring deterioration, discontinuity of protective conductors, earth electrode failure, earth loop impedance failure, inadequate insulation resistance, condition of sealant, polarity failure, protective current device failure, thermostat or heater failure;
- wiring in hazardous condition;
- access for maintenance blocked or equipment security breached;
- deterioration or damage to column, brackets or other supports – corrosion, damage or missing parts that affect function or promote deterioration.

Considering the whole-life cost of maintenance operation leads to reduced overall costs and is the most significant aspect of improving maintenance efficiency and effectiveness, and therefore best value for money. However, manufacturer development and improved specification of materials and equipment can also enhance maintenance efficiency and effectiveness.

As improvements in manufacturing processes continue, these will contribute to a longer life of the illumination equipment, and will extend the periods between bulk changes and cyclical maintenance. The Concessionaire shall consider using different wattage lamps, including lamps with an alternative light source, particularly where reductions in energy consumption and overall maintenance costs due to an increase in lamp life will lead to significant cost savings.

The Concessionaire shall supplement all equipment specifications to allow use of apparatus with an agreed minimum projected “whole life” and which offers sustainable long-term Ingress and Protection ratings, (I.P. ratings) and recycling opportunities. Manufacturers will be encouraged to extend their warranties beyond the normal 12 months to the projected “whole life” of their products.

1. Fences, Walls, Screens and Environmental Barriers

Conditions that require continuous monitoring to achieve performance requirements for fences, walls, screens and environmental barriers are:

- rotten wooden elements;
- corroded metal;
- concrete cracking, spalling or reinforcement corrosion;
- brickwork cracking, spalling or loss of mortar;
- missing, broken, deformed or cracked components;
- loose nuts, bolts and other components;
- lack of tension in a strained wire fence;
- fence or barrier below height requirements (caused by settling or otherwise);

- loss of paint, galvanizing or other protective system; and
- effects of spray and pollutants degrading color or transparency.

The appearance of fences, walls, screens and environmental barriers is important and any repairs or replacement sections will maintain the uniformity of their appearance, unless the existing components are obsolete.

In the interest of safety, the Concessionaire shall use discretion in carrying out minor/temporary repairs on any part of the fence added by the landowner/occupier, where such parts are defective because of inspection or reports from law enforcement or the public. The Concessionaire shall report serious defects to the landowner/occupier with a request for rectification. If the repairs need to take place immediately, in the interests of safety, the Concessionaire shall carry out the minimum temporary work necessary outside of the fence to ensure roadway safety and coordinate with the landowner/occupier immediately to carry out the permanent repair.

Encroachments on the Facility Right of Way by third parties shall be subject to prior TxDOT approval. Any encroachments not approved in advance shall be noted in inspections and the Concessionaire shall notify the owner of the encroaching property owner that the encroachment must be removed.

Fences designed for other special purposes, such as security of goods or protection of traffic from sporting activities, and installed by the owners on land adjoining a motorway, remain the responsibility of the landowner/occupier, and any serious defects will be drawn to the owner/occupier's attention.

J. Roadside Management

Conditions that require continuous monitoring to achieve the Facility Agreement performance requirements for roadside management include:

- vegetation restricting visibility along sight lines at interchanges and access points, and below minimum stopping distances at curves;
- vegetation obstructing the view of signs, lights, signals and marker posts;
- fire hazards;
- unsafe trees within falling distance of the traveled lanes;
- undesired vegetation in paved areas;
- noxious weeds;
- failure to protect named species and habitats, including failure of special ecological measures, such as deer fencing, badger tunnels and bat boxes;
- failure to manage planting plans and shrubbery;
- failure to manage wetlands;

- litter pickup and mowing.

K. Geotechnical

Earthwork, Embankments and Cuttings

Geotechnical defect features often become apparent through routine activities, such as identification of Category 1 defects, recording of the condition of other assets or following other reports or complaints. The requirements for inspections, maintenance and remedial work in connection with geotechnical assets include:

- annual and principal inspections;
- risk assessment of geotechnical features;
- certification procedures for remedial work and prevention measures; and
- advice on the maintenance of assets, including references to sources of information.

Principal inspections will initially take place every five years, and at a rate of at least 20 percent of the network per year to phase any necessary remedial work. Thereafter, the Concessionaire may reduce or increase the frequency of re-inspection to reflect the risk to the network.

Recording and retaining schedules of items such as ground anchoring systems and geotextiles may be useful, as these can be important during an emergency response situation when it is necessary to create temporary routes for emergency service personnel and vehicles, or road users themselves.

Certain hazards may affect the achievement of the performance requirements for the geotechnical assets. Such hazards include:

- slope instability;
- weak and compressible strata;
- adverse groundwater conditions;
- scour and erosion;
- instability and settling associated with dissolution features, mining and landfill;
- corrosion of construction materials due to adverse ground and groundwater chemistry conditions;
- highway drainage acting as a conduit for migration of leachate from landfill sites;
- degradation or failure of supporting materials or structures;
- destabilizing effects of animal burrows, vegetation or the removal of vegetation;
- and

- changes in loading or other changes from the original design assumptions.

Failure of Geotechnical Assets

Since crews often identify geotechnical defects during routine activities, general advice on the recognition of these defects by non-specialists is included in this section. Identification of potential problems related to excavation and embankments is, in many cases, not possible during driven inspections because of vegetation and the lack of visibility of embankments from the roadway.

One can often recognize slopes at an early stage of instability by bulging of the slope profile (at the bottom of the potential slip), development of tension cracks (at the top of the potential slip) or by evidence of water seepage from developing slip planes. The presence of lush, greener or marsh-type vegetation will often serve to identify seepage areas where water is not visible on the surface. In excavated rocky areas, an early stage of instability might also be evident due to relative movement of blocks of rock, fallen material and fresh surfaces.

Embankment slope failures often become evident later than failures in excavation, since the slope is below the level of the roadway and hence less visible. Therefore, these will also receive particular attention where possible. Drainage defects may result in excess surface runoff, scour and raised groundwater levels that may cause instability. In addition, distress to components such as pavements, structures, non-vertical signs, signals and lighting columns may indicate instability, and those inspecting these items will report such defects.

L. Information Technology Systems

During the D-B Phase, the Field Systems Manager will supervise the IT field maintenance technicians, who will repair and maintain the existing ITS equipment on the Facility as this equipment becomes the responsibility of the Concessionaire. These technicians will be either in-house or outsourced personnel. They will provide service during regular business hours and will be on call for Emergency events.

ITS equipment to be maintained generally includes the following, though exact details of the ITS equipment to be utilized shall be determined during final design:

- toll zone controllers;
- AVI system antennas and readers;
- Advanced Dynamic Toll Rate Signs;
- speed detectors;
- CCTVs for Access Control / Alarm Monitoring System;
- license plate cameras and related equipment for Vehicle Exception processing;
- equipment cabinets and shelters;

- equipment support structures;
- Electronic Toll Collection System control facility hardware (servers, PCs, backup system, printers, etc.);
- cables, connectors, switches and other electronic components;
- network communications infrastructure; and
- software.

M. Buildings (Administration and Maintenance Areas)

During the D-B Phase, the Concessionaire shall operate from rental facilities for both office and field personnel. The building owners will maintain these facilities in accordance with their respective lease agreements. Therefore, the Concessionaire does not foresee performing any maintenance activities related to buildings during the construction period.

N. Amenities

The Concessionaire shall remove obscene or offensive graffiti as soon as practicable after it appears. Other graffiti will also be removed as soon as practical while considering other factors such as traffic management strategies. Where graffiti is persistent and widespread in environmentally sensitive areas, the Concessionaire shall consider alternative options besides frequent removal or obliteration.

Physical measures include the use of anti-graffiti coatings, special cleaning materials, grit blasting and providing alternative surfaces such as tiling and murals. The Concessionaire shall take care to ensure the compatibility of applied materials and cleaning techniques with the structural substrate, and to avoid surface deterioration. The remedial action will not encourage further graffiti – for example, vandals often see overpainting with light-colored coatings as providing a new “blank canvas”.

O. Snow and Ice Control

Various roadway snow and ice control strategies can be implemented in winter maintenance operations given a particular weather condition. These can be classified into four general categories:

- Anti-icing;
- Deicing;
- Mechanical removal of snow and ice together with friction enhancement; and
- Mechanical removal alone.

Roadway anti-icing consists of preventing the formation or development of bonded snow and ice to a pavement surface through timely applications of a chemical freezing-

point depressant. The tactics employed during anti-icing operations consist of chemical applications that are coordinated with plowing.

Deicing consists of destroying the bond between snow and ice and the pavement surface by chemical or mechanical means or a combination of the two.

Mechanical removal of snow and ice together with friction enhancement is a strategy in which abrasives or a mixture of abrasives and a chemical are applied to a layer of compacted snow or ice already bonded to the pavement surface that may or may not have been partially removed by mechanical means (plowing and scraping). This strategy is used to provide an increase in the coefficient of friction for vehicular traffic, although this increase may be short lived. Abrasives, by themselves, are not ice control chemicals and will not support the fundamental objective of either anti-icing or deicing.

Mechanical removal alone is a strategy that involves the physical process of attempting to remove an accumulation of snow or ice by means such as plowing, sweeping and blowing without the use of snow and ice control chemicals. This strategy is strictly a physical process that has some merit during or after frozen precipitation occurs at very low pavement temperatures, below approximately 15°F, and on very low-volume and unpaved roads, which is not the case for the NTE Project.

R. Sweeping and Cleaning

To achieve the required standards of cleanliness, the response to the accumulation of litter will be proactive rather than reactive. The Concessionaire shall carry out a combination of regularly scheduled roadside cleanup operations, as need dictates, to establish the overall cleanliness standard, plus "black spot" cleanups in locations where factors such as debris from vehicles or windblown litter cause frequent heavy litter. If the Concessionaire identifies a particular source of windblown litter, the Concessionaire shall request that the owners control their site more effectively and will document such requests.

Conditions that require continuous monitoring to ensure a clean and litter-free Facility and border width are:

- detritus, litter, refuse, carcasses, debris and other objects;
- growth of grass or other vegetation between the channel and curb, which is likely to obstruct the flow of water or cause structural deterioration; and
- weeds and vegetation growth that is likely to obstruct the flow of water in channels or cause structural deterioration.

Maintenance supervisors and crews will also refer to the requirements for items contained in other sections of this document, such as Drainage.

11.5 Environmental

During Operations, the Concessionaire shall execute its duties in a manner aligned with protecting the environment, including the fulfillment of current legal and Facility-specific environmental requirements. The Concessionaire shall achieve this objective by:

- implementing an Environmental Management System and Comprehensive Environmental Protection Plan and component plans;
- complying with all applicable local, state, and federal environmental regulations;
- achieving environmental commitments set forth in TxDOT-provided approvals and environmental approvals;
- educating and training personnel according to an Environmental Protection Training Plan;
- conveying a commitment to environmental quality to all employees;
- conveying a commitment to zero tolerance for violations;
- ensuring that environmental requirements are reflected in O&M procedures.

During operations, the Maintenance Manager will direct Field Patrols and will be ultimately responsible for cleanup and disposal of materials, in consultation with the Quality/Environmental Manager. The Maintenance Manager will report any apparently abandoned vehicles or other property found within the Facility limits to the appropriate law enforcement officers. Under the supervision of maintenance personnel, a contracted towing service will remove the abandoned property. In case of large spills, the Quality/Environmental Manager (Concessionaire employee) will contract with a certified environmental services firm to clean up and dispose of any spilled materials. In case of minor spills, Concessionaire personnel will clean up the spill and the Quality/Environmental Manager will contract with a certified environmental services firm to dispose the spilled materials.

The Concessionaire's EMS will reflect the principles of the International Organization for Standardization (ISO) 14001:2004. The EMS provides a structured, documented approach to managing an organization's environmental performance and responsibilities.

All O&M non-administrative staff will receive environmental protection training before they start to work; so that anytime they perform an O&M activity, they will apply the best environmental practices to reduce and/or prevent impacts on the environment.

11.5.1 Storm Water Pollution Prevention Plan (SWPPP) Implementation

During O&M work, the Concessionaire shall adhere to the SWPPP established in the Facility Management Plan. Facility-specific amendments will be developed for any

significant renewal work not covered by the existing SWPPP. The SWPPP will cover all phases of Facility development and staging; including off-site plans, controls and reporting from borrow sites, waste sites, and plant location sites.

11.5.2 Spill Prevention and Countermeasures Plan (SPCC) and Hazardous Materials Management Plan (HMMP) Implementation

The Concessionaire shall adhere to its established SPCC and HMMP during O&M work. Facility-specific amendments will be developed for any significant renewal work not covered by the existing plans. The SPCC contains operating procedures to prevent spills, control measures to prevent spills from reaching navigable waters and countermeasures to contain, clean up, and mitigate the effects of any spills. The HMMP contains provisions for safe handling, storage, treatment and/or disposal of Hazardous Materials, whether encountered at or brought onto the Facility by the Concessionaire, encountered or brought onto the Facility by a third party, or otherwise.

11.5.3 Pollution Prevention Plan (P2), Recycling Plan and Waste Management Implementation

The Concessionaire shall adhere to the P2 Plan and Recycling Plan established in the Facility Management Plan during O&M work. Facility-specific amendments shall be developed for any significant renewal work not covered by the existing plans. The P2 Plan will record the Facility's toxic substances use, emissions and waste from current work practices, and shall contain provisions for reducing the use of toxic substances at the source, minimizing generation of hazardous waste and preventing the release of pollutants to the environment. The Recycling Plan details the Concessionaire's commitment to recycling, waste minimization and, where possible, use of "green" products.

11.5.4 Environmental Protection Training Plan (EPTP)

The Concessionaire shall adhere to its established EPTP during O&M work. Facility-specific amendments shall be developed for any significant renewal work not covered by the existing plans. The EPTP establishes training processes for providing personnel with working knowledge of issues that may potentially affect the environment, regulations related to environmental quality, and actions available to respond to and report possible incidents of non-compliance.

11.6 Maintenance Reserve

The concessionaire shall establish the Major Maintenance Reserve Account (MMRA) at the end of construction. This account will be used solely for the purpose of funding capital expenditures during operations. The level of MMRA cash balance is maintained through looking forward at future capital expenditures for the next five years following

the current year. The cash balance is then calculated based on a gradual step-down percentage of future capital expenditures. For example, the MMRA cash balance requirement for year 2020 will be calculated as 100% of capex of year 2021, 80% capex of year 2021 and so forth.

11.7 Handback Standards and Procedures

At the end of the Operating Period, the Concessionaire shall transfer the Facility to TxDOT. At this time, the Residual Life requirements set out in the Facility Agreement for each Element of the Facility must be fulfilled. This will be accomplished either by the Concessionaire performing the work necessary to ensure that each Element meets or exceeds the applicable Residual Life requirements, or by the Concessionaire paying a pro rata share of the cost required for TxDOT to perform such work in the future. It is anticipated that a combination of these two methods will be utilized depending on the type of Element, extent of work required and practicality of renewing the Element within the time remaining prior to the Termination Date.

The Concessionaire and TxDOT will engage an independent testing organization to conduct a series of inspections to determine the Residual Life of each Element and determine the extent of Renewal Work required. The results will be submitted to TxDOT and incorporated into a Handback Plan, which will set out the Concessionaire's detailed approach to meeting Handback requirements including intermediate and final inspections, Renewal Work to be performed, allocation of reserved funds for meeting Residual Life Requirements and an approach to transitioning the Facility to TxDOT control.

11.8 Emergency Response

The main objectives of the Concessionaire's emergency response are:

- safety of the roadway user;
- minimal impact of incidents on the traveling public;
- efficient transfer of information to TxDOT management for further transmittal to road users and officials; and
- restoration of the network to normal conditions as quickly as possible.

The Concessionaire shall manage emergency planning. The Director of Corporate Relations will act as the official spokesperson of the Concessionaire and will carry out all public announcements.

Prior to Operation Commencement Date, the concessionaire will hold a meeting with authorities and emergency service personnel from the appropriate state and local agencies. This session will establish roles and responsibilities, communication protocols, requirements for report creation, distribution and documentation and a chain

of command for each type of incident or emergency. Based on these outcomes, the Traffic Safety Officer will prepare standard operating procedures to supplement the Incident Management Plans.

The Incident Management Plan below provides more details on the Concessionaire's approach to incident response, management and reporting, and includes information on establishing protocols with emergency services and standard operating and communication procedures. The primary goals of the Incident Management Plan are to:

- Minimize the effect of incidents on the traveling public;
- Provide information to TxDOT management for further transmission to road users and officials;
- Restore the network to normal conditions as quickly as possible.

Regardless of various individual responsibilities, all organizations involved in incident management will work toward the following common objectives:

- Saving and protecting life;
- Relieving suffering;
- Protecting property;
- Providing the public with timely information;
- Containing the emergency;
- Maintaining critical services;
- Maintaining normal services at an appropriate level;
- Protecting the health and safety of personnel;
- Safeguarding the environment;
- Facilitating investigations and inquiries;
- Promoting self-help and recovery;
- Restoring normal conditions as soon as possible;
- Evaluating the response
- Identifying lessons learned and future plans for improvement.

Incident notification, dispatch, management and reporting are carried out through the full-time Traffic Management Center (TMC), utilizing CCTV access and communications with Field Patrols and emergency services providers to maintain an incident log.

In case of an accident, information will be communicated to the TxDOT representative; and traffic conditions, diversions and cleanup timeframes will be made available to road users through the Vehicle Management System located along the road.

11.9 Quality Control

Key quality management functions will include standardization and communication of maintenance requirements; procurement and contractor control; interaction with TxDOT, the IE and Third Parties; safety and environmental compliance; procedures for traffic and ridership and emergency response; control of quality records; internal audits and management reviews; resource allocation; measurement of customer satisfaction; and continuous improvement of the Quality Management Plan.

The Developer's Quality Manager will conduct audits to monitor and assess the effective functioning of the Quality System. These audits include identification of underperforming areas, determination of causes and corrective/preventive actions required, internal management review and reporting to the Board of Directors. Results of all internal audits will be sent to the IE and TxDOT within seven days of their completion.

TxDOT will also be able to verify the establishment and effectiveness of the operation of the O&M Quality System through its own audits, in conjunction with the IE.

11.9.1 Examinations and Audit of O&M Work

To ensure the fulfillment of quality requirements for O&M, the performance of the different activities will be controlled by the personnel responsible for those activities and by the quality team.

As part of these controls, the Maintenance Manager or someone appointed by him will determine whether the O&M activities have been carried out according to the specified requirements (plan, programs and procedures) and if the Facility Agreement specifications have been met. The results of these examinations will be recorded on an inspection sheet and compared with the specified requirement in order to assess the electiveness of the work.

In addition to these inspections, independent control of O&M work will be carried out by the Quality sub-organization with internal audits by the Quality/Environmental Manager. These internal audits will be compared with audits performed by the Corporate Quality Manager, who will evaluate the performance of the Quality/Environmental Manager in supervising the O&M work.

11.9.2 Test Observation and Reporting

Because every maintenance project is recorded, the results of every inspection must be recorded as well.

Each inspector will record the results of the inspections in a checklist form that will be uploaded in the Document Control System. By keeping the results of these inspections,

the Concessionaire will be able to follow the improvement/deterioration of the infrastructure, as well as verify the results of the current maintenance policy.

Maintenance work reports contain valuable information to guide future maintenance programming and any unacceptable results will be managed through Non-Conformity Reports and Corrective Action Reports.

11.9.3 Integrating the Comprehensive Environmental Protection Program into O&M Quality Management

The Concessionaire will develop and implement a Comprehensive Environmental Protection Program (CEPP), applicable throughout the Term of the Facility Agreement to establish the approach, requirements and procedures to be employed to protect the environment. All component parts shall reflect, in order of priority: impact avoidance, minimization and, as a last resort, mitigation. The CEPP will satisfy applicable FHWA, TxDOT and resource agency requirements, including those detailed as commitments in any Environmental Approvals.

At a minimum, the CEPP will include the following component parts:

- Environmental Management System (EMS),
- Environmental Compliance and Mitigation Plan (ECMP),
- Environmental Protection Training Plan (EPTP),
- Hazardous Materials Management Plan (HMMP),
- Communication Plan (CP),
- Construction Monitoring Plan (CMP),
- Recycling Plan (RP).

Improving the sustainability of the highway operations is an important objective of the Project. This requires the consideration and assessment of environmental issues for all activities. The assessment involves balancing the impacts of the activities in a way that sustains both environmental protection and promotes efficient operations.

The Concessionaire shall work to deliver increased sustainability via the promotion of environmental awareness throughout its team. The Concessionaire shall monitor progress towards delivery of this commitment via the development of Performance Indicators and appropriate benchmarking.

The Concessionaire shall use products and employ procedures that minimize environmental damage and provide environmental protection.

Continual changes in environmental stewardship and legislative obligations are anticipated. The Concessionaire shall work to enhance environmental awareness among its staff and supply chain partners.

The Concessionaire shall develop an Environmental Management System according to ISO 14001 and shall assure the integration of the environmental requirements stated both in the CEPP with the O&M activities through the development of an integrated Environmental and Quality Management System.

11.9.4 Ensuring Quality of Submittals to TxDOT, Governmental Entities and Third Parties

The Concessionaire shall submit the required information either generated directly by itself or by any of its subcontractors, including the Design-Build Contractor, to TxDOT, Governmental Entities and other third parties according to the following inputs:

- Contractual obligations (Facility Agreement)
- Requests for Information and/or reports required by TxDOT, Governmental Entities and other third parties
- Reference Documents:
 - - Facility Management Plan documentation
 - - Legal Requirements.
 - - Proposals for Facility optimization
 - - Etc.

All information submitted to TxDOT, Governmental Entities and other third parties will aim to achieve the following:

- fulfillment of contractual obligations and legal requirements;
- answers to Requests for Information, delivery of reports;
- Facility optimizations accepted and adopted; and
- added value to the Project.

11.9.5 Continuous Improvement

The Concessionaire shall actively promote partnering and continuous improvement through:

- promotion and delivery of business objectives;
- mutual understanding and common purpose;
- focus on the customer;
- clear responsibilities;
- development of each partner's staff;

- a framework to deal with contractual concerns;
- progression towards best value; and
- better service.

The results of the quality audits and management reviews will be used to identify areas of improvement. CARs and observations generated from these reviews will be continually monitored to identify reoccurring events and the effectiveness of corrective actions

11.10 Document Management

A document management system will be used to control the receipt of incoming documents, the preparation, checking, issuing and amending of new documents and the filing and storage of quality records.