



Texas National Highway System Review

NHS Review Methodology

Introduction

The National Highway System (NHS) in Texas should be periodically reviewed to ensure that it includes the most important and nationally significant roadways for the movement of people and goods. The Texas NHS Study, completed in 2021, was the first effort to conduct a comprehensive assessment of the Texas portion of the NHS since its original designation in the late 1990s. During this study, a methodology was developed in collaboration with TxDOT-TPP Data Management and Systems Planning branches and the FHWA-Texas Division to evaluate segments for inclusion on the NHS. Based on federal guidelines for modifying the NHS, this methodology describes criteria that a roadway must meet to be added to the NHS.

This report provides background on the NHS, including criteria for roadway inclusion, and describes the detailed methodology for reviewing candidate roadways for inclusion on the NHS. Finally, because local support is required to modify the NHS, this report outlines steps that can be taken to collaborate with local transportation officials in the evaluation. While this methodology is written to support a system-wide evaluation, the criteria can be used to evaluate individual requests to modify the NHS for requests that come outside major review cycles.

NHS Background

The NHS is a network of nationally significant roadways in the US. The network supports the movement of people and goods between population centers, international border crossings, major military installations, and intermodal facilities, such as ports, airports, and major transit stations. When originally designated in 1996, the NHS covered over 160,000 miles nationally and over 13,000 miles in Texas. In 2012, as part of the Moving Ahead for Progress in the 21st Century Act (MAP-21) legislation, the NHS was expanded to include all Urban and Rural Principal Arterials not currently on the network. This added nearly 60,000 miles to the NHS nationally, 5,000 of which are in Texas.

The network is defined within the Code of Federal Regulations (CFR) 23 CFR 470.107 (b):

“The National Highway System shall consist of interconnected urban and rural principal arterials and highways (including toll facilities) which serve major population centers, international border crossings, ports, airports, public transportation facilities, other intermodal transportation facilities and other major travel destinations; meet national defense requirements; and serve interstate and interregional travel.”

The NHS has five components. The first three consist of other networks mandated by federal law which are:

- The Interstate Highway System,
- The non-Interstate Strategic Highway Network (STRAHNET), identified by the Department of Defense, and
- Congressionally designated High Priority Corridors¹

¹ High Priority Corridors in Texas include the I-69 Corridor, United States Route 59 Corridor (I-69), Interstate Route 35 Corridor, Camino Real Corridor, Ports-to-Plains Corridor, SPIRIT Corridor, Interstate 20-635-30, and La Entrada al Pacifico Corridor.

The remaining two components of the network are designated through coordination with local transportation officials:

- Other Urban and Rural Principal Arterials
- Intermodal connectors, which link intermodal facilities such as ports, airports, and AMTRAK stations, with the rest of the NHS

Facilities on the NHS are eligible for the National Highway Performance Program (NHPP) funds, which make up over half of Texas-apportioned Federal-Aid Highway Funds.² The NHS is also the network used to evaluate the National Performance Management Measures.

The NHS consists of almost exclusively Interstates, Freeways and Expressways, and Other Principal Arterials. Other functionally classified roads on the NHS are limited to connectors between major intermodal facilities or military installations and the main network.

Federal Modification Procedures for the NHS

In 2016, the Federal Highway Administration (FHWA) updated regulations for modifying routes and intermodal connectors on the NHS. Requests to modify the NHS are made to FHWA by State Departments of Transportation (DOT) for changes outside Metropolitan Planning Organization (MPO) Areas or by MPOs through the DOTs. In both cases, changes must be approved by the US Secretary of Transportation. In requesting modifications to the NHS, the following must be provided³:

- 1) A description of the route being modified (route name, number, jurisdiction and extent),
- 2) A statement justifying the change,
- 3) Statements of coordination and consultation with affected entities, including adjacent states and MPOs as necessary, and
- 4) A statement describing how the change enhances the national transportation characteristics of the NHS.

FHWA has provided the following examples of acceptable documents for demonstration of support:

- MPO resolutions if the change occurs within an MPO area
- MPO or County letter to State DOT expressing support for the change
- An email from an MPO or other local official to the State DOT supporting the change

Requests for modification are made in writing to the FHWA Division Office by the State DOT. The Division conducts an initial review of the requests and transmits its recommendation to FHWA Headquarters. Final decisions on the requests are passed from FHWA Headquarters to the Division Office who then informs the State DOTs of the decisions.

Review Methodology

² Revised Apportionment Of Federal-Aid Highway Program Funds For Fiscal Year (FY) 2021, Table 1.

https://www.fhwa.dot.gov/legsregs/directives/notices/n4510853/n4510853_t1.cfm

³ See FHWA's "National Highway System Modification Procedures", accessed 3/15/2018 from

https://www.fhwa.dot.gov/planning/national_highway_system/update/index.cfm

This review methodology is based on the description of the NHS provided in 23 CFR 470.107 (b) along with Appendix D to Subpart A of Part 470 - Guidance Criteria for Evaluating Requests for Modifications to the National Highway System, or the Federal Guidance Criteria from this point forward. It is applicable to portions of the roadway network that can be added to the main NHS. The methodology for evaluating intermodal connectors is provided separately. Expanding on the requirement that the NHS consist of “urban and rural principal arterials”, the federal guidance criteria are as follows:

1. *Proposed additions to the NHS should be included in either an adopted State or Metropolitan Transportation Plan or program.*
2. *Proposed additions should connect at each end with other routes on the NHS or serve a major traffic generator.*
3. *Proposals should be developed in consultation with local and regional officials.*
4. *Proposals to add routes to the NHS should include information on the type of traffic served (i.e., percent of trucks, average trip length, local, commuter, interregional, interstate) by the route, the population centers or major traffic generators served by the route, and how this service compares with existing NHS routes.*
5. *Proposals should include information on existing and anticipated needs and any planned improvements to the route.*
6. *Proposals should include information concerning the possible effects of adding or deleting a route to or from the NHS might have on other existing NHS routes that are in close proximity.*
7. *Proposals to add routes to the NHS should include an assessment of whether modifications (adjustments or deletions) to existing NHS routes, which provide similar service, may be appropriate.*
8. *Proposed modifications that might affect adjoining States should be developed in cooperation with those States.*

In collaboration with FHWA-Texas Division and TxDOT staff, the following refined criteria were developed for evaluating a roadway’s inclusion on the NHS:

- 1) The review should eliminate so-called ‘stub’ connections where a segment does not connect to the NHS on both ends. While the NHS may terminate at a major traffic generator, this is usually reserved for intermodal connectors which provide access to destinations. The exception to this rule is border crossing facilities.
- 2) It must meet the functional classification standards of a Principal Arterial with reference to the type of traffic served and should provide regional or statewide mobility rather than access to local destinations. If a roadway is not currently designated as a Principal Arterial but meets the criteria, it should be re-classified and added to the NHS.
- 3) If a roadway does not currently meet the standards of a Principal Arterial, it can be evaluated based on planned improvements in a State or MPO planning document.⁴
- 4) While an evaluation can be conducted using desktop review, it should be refined and updated in consultation with local and regional officials who understand how the corridor functions.
- 5) It must be evaluated in its local, regional, and statewide context. Roadways on the NHS should provide a clear regional or statewide mobility function and should not be

⁴ During the Texas NHS Study, FHWA-Texas Division stated that they would only consider improvements that were programmed in the STIP/TIP for construction within the next 4 years.

close to parallel NHS routes that provide the same type of service. While there is no standard requirements for principal arterial spacing, general rules of thumb can be applied. See “Arterial Considerations” in FHWA’s *Highway Functional Classification Concepts, Criteria and Procedures* (2013).⁵

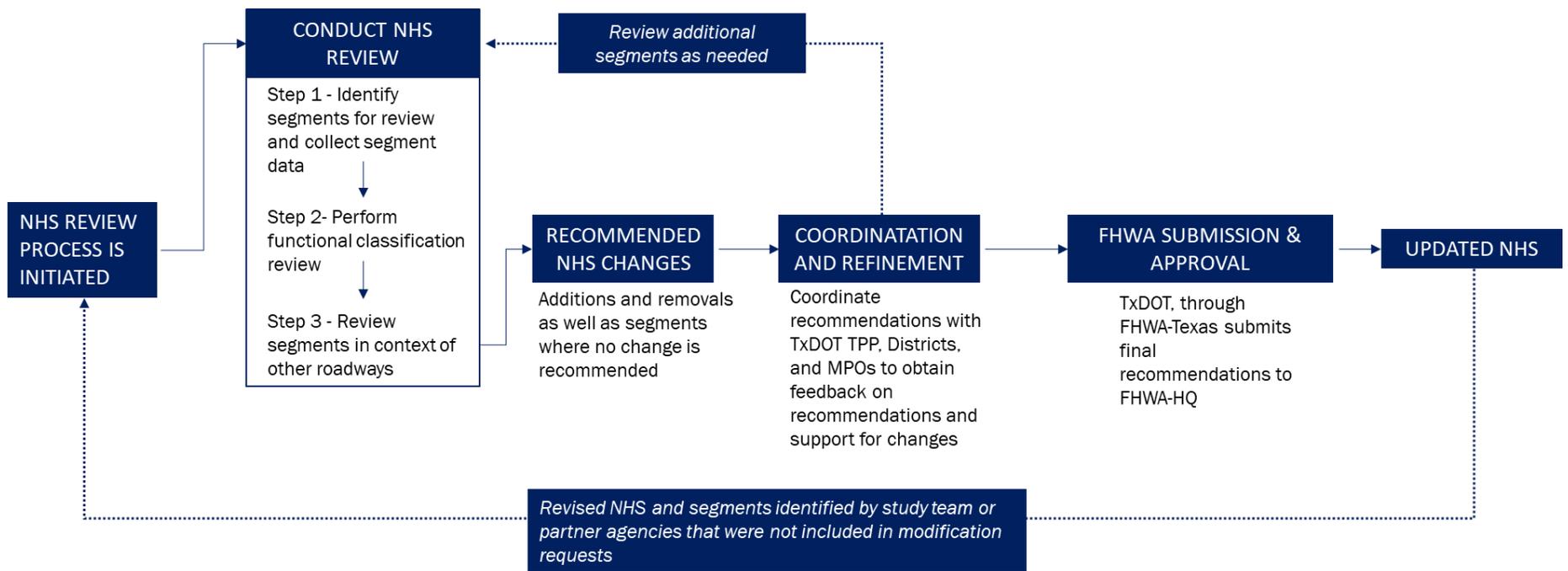
Candidates for removal from the system can be identified using these criteria as well, modified as follows:

- 1) It does not connect to the NHS on both ends and does not terminate at a major traffic generator or border crossing. The removal should also not create a ‘stub’ connection.
- 2) It does not meet the functional classification standards of a Principal Arterial, and no improvements are programmed that would upgrade its function.
- 3) It is closely parallel to another NHS route that provides similar or better regional or long-distance mobility.

The following steps should be followed to review segments for addition to or removal from the NHS. The review process is summarized in **Figure 1** below. Example segments reviewed during the Texas NHS Study are included in **Attachment C**.

⁵ See reference at the following URL:

https://www.fhwa.dot.gov/planning/processes/statewide/related/highway_functional_classifications/section04.cfm#:~:text=4.2.1%20Arterial%20Considerations



Step 1 – Identify Segments for Review and Collect Segment Data

Candidates for addition to or removal from the NHS can be identified using TxDOT resources and the results of the Texas NHS Study. These include:

- Current federal functional classifications, including Other Principal Arterials (OPA) and Minor Arterials (MA)
- Current NHS network
- Segments considered in the 2019 review that were not submitted to FHWA, including
 - Modification requests made by MPOs and Districts that were not supported by TxDOT-TPP
 - Recommended NHS modifications made during the study technical analysis that were not advanced by a District or MPO

The Roadway Inventory Annual Data, published by TxDOT every year and available online⁶, contains multiple attributes that characterize the roadway network in the State. Two of the attributes provide information related to the functional classification of each segment of the roadway network and would serve as the base. The first attribute⁷ provides a general functional classification of roads that includes Interstates, Other Freeways and Expressways, Other Principal Arterials, Minor Arterials, Major Collectors, Minor Collectors, and Local Roads. The second attribute⁸ provides the same functional classifications but distinguishes between rural and urban roadways.

The current NHS network is available online through the TxDOT Open Data Portal⁹.

Attachment A includes the modification requests submitted to FHWA as part of the Texas NHS Review completed in September 2021 and **Attachment B** includes the deferred requests, which would need additional review before being submitted to FHWA.

Once initial screening has taken place, candidate segments for addition or removal can be identified using the NHS criteria. An addition should connect with NHS routes on both ends or terminate at a border crossing. It should form part of a network that serves regional or statewide mobility, either on its own as a single route or as an extension of existing NHS routes. A candidate for removal should be an existing NHS segment that can be removed without creating NHS discontinuity, accounting for other coordinated NHS modifications. Candidate segments should be collected in a GIS feature dataset based on the latest Roadway Inventory. They should include the route name along with a unique segment identifier for use in subsequent analysis. Once candidate segments are selected, initial data collection should be conducted on the characteristics of the segment, including current NHS and Functional Classification status, route location (i.e., County, City, MPO, TxDOT District, and Urbanized Area), average, minimum, and maximum annual average daily traffic (AADT) and Truck AADT %, number of lanes, and access control. This information is available in the Texas Roadway Inventory and will support the functional classification review.

⁶ TxDOT Roadway Inventory <https://www.txdot.gov/inside-txdot/division/transportation-planning/roadway-inventory.html>

⁷ Item Name: Functional Classification. Column Name: F_System

⁸ Item Name: Functional Classification. Column Name: RU_F_System

⁹ TxDOT Open Data Portal <https://gis-txdot.opendata.arcgis.com/>

Step 2 – Perform Functional Classification Review

The functional classification review methodology is based on FHWA guidance ([FHWA Highway Functional Classification Concepts, Criteria and Procedures, 2013](#)) regarding the identification of Principal Arterials. The resulting recommended functional classifications are then used to review the NHS system designations.

While this review process identifies clear-cut cases where roads should be added or removed from the NHS, it also highlights roads that are harder to classify. In these cases, a final determination would require local knowledge of the facility from local District and MPO officials.

The review considers the arterial network in three contexts:

- **Rural Segments** in areas with populations of 5,000 or less, where Principal Arterials provide mobility between larger population centers
- **Small Community Segments** in towns and cities between 5,000 and 50,000 people, where Principal Arterials serve through traffic and may also serve major local destinations
- **Urban Segments** in areas with 50,000 or more people, where Principal Arterials provide mobility across a region in addition to connecting with other regions

The criteria for evaluating segments in each area are outlined below.

1. Rural Segments

Rural Principal Arterials enable long-distance travel between urbanized areas or cities with populations of 25,000 or more. For a given segment, this can be assessed by looking at the population centers the segment serves. If it is or is part of a direct route between those population centers, it should be considered for addition to the NHS and reclassification as a Principal Arterial if necessary. Directness can be evaluated in Google Maps or a similar route planner. If a segment is part of one of the suggested routes between the population centers it connects, it can be considered a direct connection. If the segment does not connect population centers, or does so indirectly, it should not be considered for addition to the NHS or should be considered for removal if necessary. **Table 1** provides the criteria and definitions for conducting a rural segment review. For some rural corridors, it was not clear whether they provided a direct or indirect connection between major cities. In these cases, further review and feedback would be required with Districts and/or MPOs before a final determination is made.

Table 1: Criteria and Definitions for Rural Segment Review

Does a segment...	Definition
Connect Major Population Centers?	Does a segment connect population centers (cities or urbanized areas) with 25,000 or more people?
Provide a direct route?	Does a segment provide a reasonably direct route between those population centers? Use Google Maps or other routing service to verify.

2. Small Community Segments

The role of Principal Arterials in small cities and communities outside urbanized areas is to provide continuity for Rural Principal Arterials carrying through traffic. In some cases, a secondary purpose of Principal Arterials is to serve traffic leaving a through route to access regional traffic generators, such as a major tourist destination. See Criteria and Definitions for conducting a small community segment review in Table 2 below.

Table 2: Criteria and Definitions for Small Community Segment Review

Does a segment...	Definition
Form part of a rural segment that directly connects population centers?	See definitions in the Rural Segment review in Table 1 above.
Connect the NHS to a major traffic generator?	Does a segment connect the NHS to a major traffic generator, such as a National Park? In these cases, the segment should still connect to the NHS on both ends.

3. Urban Segments

Due to the extensiveness of the road network in urban areas, the urban area review requires a more nuanced evaluation. In these areas, segments should be reviewed within their urban context. While a segment-by-segment review is necessary to create a final recommendation, it may be helpful to screen segments using a data-driven segment scoring approach, as outline in **Appendix 1**.

Based on FHWA guidance, urban Principal Arterials function by connecting major destinations such as activity centers and high-level facilities like Interstates, Freeways and Expressways. Principal Arterials serve longer distance/higher speed travel and therefore should avoid residential areas, areas with a high concentration of access points (i.e., intersections and driveways), and low-speed areas such as school zones. Each segment should be evaluated following the criteria outlined in **Table 3**. Resources to complete this review include Google Earth, Google Maps, travel times and routing based on Google Maps, ArcGIS maps and layers, and data published by TxDOT.

Table 3: Criteria and Definitions for Urban Segment Review

Does a segment...	Definitions
Serve major activity centers?	Does the segment provide regional service ¹⁰ to: <ul style="list-style-type: none"> • Central Business Districts • Regional centers • Important air/rail/ bus/truck terminals • Regional shopping centers • Large colleges • Medical complexes

¹⁰ As Principal Arterials, segments should not provide access to these facilities, but should serve regional or long-distance connections for travelers.

	<ul style="list-style-type: none"> • Military bases • Other regional institutional facilities
Serve long-distance travel needs / Connect large regions?	Does a segment provide a direct connection between major population centers, as defined above in the Rural Segment criteria?
Provide mobility across a region, especially between outlying areas and the urban core?	Does a segment connect distant areas in the region, such as linking suburban communities to the urban core?
Avoid residential areas and provide limited access to surrounding land uses?	Does a segment prioritize mobility and longer trips? It should have the following characteristics: <ul style="list-style-type: none"> • Avoid neighborhoods and other residential areas • Support higher travel speeds and not pass-through school zones • Limit commercial driveways and cross streets that can slow traffic.
Directly link Interstate Highways, Freeways, or Expressways?	For surface Principal Arterials, does a segment connect higher-capacity regional or statewide routes.

The results of this review are used to identify potential Principal Arterials as follows:

- If a facility meets four or more criteria, the recommendation is to either keep it on or add it to the Principal Arterial network.
- If a facility meets two or three criteria, the recommendation is to conduct further review in coordination with local transportation officials.
- If a facility meets one or none of the criteria, the suggestion is to remove it from or keep it off the Principal Arterial network.

Next Steps

Following the segment evaluation, initial recommendations regarding NHS designations can be made. Proposed changes to the Principal Arterial network are used to develop suggestions to modify the NHS following the guidance outlined in **Table 4**.

Table 4: NHS Review Suggestions based on Functional Classification Review

Results of FC Review	NHS Review Suggestion	
	If on the current NHS...	If off the current NHS...
Keep as PA	Keep on the NHS	Add to the NHS
Re-Designate as MA	Remove from the NHS	Don't include in review
Re-Designate as PA	Keep on the NHS	Add to the NHS
Further Review	Conduct further review with MPO/District or other local transportation official	

This approach ensures that the designation of Principal Arterials will be in step with the designation of the National Highway System.

Step 3 – Review Segment in Context of Other NHS Roadways

NHS modifications should consider the mobility needs of the region or state and how various elements of the transportation network interact to facilitate travel. At this stage, the review should be conducted at a larger scale to look at how segments function within the overall system.

NHS segments should provide a unique mobility function not served by an existing route. For instance, a surface Principal Arterial may have a high traffic volume, but if it is close to a parallel Interstate or Freeway, it is likely not serving regional or long-distance mobility and should therefore not be on the NHS. Compare similar routes using AADT, recommended routing in Google Maps or a different route planner, and other information to provide a recommendation.

This stage in the review can serve as a quality control review of the segments and can be used to coordinate multiple segments to ensure they will produce a logical network.

Step 4 – Coordinate Recommendations with TPP, Districts, and MPOs

After the review process is completed and segment recommendations have been made, the TxDOT-TPP Division should review the list and provide input on whether additional information is required to justify changes to the NHS network. TxDOT TPP review of the suggested NHS network is particularly important for segments of the network for which further review was recommended (see Table 3). TxDOT TPP has been involved in different statewide and corridor planning development efforts and can provide additional information to determine if a roadway segment should be removed or added to the NHS network. TxDOT District staff and MPOs should also be involved during the review process to validate suggested modifications and get additional input on segments for which further review was recommended.

Once feedback received from TxDOT TPP, Districts, and MPOs are incorporated into the analysis and a final list of suggested NHS modifications is compiled, TxDOT should coordinate with FHWA – Texas to assemble packages that will be submitted to FHWA – HQ and serve as the official requests for modifications. FHWA – Texas could be involved earlier in the review process, at the time meetings with TxDOT TPP are taking place, to obtain input on which recommendations would require additional justification for FHWA – HQ to approve them.

District and MPO Review Considerations

Engage MPO and District staff in reviews, including sharing this methodology and the corridor evaluation results. Reviewers should be encouraged to:

- Update evaluation information for specific corridors
- Propose new modifications that meet the criteria
- Confirm review conclusions

For MPO modifications, reviewers should prepare to engage with MPO technical advisory committees and policy boards to validate recommendations and gather local support. Districts should consult with affected County and City jurisdictions on modification requests.

Opportunities to Review NHS Designations

NHS designations can be reviewed and updated as needed in an ongoing manner. There are several milestones in TxDOT's statewide planning and project development process when reviews of NHS designations would be appropriate. These are described below.

During Functional Classification Reviews

Functional classification reviews are triggered when urbanized area boundaries change following the decennial census. When a Principal Arterial designation is considered, the following impacts on NHS designations should be addressed:

- If a new Principal Arterial is designated, consider whether it also meets the criteria for inclusion on the NHS using the methodology provided above, i.e., evaluating whether it provides NHS system continuity, serves regional or statewide mobility, and generally avoids or limits access to surrounding land uses.
- If a Principal Arterial on the NHS is proposed to be downgraded to Minor Arterial, it will be removed from the system. Review how this will impact NHS continuity and regional or statewide mobility.

During the Regional or Statewide Planning Process

Metropolitan or Statewide transportation planning processes involve a comprehensive review of transportation system performance and needs. During this review, the NHS can be used to identify those roads that are most significant for regional or statewide mobility. Because NHS designations play a central role in Federal-Aid funding and the performance management process, consideration should be given to whether the current NHS designations include regionally significant roads.

During the Project Development Process

During the project development process for major roadway improvements, changes are proposed that could affect the mobility function of area roadways. For instance, a proposed relief route around a community to move long-distance travel out of a downtown area would affect the function of both the current and new roadway segment. In such cases, efforts can be made in advance to identify functional classification and NHS designation changes to ensure the network reflects roadway function. Major changes to the function of a roadway and impacts on surrounding routes can be identified early during the corridor feasibility study, preliminary design, and environmental phases. At these stages, a functional classification and NHS review can be conducted to ensure that the appropriate designations are applied at funding, letting, or construction. During the Texas NHS Study, functional classification and NHS designation changes were accepted based on future roadway improvements that were included in the 5-year MPO Transportation Improvement Plan (TIP or Statewide TIP).

Periodic Statewide Reviews

The Texas NHS Study – September 2021 was the first comprehensive review of NHS designations in the state since the network was created in the 1990s. Through this study, 226 modifications were made to NHS designations, resulting in the addition of over 1,000 miles and the removal of 660 miles from the system. During the study, MPO and District participants requested that more frequent reviews be conducted to ensure the network

stays up to date. Future statewide reviews can apply this methodology to the state's network, building on the previous study findings.

Appendix 1

Data-Driven Scoring Methodology

To support large evaluations of NHS designation, especially in urban areas, a data-driven process can be used to identify initial segments for review. This process involves examining each facility’s usage and design characteristics compared with FHWA’s guidance on the typical characteristics of Urban Principal Arterials. **Table 5** summarizes these characteristics as defined by the FHWA Highway Functional Classification Concepts, Criteria and Procedures (2013) or as adapted for the Texas NHS Study.

Table 5: Characteristics by Functional Classification for Urban Areas Roads

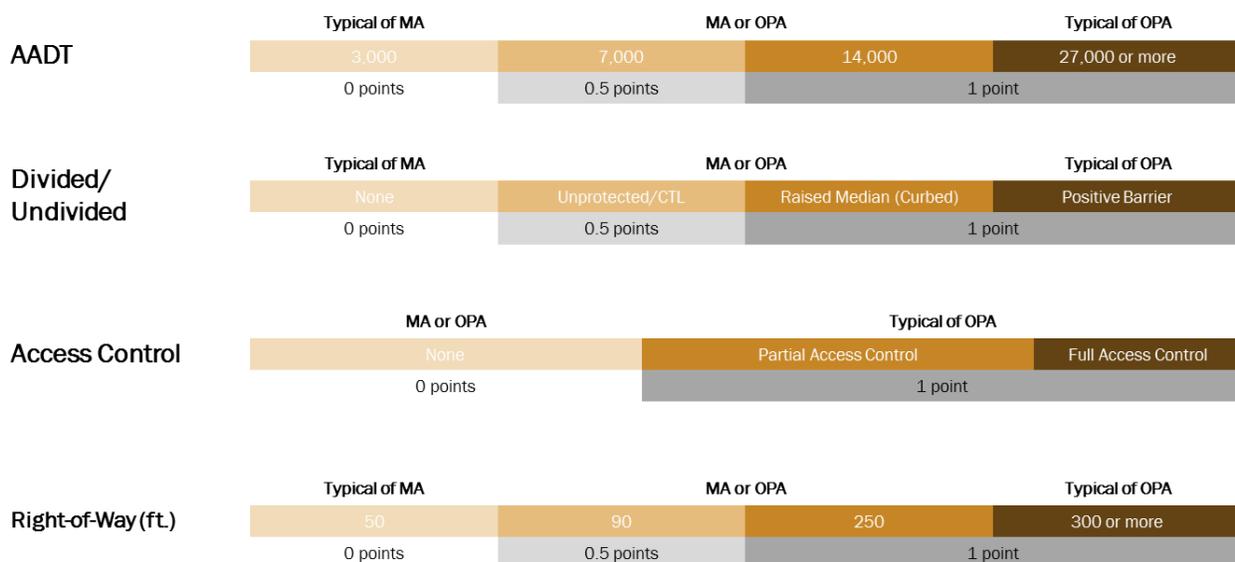
Factor	Interstate	Other Freeways & Expressway	Other Principal Arterial	Minor Arterial
AADT*	35,000 +	13,000 - 55,000	7,000 - 27,000	3,000 - 14,000
Divided/Undivided* Cross Section	Divided	Undivided/Divided	Undivided/Divided	Undivided
Access Control*	Fully Controlled	Partially/Fully Controlled	Partially/Uncontrolled	Uncontrolled
Right-of-Way Width (ft)**	300-800	250-800	87-200	54-120

*FHWA Highway Functional Classification Concepts, Criteria and Procedures, 2013

** Study Team review of TxDOT GRID 2018, 80/20 Percentile

Using the most recent version TxDOT’s Roadway Inventory database, characteristics for all urban Other Principal Arterials and Minor Arterials should be used to evaluate how well they align with those of a ‘typical’ Principal Arterial. A scoring scheme developed from these characteristics is shown in **Figure 2**.

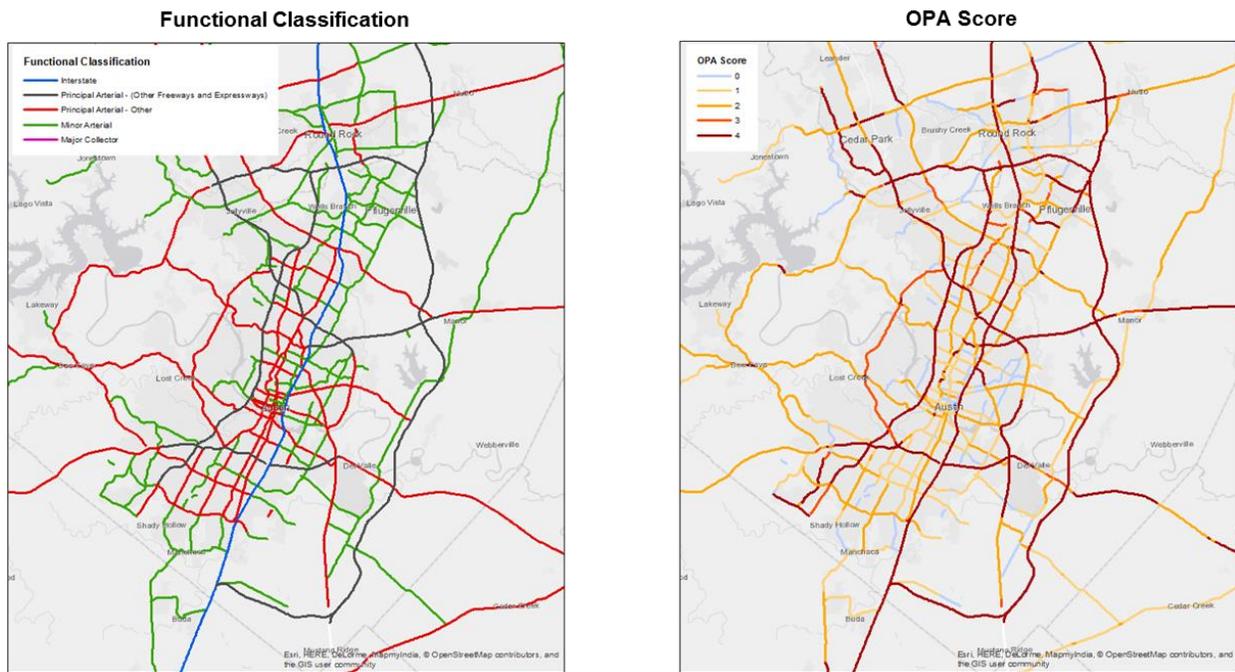
Figure 2: Other Principal Arterial and Minor Arterial Scoring Process



Following this approach, higher scores indicate that a road has characteristics similar to a typical Principal Arterial, while lower scores mean that a road is less like a typical Principal Arterial. In the review, special attention should be given to 1) Current Principal Arterials with

low scores, 2) Current Principal Arterials not on the NHS with high scores, and 3) current Minor Arterials with high scores. **Figure 3** provides an example of current Functional Classification for the roadway network in Austin and the scores that would result from Step 1.

Figure 3: Example of Other Principal Arterial and Minor Arterial Scoring in Austin, TX



This analysis can provide an initial filtering of segments to feed into Step 2 of the methodology.

Attachment A - Study Findings from the Texas NHS Study (September 2021)

Individual packets for each TxDOT District and MPO with all study Findings from the Texas NHS Study. Each packet contains a summary of the NHS, a District- or MPO-wide map of the NHS, and separate fact sheets for each proposed modification.

Attachment B – Deferred Examples by TxDOT TPP, TxDOT Districts, or MPOs

List of deferred proposed modifications. It contains corridor information, feedback received from stakeholders, results of the corridor review process, and study recommendations.

Attachment C – Review Methodology Example and Template

Proposed modifications and review methodology examples. Includes a template table with all the attributes used to evaluate corridors during the Texas NHS Study (September 2021). Maps of the proposed modification examples are also included.

Attachment D – Shapefiles

Shapefile Name: TX_NHS_Study_Deferred_MPO_Dist_Mod_Requests

Description: Modification requests made by Districts and MPOs that were deferred by TxDOT based on further technical analysis.

Shapefile Name: TX_NHS_Study_Tech_Review_MPO_Corridors

Description: Segments in MPO areas reviewed as part of the Texas NHS Study.

Shapefile Name: TX_NHS_Study_Tech_Review_Non_MPO_Corridors

Description: Segments outside MPO areas reviewed as part of the Texas NHS Study.