

List of Figures

Figure 1.1-1: Population Trends, 1950-2010 and 2015 Estimate, Cleveland and the Five NOACA Counties.....	2
Figure 1.1-2: Population Trends, 1950-2010 and 2015 Estimate, Cleveland and the Five NOACA Counties.....	3
Figure 1.1-3: Average Household Size (persons/household).....	4
Figure 1.1-4: Population Density 1990	7
Figure 1.1-5: Population Density 2000	8
Figure 1.1-6: Population Density 2010	9
Figure 1.1-7: Population Control Totals for Future Projections	11
Figure 1.1-8: Population Trend & Forecast: Downtown Cleveland, 1990-2040.....	12
Figure 1.2-1: NOACA Civilian Labor Force.....	13
Figure 1.2-2: NOACA 2010 Employment Characteristics	17
Figure 1.2-3: Employment Projections	18
Figure 1.2-4: County Employment by Sector.....	21
Figure 2.1-1: Federal Requirements and Status.....	26
Figure 2.2-1: Connection of Strategies to Goals.....	38
Figure 2.3-1: Comparison of 1999 Statement of Principles with Regional Strategic Plan Goals	41
Figure 2.4-1: Comparison of 2009 Transportation Planning Goals with Regional Strategic Plan Goals	47
Figure 3.1-1: Congestion Management Plan Objectives and NOACA Long-Range Goals and Objectives	50
Figure 3.1-2: First-Tier Congestion Management Objectives.....	51
Figure 3.1-3: Supplemental Congestion Management Objectives	51
Figure 3.1-4: Congestion Management Process	52
Figure 3.1-5: 2015 Highway Network by Facility Type.....	55
Figure 3.1-6: 2015 Highway Network Centerline Miles by Road Facility Type	57
Figure 3.1-7: Road Facility Types of the 2015 Highway Network by Percentage.....	57
Figure 3.1-8: 2015 Highway Network by Number of Directional Lanes.....	59
Figure 3.1-9: 2015 Highway Network Mileage by Directional Lanes	61
Figure 3.1-10: Centerline Directional Lane Mileage of the 2015 Highway Network by Percentage	61
Figure 3.1-11: 2015 Premium Bus, BRT, and Rail Line Network	63
Figure 3.1-12: TAZs within a 5-Mile Drive of Park-and-Ride Stations	67
Figure 3.1-13: TAZs within a Half-Mile Walk of Rail Stations.....	68
Figure 3.1-14: Roadway Committed Projects for the 2040 Model Network.....	71
Figure 3.1-15: Roadway Committed Projects for the 2040 Model Network.....	75
Figure 3.1-16: 2040 Highway Network Centerline Miles by Road Facility Type	77
Figure 3.1-17: 2040 Highway Network Mileage by Directional Lanes	77
Figure 3.1-18: 2040 Highway Network by Number of Directional Lanes.....	79
Figure 3.1-19: 2040 Premium Bus, BRT, and Rail Line Network	80
Figure 3.1-20: Volume over Capacity Ranges	81
Figure 3.1-21: Mode Share Percentages of 2015 Daily Person Trips	83
Figure 3.1-22: Mode Share Percentages of 2015 Daily Person Trips	84
Figure 3.1-23: Mode Share Percentages of 2040 Daily Person Trips.....	84
Figure 3.1-24: Mode Share Percentages of 2040 Daily Person Trips.....	85
Figure 3.1-25: 2015 Daily Ridership by Transit Mode.....	85
Figure 3.1-26: 2015 Capacity Factors for the Modeling Periods	86
Figure 3.1-27: Volume over Capacity Ratio for the 2015 PM Peak Period.....	88
Figure 3.1-28: Freeway Locations with an LOS of F for the 2015 PM Peak Period	89

Figure 3.1-29: Arterial Locations with an LOS of F for the 2015 PM Peak Period.....	90
Figure 3.1-30: Volume over Capacity Ratio for the 2040 PM Peak Period.....	91
Figure 3.1-31: Freeway Locations with an LOS of F for the 2040 PM Peak Period	92
Figure 3.1-32: Arterial Locations with an LOS of F for the 2040 PM Peak Period.....	93
Figure 3.1-33: Congestion Mitigation Impacts of the Committed Highway Projects	94
Figure 3.1-34: 2015 Additional Delay and Fuel Costs due to Congestion	100
Figure 3.1-35: 2040 Additional Delay and Fuel Costs due to Congestion	100
Figure 3.2-1: Pavement Condition Ratings.....	106
Figure 3.2-2: Condition of Bridges.....	106
Figure 3.2-3: Transit Ridership: Annual Unlinked Passenger Trips by Agency, 2009-2014	107
Figure 3.2-4: Regional Transit Assets Map	109
Figure 3.2-5: Regional Bikeway Assets Map	113
Figure 3.2-6: Regional Sidewalk Assets Map	114
Figure 3.2-7: Regional Freight Assets Map	117
Figure 3.2-8: Cost of Rehabilitations by Lane-Length.....	120
Figure 3.2-9: Condition Appraisal of Bridges in NOACA's Region	121
Figure 3.2-10: Pavement Rating Criteria	125
Figure 3.2-11: Bridge Condition Ratings.....	126
Figure 3.2-12: NOACA Performance Measures and Targets.....	126
Figure 3.3-1: Potential Impacts of Climate Change	134
Figure 3.4-1: Regional Freight Network.....	139
Figure 3.4-2: 2015 Freight by Mode	141
Figure 3.4-3: Tonnage and Value of Freight.....	146
Figure 3.4-4: Imports and Exports via Shipping Mode	147
Figure 3.4-5: Top 10 Exports by Tonnage in 2045	148
Figure 3.4-6: Top 10 Imports by Tonnage in 2045.....	148
Figure 3.4-7: National Freight Strategic Plan Goals	152
Figure 3.4-8: Average Truck Volumes during 2016	155
Figure 3.4-9: Projects Currently Programmed in the TIP to Begin Construction no later than 2019.....	158
Figure 3.4-10: Proposed Long-Range Transportation Plan Projects.....	159
Figure 3.5.1-1: TLCI: Dollars Invested 2006-2016.....	166
Figure 3.5.1-2: TLCI Program Awards by Area and Type 2014 - 2016	167
Figure 3.5.2-1: Transit Network in Northeast Ohio	175
Figure 3.5.2-2: Transit System Operators	177
Figure 3.5.2-3: Average Annual Transit Operating and Capital Expenses	178
Figure 3.5.2-4: Vehicle Replacement Schedule.....	183
Figure 3.5.3-1: Regional Population	192
Figure 3.5.3-2: Individuals with Disabilities by County, 2010	193
Figure 3.5.3-3: Individuals with Low Income by County, 2010	193
Figure 3.5.3-4: Percent of Households without a Vehicle Available, 2010	194
Figure 3.5.4-1: Bicycle Inventory.....	199
Figure 3.5.4-2: Northeast Ohio Bicycle Network.....	200
Figure 3.5.4-3: Northeast Ohio Sidewalk Network.....	205
Figure 3.5.4-4: Transportation Mode Choice in Northeast Ohio.....	209
Figure 3.5.4-5: Areas of Active Transportation in Northeast Ohio.....	210
Figure 3.5.4-6: Crashes by Transportation Mode in Northeast Ohio.....	211
Figure 3.5.4-7: Bicycle and Pedestrian Crashes: Top 10 Corridors, 2010-2014	213
Figure 3.5.5-1: Greater Cleveland Destinations.....	221
Figure 3.5.5-2: 2015 Reasons for Day Person-Trips to Cleveland DMA.....	223
Figure 3.5.5-3: 2015 Reasons for Overnight Person-Trips to the Cleveland DMA	224

Figure 3.5.5-4: Large Regional Event Facilities	225
Figure 3.5.5-5: Transportation to Cleveland DMA, Overnight Person-Trips	228
Figure 3.5.5-6: Home Locations of Overnight Person-Trips to Cleveland DMA	229
Figure 3.5.5-7: Enplanements at Airports	230
Figure 3.5.5-8: Car Rental Agencies by County	231
Figure 3.5.5-9: Cleveland Retail Market Statistics	236
Figure 3.5.5-10: Park Systems in Northeast Ohio	238
Figure 3.5.5-11: Revenue from Tourism.....	240
Figure 3.6-1: NOACA Board and Committee Structure	242
Figure 3.6-2: Crash Frequency by Severity, 2002-2015	243
Figure 3.6-3: Crash Frequency by County and 2010-2014	243
Figure 3.6-4: Top High Crash Corridors	245
Figure 3.6-5: Top High Pedestrian/Bike Crash Corridors.....	246
Figure 3.5-6: Completed RSA locations	249
Figure 3.6-7: Completed Technical Assistance Plans and Studies	251
Figure 3.5-8: Technical Assistance Projects.....	253
Figure 3.6-9: Matrix of Identified Performance Measures	256
Figure 3.7-1: Transportation Sector Interdependencies with Critical Infrastructure Sectors	257
Figure 3.7-2: ITS projects mapped to the regional ITS architecture.....	259
Figure 3.7-3: Alignment of ITS Strategic Themes with Strategic Goal Areas and MAP-21	275
Figure 3.8-1: Share of U.S. GHG Emissions by Sector in 2014.....	278
Figure 3.8-2: Population & On-Road GHG Emissions in NOACA Region.....	279
Figure 3.8-3: On-Road Greenhouse Gas Emissions in NOACA Region, 2015-2040	280
Figure 3.8-4: Summary of Nonattainment Status for Northeast Ohio.....	282
Figure 3.8-5: 2014 Tier-1 VOC Emissions Inventory for Northeast Ohio	284
Figure 3.8-6: 2014 Tier-1 PM ₁₀ Emission Inventory for Northeast Ohio	284
Figure 3.8-7: 2014 Tier-1 Primary PM _{2.5} Emissions Inventory for Northeast Ohio	285
Figure 3.8-8: 2014 Tier-1 SO ₂ Emissions Inventory.....	285
Figure 3.8-9: 2014 Tier-1 CO Emissions Inventory for Northeast Ohio.....	286
Figure 3.8-10: Change in Concentrations of Criteria Air Pollutants in Northeast Ohio, 1990-2010	287
Figure 3.8-11: Number of Ozone Exceedance Days in Northeast Ohio, 1995-2015	288
Figure 3.8-12: Ohio Total Maximum Daily Load Program Progress.....	292
Figure 3.8-13: Cuyahoga County of List of Impaired Waters	294
Figure 3.8-14: Geauga County of List of Impaired Waters.....	296
Figure 3.8-15: Lake County of List of Impaired Waters.....	298
Figure 3.8-16: Lorain County of List of Impaired Waters	299
Figure 3.8-17: Medina County of List of Impaired Waters.....	301
Figure 3.8-18: Aquatic Life Use Attainment	303
Figure 3.8-19: Ohio EPA's TMDL Project Process	305
Figure 3.8-20: TMDL Status Summary for Northeast Ohio's Watersheds.....	306
Figure 3.8-21: Northeast Ohio On-Road GHG Emissions by Vehicle Type	312
Figure 4-1: Major Projects (Map).....	314
Figure 4-2: Major Projects (List)	316
Figure 4-3: Illustrative Major Projects	323
Figure 5.1-1: Ohio Motor Fuel Tax Distribution.....	328
Figure 5.4-2: Ohio Motor Fuel Tax Historic Gallons Taxed.....	331
Figure 5.1-3: ODOT Programs eligible for Highway Projects.....	332
Figure 5.1-4: State Funding for Transit Operations (Funding Per Capita).....	338
Figure 5.1-5: Operating Funding Shares	338
Figure 5.1-6: AIM Forward 2040 Forecasted Revenue Scenarios	343

Figure 5.1-7: Total Revenue for Projects under Trend Growth Scenario	345
Figure 5.1-8: Total Revenue for Projects under FAST Act Average Growth Scenario	346
Figure 5.1-9: Total Revenue for Projects under No Growth Scenario	347
Figure 5.1-10: ODOT Construction Cost Inflation Forecast Scenarios.....	348
Figure 5.1-11: Annual and Compound Inflation Factors	349
Figure 5.1-12: Estimated Cost of Planned Bicycle and Pedestrian Projects	351
Figure 5.1-13: Summary of Costs by Project Type (Year of Expenditure).....	355
Figure 5.1-14: Projected Costs of Plan Projects Against Revenue Scenarios	362
Figure 5.2-1: Minority and Poverty Levels in the U.S. and in the NOACA Region.....	363
Figure 5.2-2: Environmental Justice Areas in the NOACA Region.....	364
Figure 5.2-3: Proximity of Major Projects to Environmental Justice Areas in the NOACA Region	367
Figure 5.3-1: Aim Forward 2040 - Transportation Conformity Highway Networks Summary....	371
Figure 5.3-2: 2008 Daily 8-Hour Ozone Standard	375
Figure 5.3-3: 1997 and 2006 Annual PM _{2.5} Standard.....	376
Figure 5.3-4: Annual PM _{2.5} 2012 Standard	377
Figure 6-1: Facebook Engagements	382
Figure 6.2: Twitter Engagements	383
Figure 6-3: LinkedIn Engagements	384
Figure 6-4: Key Dates	409
Figure 7.1-1: Future Premium Bus, BRT and Rail Line Network.....	413
Figure 7.1-2: 5-mile Drive Access Buffer of Park-and-Ride Stations.....	417
Figure 7.1-3: 0.5-mile Walk Access Buffer of Rail Stations.....	418
Figure 7.1-4: The Envisioned Future Rail Lines.....	421
Figure 7.1-5: The Envisioned Future Rail Stations and 0.5-mile Walk Access Buffer	422
Figure 7.1-6: Total cost of Visionary Future Rail Lines	423
Figure 7.1-7: Total cost of Visionary Future Rail Line Stations	423
Figure 7.1-8: Total cost of Visionary Future Rail System.....	423