Appendix D: Analyze Data Element-Level Response Templates

This Appendix offers element-level response templates for Area D: Analyze Data.

Note: Use of the TAM Data Assistant is recommended however these templates are provided for informal use or pen and paper assessment.

D-Analyze Data
1-Data Exploration, Reporting and Visualization

D.1.a – Analysis Environment

Element Description   Creation and maintenance of data processing, analysis and reporting environments (e.g. staging areas, data warehouses, data marts, data lakes).

Benchmark Level 0	Benchmark Level 1	Benchmark Level 2	Benchmark Level 3	Benchmark Level 4
No central data analysis environments have been set up.	Data from different sources is brought together into a central platform for access; with little or no transformation or summarization.	Data are transformed in a limited fashion and made available for analysis; additional data manipulation is required to meet specific analysis needs.	Data are transformed, summarized and made available in a convenient form to meet the most common analysis and reporting needs; data are structured and documented to support more specialized queries.	A "big data" environment is available supporting sophisticated exploration, cleansing, visualization and analysis of large, heterogeneous datasets.
Current: ☐ Desired: ☐	Current: ☐ Desired: ☐	Current: ☐ Desired: ☐	Current: ☐ Desired: ☐	Current: ☐ Desired: ☐
☐ Create a data warehouse to make data centrally available for analysis.	☐ Apply basic data transformations supporting data exploration, reporting, and visualization needs.	☐ Apply more complex and/or additional data transformations needed to meet specialized analysis needs.	☐ Provide a "big data" environment with data profiling tools – include functions to generate random sampling of large data sets, provide graphical insight into data distributions and outlier values.	
☐ Identify initial priority datasets supporting asset analysis and reporting needs to make available within a central data warehouse.	☐ Provide standard analysis and reporting views combining data from different sources for asset related analysis.	☐ Develop data marts meeting specific asset related business analysis and reporting needs.	☐ Develop user capability to share data and analysis products through the environment.	
☐ Other:	☐ Other:	☐ Other:	☐ Other:	

Assessment Notes:

Improvement Notes:

Date: **Participating Members:**   **Assessment Context:**

D-Analyze Data
1-Data Exploration, Reporting and Visualization

D.1.b – Analysis Practices

Element Description	Procedures, standard reports, templates, and training to ensure valid and productive analysis of current data.

Benchmark Level 0	Benchmark Level 1	Benchmark Level 2	Benchmark Level 3	Benchmark Level 4
No standard reports or agency reporting procedures have been established.	Limited standard reports are available within the agency's individual asset management systems. Reports are produced on request.	A regular process has been established to produce and make available standard reports.	A regular process of data exploration and analysis has been established to identify patterns in the data, explore hypotheses and derive actionable information. Staff conducting this analysis receive appropriate training in statistics and data analysis techniques.	Based on inputs from data analysts, data and analysis environments are continually improved to enhance the agency's ability to derive valuable insights from data.
Current: ☐ Desired: ☐	Current: ☐ Desired: ☐	Current: ☐ Desired: ☐	Current: ☐ Desired: ☐	Current: ☐ Desired: ☐
☐ Configure agency asset management systems and tools to provide standard reporting for asset SMEs.	☐ Put standard operating procedures in place to develop reporting commonly needed outside the asset area.	☐ Integrate data science practices within asset related analysis.	☐ Develop a data science program to share and develop techniques to generate quantifiable, data-drive insights among data scientists and analysts.	
☐ Identify ad-hoc data exploration, reporting, and visualization practices in use in asset related business.	☐ Document and promote useful analysis techniques to deliver on common needs.	☐ Document and promote useful techniques to communicate complex asset management analysis results.	☐ Develop training plans for data analysis and data science practices and applications. Routinely evaluate to ensure alignment with staff needs.	
☐ Other:	☐ Other:	☐ Other:	☐ Other:	

Assessment Notes:

Improvement Notes:

D.1.c – Analysis Tools

D-Analyze Data
1-Data Exploration, Reporting and Visualization

Element Description	Tools supporting productive analysis and reporting practices (e.g. GIS, charting, reporting, dashboards)

Benchmark Level 0	Benchmark Level 1	Benchmark Level 2	Benchmark Level 3	Benchmark Level 4
No tools exist.	Tools for data exploration, reporting, and visualization are available in the agency but they are geared to expert users and requests for reports, dashboards or maps involve a request process with substantial lead time for service.	Limited tools are procured by individual business units that can be used to meet basic reporting and mapping needs. There is no training (or support for training) on proper application of these tools.	A variety of tools for data exploration, reporting, and visualization are available for use, and training is available to ensure that the capabilities of these tools is fully leveraged.	Standard tools for data exploration, reporting, and visualization are available across the agency, and meet the needs of asset management staff. The agency provides training and support for these tools and undertakes periodic improvements / upgrades to ensure they evolve with changing business and technology.
Current: ☐ Desired: ☐	Current: ☐ Desired: ☐	Current: ☐ Desired: ☐	Current: ☐ Desired: ☐	Current: ☐ Desired: ☐
☐ Develop agreements and/or process for use of analysis tools and/or expert analysts in support of priority analysis needs.	☐ Implement analysis tools allowing internal asset program staff to meet basic reporting and mapping needs.	☐ Transition existing analysis to standard business intelligence/analysis tools.	☐ Implement data profiling tools supporting random sampling of large datasets and provide graphical insights into data distributions and outlier values.	
☐ Inventory in-house asset management, reporting, business intelligence, dashboarding and other tools useful to asset related analysis.	☐ Document simple user instructions for available analysis tools.	☐ Develop training materials supporting application of standard tools to individual program analysis, reporting, and mapping needs.	☐ Develop detailed training plans for analysis tool uses and applications. Routinely evaluate to ensure alignment with staff needs.	
☐ Other:	☐ Other:	☐ Other:	☐ Other:	

Assessment Notes:

Improvement Notes:

Date: **Participating Members:**   **Assessment Context:**

D-Analyze Data
2-Modeling

D.2.a – Asset Performance Prediction

Element Description Capabilities for development and application of asset performance models.

Benchmark Level 0	Benchmark Level 1	Benchmark Level 2	Benchmark Level 3	Benchmark Level 4
Asset performance models have not been developed.	Predictive models have been developed for key asset condition or performance measures. There is limited confidence in these models for applications outside of network-level performance prediction or needs analysis.	Predictive models have been developed for key condition or performance measures. These models are generally trusted and applied in project-level decision-making. However, these models are not routinely validated and/or evaluated for improvement.	Predictive models have been developed for key condition or performance measures. These models are trusted, integrated into project-level decision-making and are periodically validated and improved using project-level and/or asset specific information.	Prediction and model building leverage asset component and/or very specific location or asset information. Available information is used to tailor model input to the specific asset, with built in methodologies to revert to network level models when asset specific data is not available or trusted. Models and assumptions are regularly validated.
Current: ☐ **Desired:** ☐	**Current:** ☐ **Desired:** ☐	**Current:** ☐ **Desired:** ☐	**Current:** ☐ **Desired:** ☐	**Current:** ☐ **Desired:** ☐
☐ Develop predictive models for key condition or performance data using historical data and/or expert opinion.	☐ Improve predictive modeling through evaluation of available condition or performance data, reducing reliance on expert opinion as a key input to the models.	☐ Improve predictive modeling through integration of data sources beyond condition or performance data (e.g. utilization/environmental data).	☐ Develop performance modeling based on data collected for a specific asset or location.	
☐ Develop methodology for use of predictive models in forecasting network-level needs.	☐ Develop methodology for use of predictive models in project-level investment decision-making. Document processes for use.	☐ Validate and improve methodology for use of models in project-level decision-making. Document processes for use.	☐ Develop analytical tools to identify discrepancies between actual and anticipated performance.	
☐ Other:	☐ Other:	☐ Other:	☐ Other:	

Assessment Notes:

Improvement Notes:

D-Analyze Data
2-Modeling

D.2.b – Optimization / Prioritization

Element Description   Capabilities for development and application of prioritization and optimization techniques.

Benchmark Level 0	Benchmark Level 1	Benchmark Level 2	Benchmark Level 3	Benchmark Level 4
Asset investment prioritization is not conducted.	Investment prioritization / optimization methodology exists for individual assets. This methodology does not use information on work history and planned work.	Investment prioritization / optimization methodology exists for individual assets and uses information on work history and planned work.	Results from individual asset investment optimizations are used to discuss investment tradeoffs across assets, however there is no quantitative approach to cross-asset optimization.	A quantitative approach to cross-asset resource optimization is in use.
Current: ☐ Desired: ☐	Current: ☐ Desired: ☐	Current: ☐ Desired: ☐	Current: ☐ Desired: ☐	Current: ☐ Desired: ☐
☐ Develop treatment selection criteria, associated improvement benefit and cost models, and methodology for investment optimization and prioritization.	☐ Improve treatment selection criteria, benefit and cost models, and prioritization through analysis of historical data and expert opinion.	☐ Improve treatment selection, benefit and cost models, and prioritization with non-asset data (e.g. utilization / environmental data).	☐ Develop method to tie asset investments to overarching "benefit" or "value" against agency objectives, supporting a quantitative cross-asset resource optimization approach.	
☐ Document key factors input as constraints to optimization analysis (e.g. performance constraints, available funding). Identify values / data sources.	☐ Identify data sources for planned work and define method for incorporating this data into existing investment analysis.	☐ Produce asset specific investment optimization / prioritization analysis results in a format useful in an overarching investment optimization and prioritization decision process.	☐ Develop analytical tools to identify where discrepancies are identified between actual and anticipated performance of asset investments and improvements.	
☐ Other:	☐ Other:	☐ Other:	☐ Other:	

Assessment Notes:

Improvement Notes: