

Performance Audit of Metro Transit Work Tasks

Service Design Analysis:

Determine whether routes are being designed in such a way that resources are being efficiently and effectively utilized

Service design analysis: Are Metro's service design standards appropriate and are they used effectively to make service decisions?

To be effective, what provisions should Metro's service design standards include?

Are Metro routes designed to minimize off-route travel unless supported by passenger boarding trends?

Do routes unnecessarily duplicate each other?

Do routes function effectively as an overall system?

Does Metro's service design reflect ongoing and projected changes in land use and demographic patterns?

What impacts do existing criteria have on service design and operating costs? Should service design standards be changed, and if so, how should they change?

Delay analysis: Does Metro evaluate delays and take steps to minimize them?

To be cost effective, a transit system would take measures to minimize delays.

Are policies and procedures in place that allow Metro's supervisory staff to monitor street operations and implement remedial actions when appropriate? Are established procedures followed? Are they adequate?

Are bus stop locations appropriately spaced to minimize delays? What are the costs associated with current bus stop placement practices?

Runtime and recovery analysis: Are route running times and schedule recovery times developed to balance on-time performance objectives and operating costs?

What standard runtime to recovery ratios are used by peer transit agencies? What standards does Metro apply? What labor contract provisions impact Metro's standards?

Do Metro buses run on time?

Do Metro services meet but not greatly exceed contract requirements? Are actual run times consistent with scheduled times? Are actual layovers consistent with the contract and standard industry practices?

What conditions cause schedule runtimes to deviate from industry norms?

Can layover times be reduced?

Load Factor Analysis: Are vehicles being efficiently allocated to individual routes/time periods and are service frequencies and seating capacities appropriate for the loads carried?

What should Metro's passenger load standards be?

What load factors is Metro experiencing (current, FY08, audit period)?

How do base and fleet constraints impact load factors and service decisions?

How do Metro's passenger loads compare to peer agencies?

Does the existing schedule optimize resource allocation? What actions does Metro take in response to over/under loading?

Schedule Coordination: Are there opportunities to reduce costs in corridors served by more than one route?

Headway Standards

Metro minimum/maximum headway standards, by time of day

Determine if routes along each of the 20 corridors are over- or under-served

Load Standards

Metro load standards and ridership

How do passenger loads on routes in 20 corridors compare to load standards?

Metro schedule coordination across multiple routes

Determine extent to which schedules are coordinated. Identify potential alternative routings to reduce service duplication.

What would be the ridership, load and cost/cost savings implications of eliminating or moving a route(s)?

Scheduling Practices:

Determine whether routes are being scheduled efficiently and effectively

Scheduling effectiveness analysis: What is an effective measure of schedule performance as a ratio of total service hours to revenue hours?

The ratio of total service hours to revenue hours is a common and effective measure of schedule performance. What is Metro's current ratio and what should it be? What ratio do other transit agencies experience?

Are Metro's current scheduling practices consistent with industry best practices and overall, do they appear to be efficiently conducted?

Analysis of travel times: Are schedule efficiencies considered during the planning process? Are inefficiently planned routes grouped to optimize round trip cycle times and reduce operating costs?

How should Metro provide for running time variability in designing its schedules?

When are interlines employed? What are the costs associated with current practices? Are agency criteria cost effective?

Do timetables enforce synchronization of inbound and outbound trips to achieve natural efficiencies observed with the Round Trip Cycle Time (RTCT) and trip cycle time (TCT) analysis?

Are Metro services interlined when it is economically advantageous to do so? Do current practices result in inefficiencies?

Does Metro achieve stand alone blocking when developing routes and schedules?

Is interlining handled appropriately?

Deadhead analysis: Is work being assigned and routed optimally?

What rules govern the assignment of deadheads? Are they consistent with practices at other agencies?

How do Base restrictions/constraints impact analysis/decisions? Is work being assigned from the optimal garage?

Is deadhead routing optimal?

Blocking and fleet optimization: Do Metro's blocking and fleet optimization methodologies minimize overall operating costs?

Do Metro's blocking and fleet optimization practices result in minimizing the number of vehicles employed, put together pieces of work that break into logical (8-10 hrs) work days, and minimize non-revenue time (layover and deadhead).

Do Metro's scheduling and software approaches result in the production of efficient vehicle blocks?

Runcutting: Does Metro efficiently balance operator requirements and related fringe benefit costs against overtime and guarantee costs?

Is Metro using appropriate measures to judge the effectiveness of current runcutting practices?

Do current runcutting practices result in economical operations and effective use of operators?

Labor Contract Analysis:

Determine whether collective bargaining agreement provisions are being optimized in scheduling operators

Review of labor contract provisions: Does Metro use labor contract provisions effectively in scheduling operators?

Do Metro's scheduling practices leverage labor contract provisions to optimize the number of operators required?

What unwritten past practices impact Metro's scheduling practices?

Are labor rules consistent with their implementation in terms of software guidelines, scheduling practices, and resulting production schedules?

What constraints on scheduling practices exist that management acknowledges are set by the labor agreement?
How do side agreements constrain Metro's ability to achieve economies through scheduling practices?
What changes has Metro agreed to over the last 2-3 labor agreements that impact Metro's ability to schedule efficiently?
What constraints exist that restrict Metro's ability to fully leverage labor contract provisions?
Operating Practices: Determine whether staffing levels are appropriate for the level of service operated
Operator utilization: Does Metro effectively manage operator staffing requirements?
Is Metro effectively considering service levels, labor contract provisions, attrition, absenteeism, recruitment and hiring, and training when determining staffing needs?
Does Metro effectively employ labor contract provisions in utilizing operators?
Is Metro utilizing part time operators efficiently and effectively?
Are Metro's staffing and extraboard practices managed developed effectively and efficiently?
Is Metro's span of control (Supervisors to Operators) appropriate?
Data: Determine whether Metro staff are making optimal use of available data and software
Use of data: Are APC, AVL, HASTUS and farebox data being used effectively to optimize service planning?
What data are available and are they used in service planning and evaluation?
Is there a need for additional data that are not readily available?
Are there concerns about the validity and/or completeness of available data?
Are there opportunities to improve available data through integration?
Are there opportunities to better integrate data?
Software tools and approach: Is Metro optimizing the use of Hastus to achieve service effectiveness and scheduling efficiency objectives?
Is Metro effectively using HASTUS by utilizing all available features to balance customer needs with operating costs?
Is Metro optimizing HASTUS to achieve service effectiveness and scheduling efficiency objectives?
Service management: Are there opportunities to better manage service delivery by using data to support real-time remedial actions?
Is Metro effectively using service data to make real-time service adjustments?
Are service data used to make real-time service adjustments?
Are there additional opportunities to use data to make proactive, real-time service adjustments at the Operations Control Center and in the field
Vehicle Maintenance: Determine whether bus maintenance operations are being conducted efficiently and effectively
Preventive maintenance (PM)/corrective maintenance (CM): Is Metro adhering to preventive maintenance schedules - and if not, what are the implications for maintenance costs?
Required PM intervals per Metro's Maintenance Plan and PM checklists
Review mileage intervals between PMs conducted in 2008 for a sample base to assess Metro's compliance with its PM intervals. (If electronic data are available for the entire system, review entire system rather than just one base.)
Are Metro's PM intervals based on manufacturers recommendations? If not, what is the basis for Metro's PM intervals?

Is Metro within $\pm 10\%$ of schedule? What proportion of PMs is higher/lower than the range specified?
What are the cost implications of early/late PMs? What are other implications of deferring preventive maintenance?
Relative proportions of time spent on preventive and corrective maintenance, systemwide, for FY2008
For a sample base, determine proportion of time spent on CMs and PMs in FY2008
What is the cost/level of effort for large CM jobs that are performed routinely (e.g., brakes, engines, transmissions)? Given the nature and extent of CM activities, could a Zero Defect program reduce maintenance costs?
What are the cost/other implications of corrective maintenance? Are there ways to reduce CM costs?
Vehicle maintenance productivity: Could the productivity of Metro's maintenance resources be improved?
Metro's productivity standards (e.g., revenue vehicles per mechanic), by base for FY2008
Review productivity and efficiency indicators by shift, by base, for all seven bases.
Are there significant differences across bases? If Metro is not achieving its standards, what are the causes? Are there industry strategies or approaches already used by Metro to improve productivity that could be applied to less productive bases/shifts?
Standard repair times: Does Metro effectively use reasonable time expectations to manage major maintenance activities?
Time standards for major maintenance activities used by Metro
Determine the fleets and major maintenance activities for which Metro uses standard times and the expected benefits to Maintenance of using standard times.
How is adherence to standard times measured? What proportion of work is higher/lower than the range specified?
What are the cost/other implications of work that is performed in more/less time than expected? What are the benefits to Maintenance of using reasonable time expectations? Should time standards be updated?
What value do reasonable time expectations have for Metro's maintenance program? Should the use of standard time expectations be expanded?
Vehicle maintenance staffing: Does Metro effectively manage its maintenance staff resources, relative to maintenance and shift requirements?
Metro's shift requirements and supervisory ratios, by base for FY2008
Review absence patterns, use of FMLA and overtime, supervisory ratios and efficiency indicators (e.g., absence rates, supervisory ratios, average overtime per mechanic) by shift, by base.
How do supervisory ratios compare across bases/shifts and to industry practices? What are the costs/other implications of unusually high/low supervisory ratios?
Are Metro managers effectively managing employee performance (particularly attendance) according to terms of the labor contract? Are there significant differences across bases? What are the costs/other implications of not managing staff to contract provisions?
Fare Strategies
nearing finalization
Paratransit
nearing finalization
Trolley Bus Alternatives:
Evaluate costs and benefits of alternatives to the existing trolley bus fleet
Background
Commitment to sustainability and climate control

Alternative technologies
FTA support and funding of new technologies
ETB status in other systems
FTA support/position on ETB procurements
Viability of ETBs, based on projected demand, availability and funding for ETBs
Baseline: Metro fleet data
Condition and operating and maintenance costs of KCM's ETB fleet
Operating and maintenance costs of KCM's HEB fleet
Compare performance of Metro's ETB fleet (e.g., emissions, vehicle performance in snow) to alternatives (HEB, all battery, fuel cell, other alternatives identified)
Evaluate implications of 40' vs. 60' buses
Life Cycle Cost Analysis
ETB Infrastructure
ETBs
Hybrids
Fuel Cell
All Battery
Consider implications of 40' vs. 60' vehicles
Transit Financial Plan and Model
Determine if Metro's financial plan and financial model are effective and serve their intended purposes.
Are the financial plan and financial model effective?
Do the plan and model comply with the principles for sound financial planning?
Are Transit's cost recovery relationships fully reflected in the plan and model?
How sensitive is the model to changes in assumptions and variables?
Have the model and plan been accurate historically? If not, what parts of the model have not been accurate?
Is the financial plan being effectively used by Transit management, OMB, and Council?
What would effective use of the plan and model look like? What level of review/oversight is appropriate?
What information is useful to decision-makers in the model and plan?
What review/oversight is performed and what decisions are made based upon the plan? Is the level of review/oversight appropriate?
Is the information in the model and plan useful to decision-makers?
Cost Allocation (currently reassessing approach)
Determine if the financial impact of the services provided to Sound Transit, Vanpool customers, Employer Pass, South Lake Union Streetcar, and Free Ride Area programs administered by Transit have a fair cost recovery.
Full cost recovery best practices, county policy for cost recovery, contractual agreements for cost recovery.
What is county policy for cost allocation for the financial relationships with Sound Transit? Is Transit meeting policy requirements? If not all costs are recovered, what is the difference between the cost of delivery and cost recovery (i.e. what effect does the difference have on Transit?)
What is county policy for cost recovery for VanPool? Is cost recovery meeting policy requirements? If cost recovery is not full cost recovery, what is the difference between the cost of delivery and cost recovery (i.e. what effect does the difference have on Transit?)
What is county policy for Employer Passes? Is cost recovery meeting policy requirements? If cost recovery is not full cost recovery, what is the difference between the cost of delivery and cost recovery (i.e. what effect does the difference have on Transit?)

What is county policy for cost recovery for South Lake Union Streetcar? Is cost recovery meeting policy requirements? If cost recovery is not full cost recovery, what is the difference between the cost of delivery and cost recovery (i.e. what effect does the difference have on Transit?)

What is county policy for Ride Free Area? Is cost recovery meeting policy requirements? If cost recovery is not full cost recovery, what is the difference between the cost of delivery and cost recovery (i.e. what effect does the difference have on Transit?)

Capital Financial Planning

Determine if capital financial planning has been effective.

Does Transit effectively plan for replacing its fleets?

Does Transit conduct economic replacement analysis for its various fleets?

Are the fleet replacement plans for revenue, non-revenue, VanPool, Access, and DART effectively managed?

Are replacement reserves maintained at an appropriate level?

Does Transit effectively plan the capital budget?

Have recommendations of two prior audits been implemented? In particular, evaluate prioritization processes, TAMP, and Transit's ability to complete its planned projects. If recommendations have not been implemented, why not?

Operations Staffing

Track and Supplement

Supplement BAH Operations Staffing Analysis as needed.

Quantify implications of review of collective bargaining agreements, rules, practices.

Ensure that full costs of full-time vs. overtime vs. part-time vs. compensatory time of providing staffing resources for transit operations are captured.

Collect and Share Absence Data

Assist BAH in acquiring relevant data on staff absences (both planned and unplanned), and follow the BAH analysis of absence trends and reasons.

Conduct the elements of a "relief factor" analysis, identifying patterns and amounts of planned and unplanned absences by staffing type and pay level.

Binomial Modeling

Based on estimates from BAH on current or desired Full-Time, Extraboard and Relief staffing resources, by individual BOF or in combination, use information gathered in previous tasks to create a binomial staffing model.

Subject to best practices or policy directives defining operational constraints, identify the most cost-effective mix of staffing resource needed to carry out given levels of operation.

Vehicle Maintenance Staffing (currently reassessing approach)

Track and Supplement

Supplement BAH Operations Staffing Analysis as needed

Quantify implications of review of collective bargaining agreements, rules, practices.

Ensure that full costs of full-time vs. overtime vs. part-time vs. compensatory time of providing staffing resources for transit vehicle maintenance are captured.

Collect and Share Absence Data

Assist BAH in acquiring relevant data on staff absences (both planned and unplanned), and follow the BAH analysis of absence trends and reasons.

Conduct the elements of a "relief factor" analysis, identifying patterns and amounts of planned and unplanned absences by staffing type and pay level.

Binomial Modeling

Based on estimates from BAH on current or desired VM staffing resources, use information gathered in previous tasks to create a binomial staffing model.

Subject to best practices or policy directives defining operational constraints, identify the most cost-effective mix of staffing resource needed to carry out given levels of operation.

Transit Metro Police and Security

Assess existing staffing plans

Are the methods used to determine staffing needs and set staffing levels for the Metro Transit Police and Transit Security soundly developed and efficiently administered?

How does the Metro Transit Police model (scope, responsibilities, staffing levels/plan) compare to national practices or peer agencies? Same question for Security operations.

Evaluate staffing methods/models, determine if they are clearly tied to work load factors or policy goals and based on sound data.

Assess cost-effectiveness of scheduling and OT/relief management practices. If warranted (given small size of operations) determine the most cost effective mix of OT/ST through binomial staffing analysis.

Assess Sound Transit's Impact

Assess the impact of the pending tunnel expansion on staffing needs for Metro Transit Police and Security.

Communication with Riders During Emergencies

How effectively does Metro communicate accurate real-time schedule information to customers during emergencies or other events that alter transit schedules?

What mechanisms does Metro use, or plan to use prior to the winter 2009 snow season, to communicate real-time schedule changes to customers and others during emergencies or other events that alter regular transit schedules?

How does Metro know it is meeting customer's communication needs?

a) What performance measures will Metro use to evaluate whether customer communication is effective?

b) How is Metro using customer feedback to design an effective communication strategy?

c) How does Metro plan to evaluate its communication strategy to ensure customers or others are receiving accurate and sufficient schedule information during emergencies or other events that alter transit schedules?

Is Metro's existing or planned communication methods consistent with transit industry best practices/benchmarks and Web 2.0 strategies?

Do gaps exist in Metro's existing or planned emergency communication mechanisms and/or strategy with customers?