Union Pacific Railroad Project Plan Outline for Emission Estimation and Dispersion Modeling of Railyards Under the ARB/Railroad Statewide Agreement of June 2005
DRAFT – September 23, 2005

TASK OUTLINE

General Data Applicable to All Yards

1. Emission Factors
   1.1. Locomotives (g/hr)
      1.1.1. By model group
      1.1.2. By throttle notch
      1.1.3. Adjustment factors for Tier 0, 1, and 2
      1.1.4. Adjustment factors for fuel sulfur
   1.2. Off-road equipment (g/bhp-hr)
      1.2.1. By horsepower
      1.2.2. By model year
      1.2.3. Deterioration rate equation
      1.2.4. Adjustment factors for fuel sulfur
      1.2.5. Conversion factor for bhp-hr/gallon of fuel to produce g/gal emission factors
   1.3. On-road diesel vehicles
      1.3.1. EMFAC2002 scenario specs (CY2004 County-specific)
      1.3.2. Default age and mileage accumulation assumptions if fleet-specific data are not available
      1.3.3. Adjustment factors for fuel sulfur (if ULSD is used)
      1.3.4. Method for estimating idle emission rates

2. Base Activity and Equipment Parameters
   2.1. Locomotives
      2.1.1. In-yard default duty cycle if data/engineering estimates not available (EPA switch cycle w/o N7 or N8)
      2.1.2. Assumed duration of idle events for non-auto-start-stop (ZTR, AESS) units
      2.1.3. Assumed duration of idle events for auto-start-stop units
      2.1.4. Idling stack parameters by model group
      2.1.5. Volume source parameters for in-yard movements
2.2. Off-road equipment
   2.2.1. Default annual operating hours by equipment type if data not available
   2.2.2. Default average load factor by equipment type if data not available
   2.2.3. Develop method to reconcile operating schedule and load factors with total fuel deliveries, if fuel consumption is available
   2.2.4. Stack parameters by equipment type and horsepower range for stationary and slow moving equipment (e.g., RTG cranes)
   2.2.5. Volume source parameters for moving off-road equipment (e.g., yard hosters)
   2.2.6. Default average diurnal operations profiles by equipment type

2.3. On-road vehicles
   2.3.1. Default stack parameters for idling by vehicle class
   2.3.2. Default idling event duration
   2.3.3. Default on-site speed distribution
   2.3.4. Default volume source parameters for moving vehicles by vehicle class

Yard-Specific Data and Tasks

3. Georeferenced Facility Information (UTM)
   3.1. Boundaries
   3.2. Main line (through) tracks
   3.3. Arrival and departure tracks
   3.4. Switching operational areas
   3.5. Hump operational areas
   3.6. Service areas
   3.7. Maintenance and testing areas
   3.8. Other consist idling locations
   3.9. Operational locations and areas for off-road intermodal equipment by equipment type
   3.10. Operational areas for on-road freight vehicles (container, auto carrier)
   3.11. Yard entrances
   3.12. Routes followed by on-road freight vehicles
   3.13. DTL fueling areas and tanker routes

4. Activity Data by Yard
   4.1. Locomotives on Trains (Transient)
4.1.2. Train data for base year

4.1.3. Process train data
   4.1.3.1. Number by time of day, direction, arrival and departure area
   4.1.3.2. Consist characteristics by area (model group distribution, number working per consist, Tier, auto start-stop)
   4.1.3.3. Baseline characteristics (total trailing tons, horsepower, etc.)

4.2. Consist service, maintenance and movements
   4.2.1. Routes, speeds and notch for in-yard consist movement
   4.2.2. Idle time estimates by location/service event type
   4.2.3. Service and shop release data for base year
   4.2.4. Process service, shop and train data
      4.2.4.1. Number of movements between areas
      4.2.4.2. Number of service events by type
      4.2.4.3. Number of load tests by model group and type

4.3. In-yard (Resident) Locomotive Operations
   4.3.1. Population of working in-yard locomotives by model group, Tier, auto start-stop
      4.3.1.1. Trim
      4.3.1.2. Hump
      4.3.1.3. Flat switching
      4.3.1.4. Remote control locomotives (RCLs)
      4.3.1.5. Other
   4.3.2. Work areas, speeds and routes by activity
   4.3.3. Diurnal work patterns (on-shift, off-shift, tradeouts)
   4.3.4. Duty cycle by activity while working
   4.3.5. Idling duration (if any) for off-shift periods

4.4. Off-road Yard Equipment
   4.4.1. Census of captive off-road equipment
      4.4.1.1. Type (e.g., yard hostler, RTG crane, gen-set)
      4.4.1.2. Horsepower
      4.4.1.3. Model year
      4.4.1.4. Assigned activity or work area
   4.4.2. Activity data (depending on availability)
4.4.2.1. Annual operating hours
4.4.2.2. Fuel deliveries
4.4.2.3. Diurnal activity profile
4.4.2.4. Routes and speeds

4.5. Transient Off-road Equipment
4.5.1. Number, type, and horsepower arriving daily
4.5.1.1. TRUs
4.5.1.2. Other?
4.5.2. Average duration on-site
4.5.3. Duty cycle

4.6. Transient On-road Vehicles
4.6.1. Number of trucks arriving by carrier
4.6.2. Age (model year) and vehicle class by carrier
4.6.3. On-site dwell by carrier
4.6.4. Diurnal arrival and departure profile
4.6.5. Entrance and routes
4.6.6. On-site speeds
4.6.7. Idle duration on arrival, during loading/unloading, departure gate

5. Preliminary Emission Inventory Preparation and Review
5.1. Calculate emission totals by major activity
5.1.1. Transient locomotive arrival and departure
5.1.2. Consist movement in yard
5.1.3. Idling and load testing during service
5.1.4. Resident locomotive operations
5.1.5. Captive off-road equipment by activity (container loading/unloading, yard hostlers, other)
5.1.6. Transient off-road equipment
5.1.7. Transient on-road vehicles
5.2. Calculate approximate emission density by work area
5.3. Assess level of spatial/temporal detail needed for emission inputs to modeling
5.4. Collect additional data if needed

6. Prepare Emission Inputs for Modeling
6.1. Define source groups
6.2. Disaggregate emissions by major activity to multiple point or volume sources
6.3. Spatially distribute individual sources
6.4. Prepare hourly activity factors for source groups
6.5. Prepare stack or volume source parameters for source groups
6.6. Assemble source pathway ISC inputs
6.7. Post-process ISC inputs to verify emission totals

7. Select Meteorological Inputs
   7.1. Review closest sites from SCAQMD 1981 data sets (SoCAB)
   7.2. Identify other APCD, ARB, EPA, or other available data
   7.3. Assess differences in wind speeds and directions, and potential terrain influences
   7.4. Select two or three most representative data sets

8. Conduct Preliminary Modeling
   8.1. Develop a coarse receptor grid (200+ meter spacing, 40 x 40 km domain
   8.2. Exercise model for each meteorological data set
   8.3. Review isopleths to assess uncertainty associated with meteorological inputs
   8.4. Identify appropriate fine grid receptor arrays (locations and spacing)
   8.5. Identify appropriate total domain dimensions

9. Conduct Refined Modeling
   9.1. Prepare multiple fine and coarse grid receptor arrays
   9.2. Select meteorological data set(s)
   9.3. Conduct modeling for annual average concentrations
   9.4. Conduct modeling for near-field diurnal concentrations
   9.5. Generate annual average concentration isopleth plots for total facility and major
         source group emissions

10. Post-Process Modeling Results
    10.1. Obtain census block group boundaries and populations
    10.2. Calculate spatial average concentrations by census block group
    10.3. Calculate residential population potential exposure distributions
    10.4. Plot predicted diurnal concentration variation for near-field receptors

11. Reporting
    11.1. Document emission inventory preparation and assumptions
    11.2. Document assessment of meteorological data
11.3. Document predicted concentration patterns and assess the magnitude and source of major uncertainties

11.4. Document residential potential population exposures

11.5. Assemble electronic files documenting results (activity, emission calculations, model inputs, model outputs)