TRANSFER STATION ECONOMICS: DESIGN, CONSTRUCTING & OPERATING

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- Cost Model Assumptions
- Cost Model Results
- Costs of Increased Waste Diversion
- Operational Cost Factors
- Operational Cost Considerations
- Procuring Landfill Capacity
- Scheduling to Meet the October 2007 Compliance Date
- Questions and Answers

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COST MODEL ASSUMPTIONS

- The purpose of the model is to determine the per ton cost to develop and operate a transfer station
- The following costs are quantified:
  - Site development costs
  - Building construction costs
  - Operating costs
- Two scenarios have been evaluated:
  - Retrofit an existing building (least likely)
  - Construct a new facility (most likely)

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COST MODEL ASSUMPTIONS (cont'd)

- General assumptions for both scenarios:
  - Average throughput = 30 tons per day
  - No additional costs have been assumed for:
    - Stormwater management
    - Local approval and permitting
    - Land acquisition
  - Personnel assumed to consist of supervisor / equipment operator, laborer and scalehouse clerk
  - Assumes all equipment purchased new (not leased or purchased used)

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COST MODEL ASSUMPTIONS (cont'd)

SCENARIO 1: BUILDING RETROFIT

OPTION A: TOP-LOAD TRANSFER TRAILERS AT GRADE WITHIN BUILDING

- Preliminary requirements to permit a building retrofit:
  - Building dimensions (minimum) = 60 feet deep, 60 feet wide
  - Clear-span height (minimum) = 30 feet
  - No center columns present in the building
  - Existing concrete floor with minimum thickness = 6 inches

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COST MODEL ASSUMPTIONS (cont'd)

SCENARIO 1: BUILDING RETROFIT

OPTION A: TOP-LOAD TRANSFER TRAILERS AT GRADE WITHIN BUILDING

- Existing building / site features:
  - Scale and scalehouse in place and available to use by facility
  - Access door dimensions (minimum) = 24 feet high, 15 feet wide (collection vehicle access); 16 feet high, 12 feet wide (passenger vehicle access)
  - All utilities present on-site and connected to building (electric, water, telephone, gas, sanitary sewer)
  - Fencing is installed around the facility perimeter
  - No site grading or placement of gravel / pavement required

COST MODEL ASSUMPTIONS (cont'd)

SCENARIO 1: BUILDING RETROFIT

OPTION A: TOP-LOAD TRANSFER TRAILERS AT GRADE WITHIN BUILDING

- Required building modifications:
  - Tipping floor installed, minimum thickness = 6 inches reinforced concrete
  - Pushwall installed along back wall and half of side wall (90 feet), consisting of concrete gravity blocks to height of 8 feet
  - Install washwater storage tank

- Operating equipment required:
  - Front-end wheel loader

COST MODEL ASSUMPTIONS (cont'd)

SCENARIO 1: BUILDING RETROFIT
OPTION B: TRUCK-TO-TRUCK TRANSFER

- Preliminary requirements to permit a building retrofit:
  - Building dimensions (minimum) = 90 feet deep, 30 feet wide
  - Clear-span height (minimum) = 30 feet
  - No center columns present in the building
  - Access available from both ends of building

COST MODEL ASSUMPTIONS (cont'd)

SCENARIO 1: BUILDING RETROFIT

OPTION B: TRUCK-TO-TRUCK TRANSFER

- Existing building / site features:
  - Scale and scalehouse in place and available to use by facility
  - Access door dimensions (minimum) = 24 feet high, 15 feet wide (collection vehicle access)
  - All utilities present on-site and connected to building (electric, water, telephone, gas, sanitary sewer)
  - Adequate space available on-site to locate citizen drop-off area
  - Fencing is installed around the facility perimeter
  - No site grading or placement of gravel / pavement required

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COST MODEL ASSUMPTIONS (cont'd)

SCENARIO 1: BUILDING RETROFIT

OPTION B: TRUCK-TO-TRUCK TRANSFER

- Required modifications:
  - Loading ramp constructed within building for collection vehicles to back to level of trailer bed (approximately 4 feet)
  - Citizen drop-off area, consisting of roll-off boxes and signs indicating operating procedures
  - Install washwater storage tank

- Operating equipment required:
  - Transfer trailers (2) designed for truck-to-truck transfer
  - Small wheel loader

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COST MODEL ASSUMPTIONS (cont'd)

SCENARIO 2: CONSTRUCT NEW FACILITY

- Site requirements:
  - Minimum site size = approximately 1.25 acre
  - All utilities available from the property line
  - All maneuvering areas and access roads will be gravel
  - Scale and scalehouse must be constructed
  - Site is assumed to be level and require minimal grading or excavation

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COST MODEL ASSUMPTIONS (cont'd)

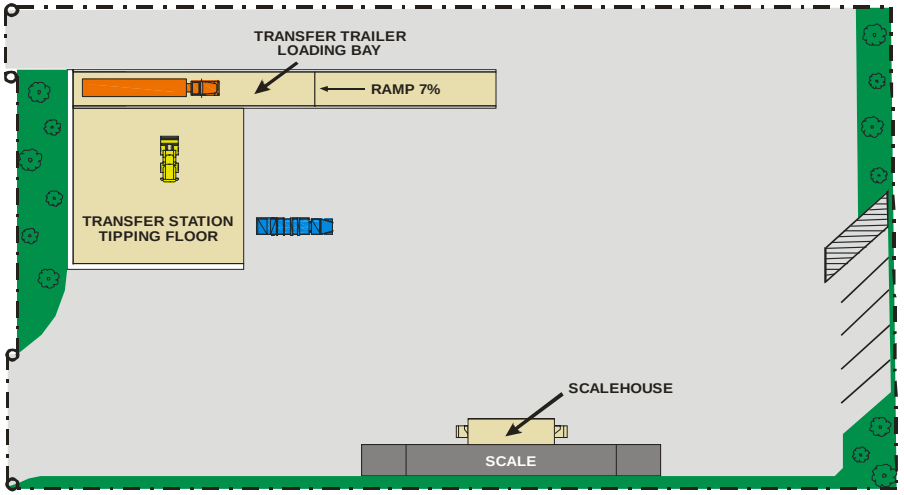
SCENARIO 2: CONSTRUCT NEW FACILITY

- Building requirements:
  - Dimensions (minimum) = 60 feet deep, 60 feet wide
  - Clear span height (minimum) = 30 feet
  - No center columns
  - Access door dimensions (minimum) = 24 feet high, 15 feet wide (collection vehicle access); 16 feet high, 12 feet wide (passenger vehicle access)
  - Tipping floor (minimum thickness) = 12 inches reinforced concrete

COST MODEL ASSUMPTIONS (cont'd)

SCENARIO 2: CONSTRUCT NEW FACILITY

- Building requirements (cont'd):
  - Reinforced concrete pushwalls on rear and one side of building to height of 8 feet
  - Depressed back-in loading bay for transfer trailer loading, depressed to 6 feet with 7% ramp grade
  - Floor drains installed to capture washwater and deliver to storage tank



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COST MODEL RESULTS

- Components of per ton transfer station cost:
  - Construction and operating cost
  - Transportation cost
  - Disposal cost

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COST MODEL RESULTS (cont'd)

- The analysis to this point calculates the cost per ton to construct and operate a transfer station
- Assumes that landfills raise current tip fees by October 2005 by the incremental cost to become Subtitle D-compliant ($17.10 – $21.54 per ton)
  - Additional tip fee is placed in a reserve fund to partially finance initial capital investment for transfer station development
  - Remainder of capital investment is financed through a 15-year loan at a rate of 5%

TRANSFER STATION ECONOMICS: DESIGN, CONSTRUCTING & OPERATING

COST MODEL RESULTS (cont'd)

- Scenario 1: Retrofit existing building
  Option A: Top-load transfer trailers at grade on tipping floor
  - Estimated cost of **$17.73 – $18.37 per ton**

- Scenario 1: Retrofit existing building
  Option B: Truck-to-truck transfer
  - Estimated cost of **$17.37 – $18.01 per ton**

- Scenario 2: Construct new facility
  - Estimated cost of **$20.69 – $23.57 per ton**

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COST MODEL RESULTS (cont'd)

- Additional construction and operating costs may be incurred if:
  - Preliminary building requirements are not met, in the case of a building retrofit (for example, adequate access door dimensions)
  - Additional design features are desired (such as paving interior roads and vehicle maneuvering areas)
  - Retrofit design results in imperfect operations due to limitations of building size, building layout, etc.

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COST MODEL RESULTS (cont'd)

- Construction and operating cost summary:
  - Scenario 1 (retrofit existing building) = **$17 – 18 per ton**
  - Scenario 2 (construct new facility) = **$21 – 24 per ton**

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COST MODEL RESULTS (cont'd)

- Transportation cost:
  - Factors include cost to operate transfer trailer, distance to disposal facility and payload of trailers
  - Formula to calculate per ton transportation cost:

$$\text{Cost per ton} = \frac{(\text{Trailer cost / hour}) \times (\text{Number of hours})}{(\text{Tons per load})}$$

TRANSFER STATION ECONOMICS: DESIGN, CONSTRUCTING & OPERATING

COST MODEL RESULTS (cont'd)

- Transportation cost (cont'd):
  - Estimated cost to operate a transfer trailer = $70 per hour
  - Average trailer payload = 20 tons
  - Example calculation (assuming a round-trip travel time of 2 hours):

$$\text{Cost per ton} = \frac{(\$70/\text{hour}) \times (2\ \text{hours})}{(20\ \text{tons/load})} = \$7\ \text{per ton}$$

TRANSFER STATION ECONOMICS: DESIGN, CONSTRUCTING & OPERATING

COST MODEL RESULTS (cont'd)

- Disposal cost:
  - Variable based on rate negotiated during landfill capacity procurement
  - Planning areas will benefit from negotiating with more than one landfill
  - Cost may decrease in the future as landfills become more regional in nature

TRANSFER STATION ECONOMICS: DESIGN, CONSTRUCTING & OPERATING

COST MODEL RESULTS (cont'd)

- Total cost to transfer haul waste may be calculated:
  Cost per Ton = Construction / Operation Cost + Transportation Cost + Disposal Cost

- Example calculation: assuming a transportation cost of $7 per ton and disposal cost at a regional landfill of $26 per ton:
  - Scenario 1 (retrofit existing building) may result in a total cost of **$50 – $51 per ton**
  - Scenario 2 (construct new facility) may result in a total cost of **$54 – $57 per ton**

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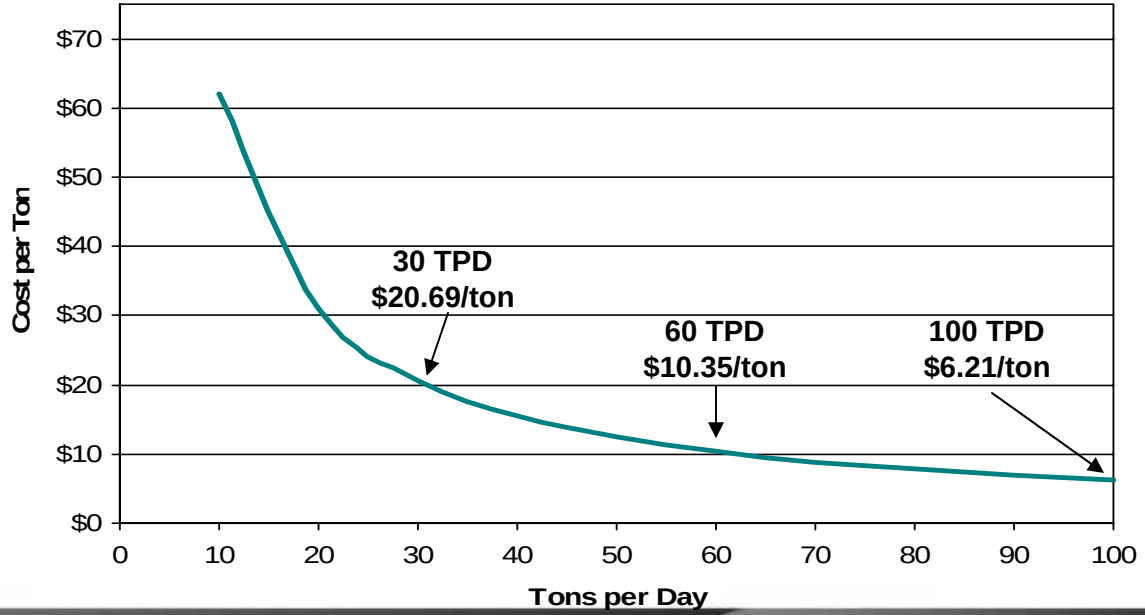
COST MODEL RESULTS (cont'd)

- As average daily tonnage increases, per ton cost of transfer station construction and operation will decrease due to economies of scale:



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COST MODEL RESULTS (cont'd)

- Other options may include direct hauling waste to landfills or transfer stations in other planning areas
  - Construct and operate transfer station and transfer haul waste a given distance or direct haul waste a given distance
  - Compare costs, assuming a cost of $80 per hour to operate a collection vehicle and an average vehicle speed of 50 mph

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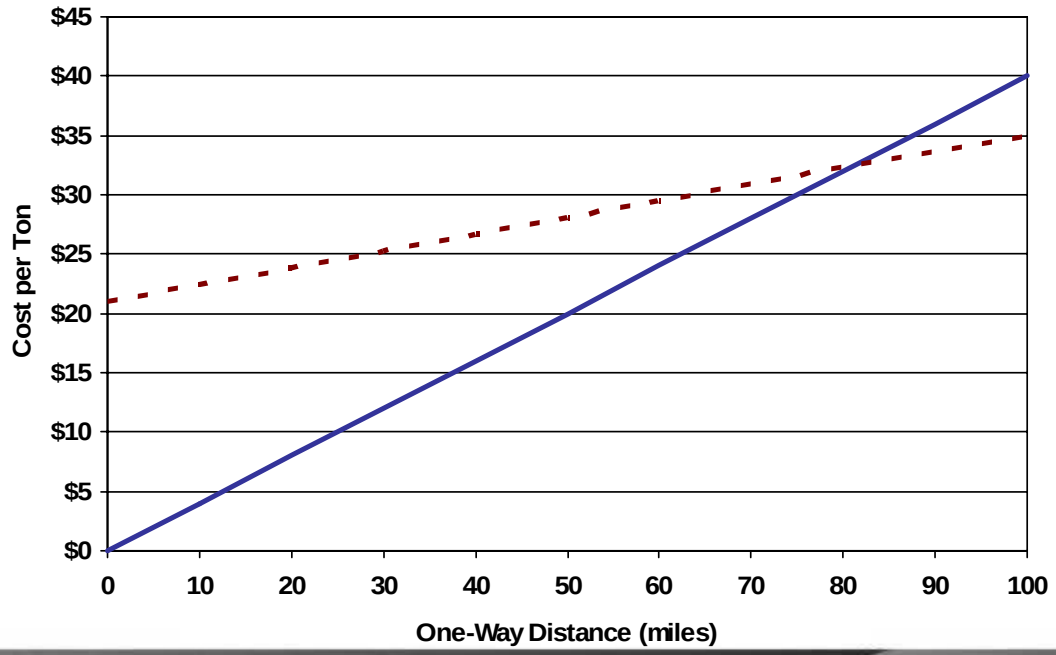
COST MODEL RESULTS (cont'd)

- Other options may include direct hauling waste to landfills or transfer stations in other planning areas (cont'd)



Notes:

1. **Assumes transfer station construction and operating cost of $21 per ton.**
2. **Costs are calculated based on round-trip travel distance.**

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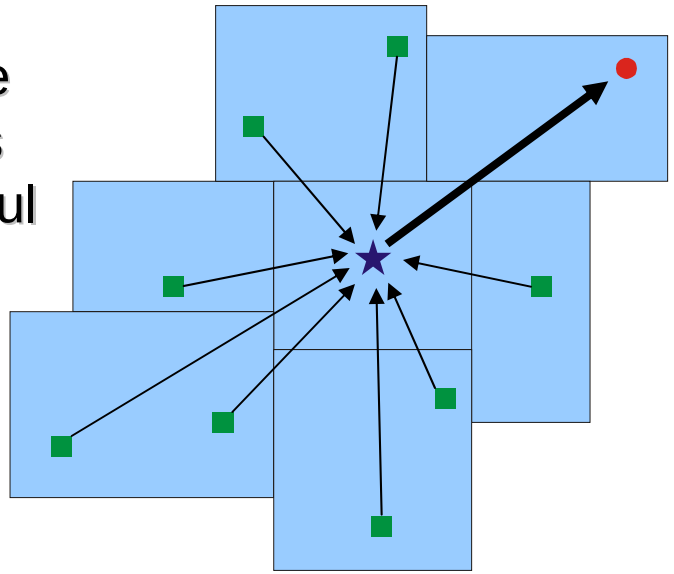
COST MODEL RESULTS (cont'd)

- Other options may include direct hauling waste to landfills or transfer stations in other planning areas (cont'd)
  - Develop citizen convenience centers to serve self-haulers
  - Collection vehicles direct haul to regional transfer station or landfill



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COST MODEL RESULTS (cont'd)

- Other options may include direct hauling waste to landfills or transfer stations in other planning areas (cont'd)
  - This regionalization will result in lower per ton costs because of economies of scale achieved by capturing greater tonnages
  - Regionalization may have an impact on a planning area's right to remain autonomous

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COST MODEL RESULTS (cont'd)

- Comparison to costs to develop a Subtitle D-compliant landfill
  - Subtitle D-compliant landfill:
    Cost per Ton = Incremental Cost per Ton + Current Tip Fee + Assessment Fee
  - Per capita assessment may be converted to a per ton assessment:
    Assessment (per ton) = (Per capita fee) x (Population) / (Total tons per year)

TRANSFER STATION ECONOMICS: DESIGN, CONSTRUCTING & OPERATING

COST MODEL RESULTS (cont'd)

- Comparison to costs to develop a Subtitle D-compliant landfill (cont'd)
  - Incremental cost = **$17.10 – $21.54 per ton**
  - Incremental cost calculated assuming cell construction, final cover, permitting and operating costs are based on estimates presented in Workshop #1 and are saved over an 18-month period in order to develop a sufficient cell construction reserve fund to pay for cell construction in 2007

COST MODEL RESULTS (cont'd)

- Comparison to costs to develop a Subtitle D-compliant landfill (cont'd)
  - Example calculation: assuming current tip fee of $36 per ton and assessment fee of $4 per ton,

Cost per Ton = Incremental Cost per Ton + Current Tip Fee + Assessment Fee
= $17 + $36 + $4 = $57 per ton
= $22 + $36 + $4 = $62 per ton

TRANSFER STATION ECONOMICS: DESIGN, CONSTRUCTING & OPERATING

COST MODEL RESULTS (cont'd)

- Transfer station cost:

  Cost per Ton = Construction / Operation Cost + Transportation Cost + Disposal Cost

- Subtitle D-compliant landfill:

  Cost per Ton = Incremental Cost per Ton + Current Tip Fee + Assessment Fee

TRANSFER STATION ECONOMICS: DESIGN, CONSTRUCTING & OPERATING

COSTS OF INCREASED WASTE DIVERSION

- May increase capital and operating costs:
  - Additional storage capacity for segregated recyclables
  - Additional equipment may be desired (sorting line, baler)
  - Additional staff may be required
  - Actual cost increases must be determined on a case-by-case basis
- Cost increases may be minimized by using available staff and capacity and performing sorting on the floor

TRANSFER STATION ECONOMICS: DESIGN, CONSTRUCTING & OPERATING

COSTS OF INCREASED WASTE DIVERSION (cont'd)

- Increased waste diversion will result in less waste being transported to landfills for disposal
  - Reduced disposal costs
  - Potential income resulting from resale of recyclables

TRANSFER STATION ECONOMICS: DESIGN, CONSTRUCTING & OPERATING

OPERATIONAL COST FACTORS

- Contracting options
  - Public / private partnership for operation: contract with private operator while retaining ownership of the facility
  - Contract with regional landfill for disposal to guarantee a source of disposal capacity and control future disposal costs

TRANSFER STATION ECONOMICS: DESIGN, CONSTRUCTING & OPERATING

OPERATIONAL COST FACTORS (cont'd)

- Hauling distance vs. tipping fees
  - Increased hauling distances will result in increased transportation costs
  - Transfer trailers are more efficient and less costly than hauling waste to distant landfills in collection vehicles
  - More distant landfills may have lower tip fees (larger, regional landfills), offsetting the increased transportation costs

TRANSFER STATION ECONOMICS: DESIGN, CONSTRUCTING & OPERATING

OPERATIONAL COST FACTORS (cont'd)

- Limiting operating days and short-term waste storage
  - Reducing operating days may reduce operating costs associated with staffing and maintenance
  - Storing waste over the short-term may result in fuller loads being hauled to the landfill (Iowa DNR allows waste to be stored on-site at transfer stations for up to 48 hours, excluding national holidays and Sundays)
- Partnering with other planning areas for disposal bids
  - Economies of scale resulting from increased volume of waste to be delivered
  - Maximizes bargaining power when a larger waste stream is available

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OPERATIONAL COST CONSIDERATIONS

- Bulky items
  - Require additional storage capacity on-site
  - May require separate handling from waste
  - Transfer trailer loads may not be as full due to greater material density
  - Potential to damage transfer trailers if top-loaded
  - Disposal costs may be cheaper than for MSW
  - May not require handling within a building
- C&D management
  - Options for material reuse
  - Potentially lower disposal costs at processing facilities or C&D landfills

TRANSFER STATION ECONOMICS: DESIGN, CONSTRUCTING & OPERATING

OPERATIONAL COST CONSIDERATIONS (cont'd)

- C&D management
  - Potential options for material reuse
  - Potentially lower disposal costs at processing facilities or C&D landfills
- Special wastes
  - Not typically managed at transfer stations
  - May require additional storage capacity on-site
  - More efficiently hauled directly to permitted disposal site by licensed special waste hauler

OPERATIONAL COST CONSIDERATIONS (cont'd)

- Short-term waste storage during inclement weather (e.g., roads iced or landfill closed due to wind)
  - Requires additional storage capacity
  - Waste may be loaded into transfer trailers to provide more floor storage (if trailers are available)

TRANSFER STATION ECONOMICS: DESIGN, CONSTRUCTING & OPERATING

PROCURING LANDFILL CAPACITY

- Guaranteed disposal capacity
- Control future disposal cost increases or stabilize disposal costs for several years through contractual agreement
- Partnering with other planning areas may result in:
  - Greater bargaining power resulting from larger waste volumes
  - Economies of scale, spreading disposal cost over greater tonnage

TRANSFER STATION ECONOMICS: DESIGN, CONSTRUCTING & OPERATING

PROCURING LANDFILL CAPACITY (cont'd)

- Potential for environmental liability can be reduced by conducting a comprehensive environmental audit of the landfill, consisting of a review of several features:
  - Site geology and hydrogeology
  - Historical groundwater monitoring data
  - Landfill design
  - Landfill operations
  - Permit history
  - Violation history

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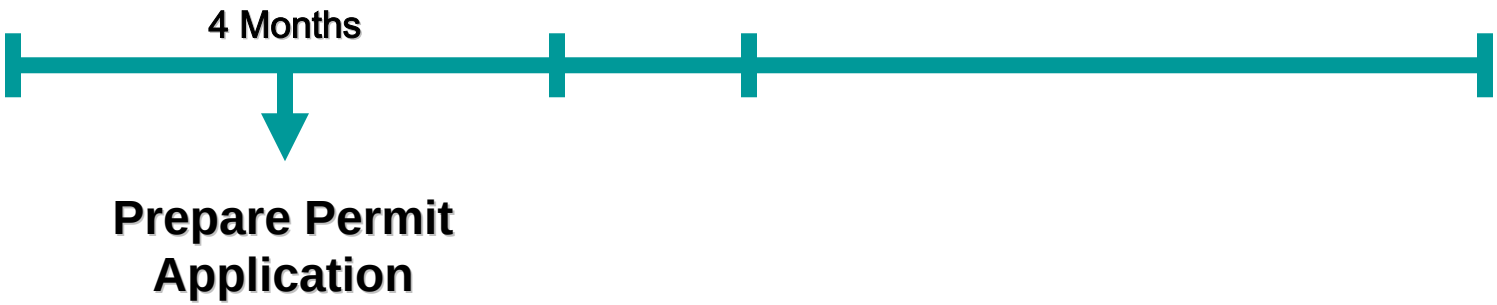
SCHEDULING TO MEET THE OCTOBER 2007 COMPLIANCE DATE



TRANSFER STATION ECONOMICS: DESIGN, CONSTRUCTING & OPERATING

SCHEDULING TO MEET THE OCTOBER 2007 COMPLIANCE DATE (cont'd)

- Prepare permit application:
  - Conceptual facility design
  - Develop application documents
- Permit application may be prepared in approximately 4 months

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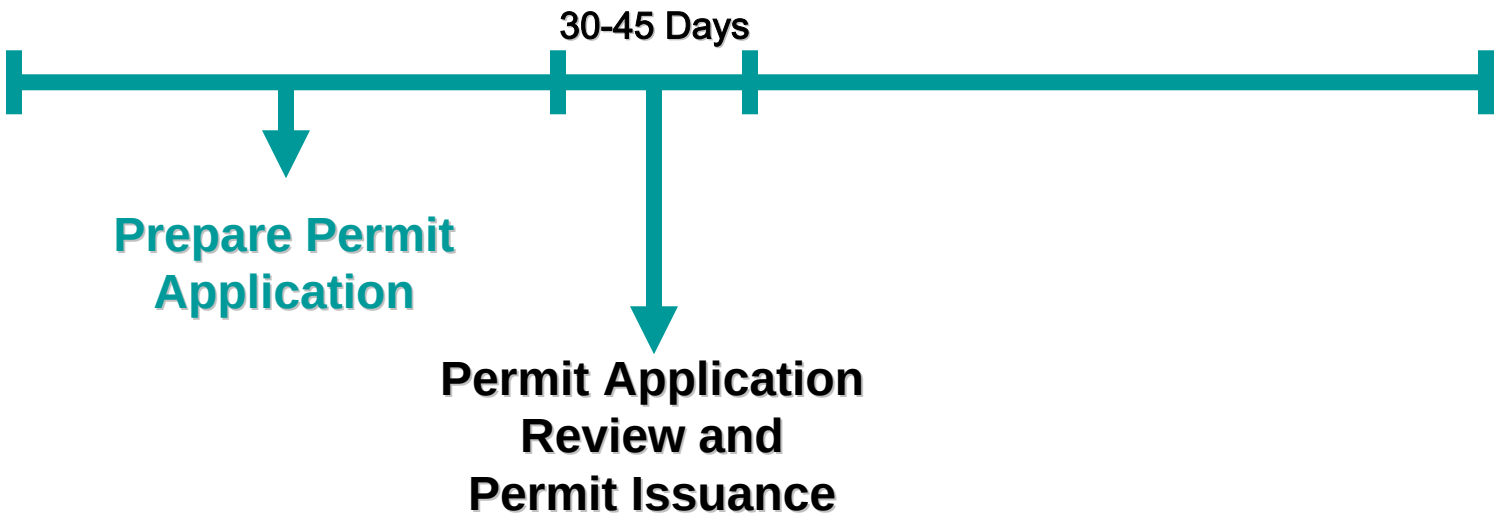
SCHEDULING TO MEET THE OCTOBER 2007 COMPLIANCE DATE (cont'd)



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SCHEDULING TO MEET THE OCTOBER 2007 COMPLIANCE DATE (cont'd)

- Permit application review:
  - Check for completeness
  - Review to determine consistency with regulations
- Permit issuance:
  - Site inspection is required
  - Construction may not commence until permit is issued
- Permit will generally be issued within 30-45 days of application submittal

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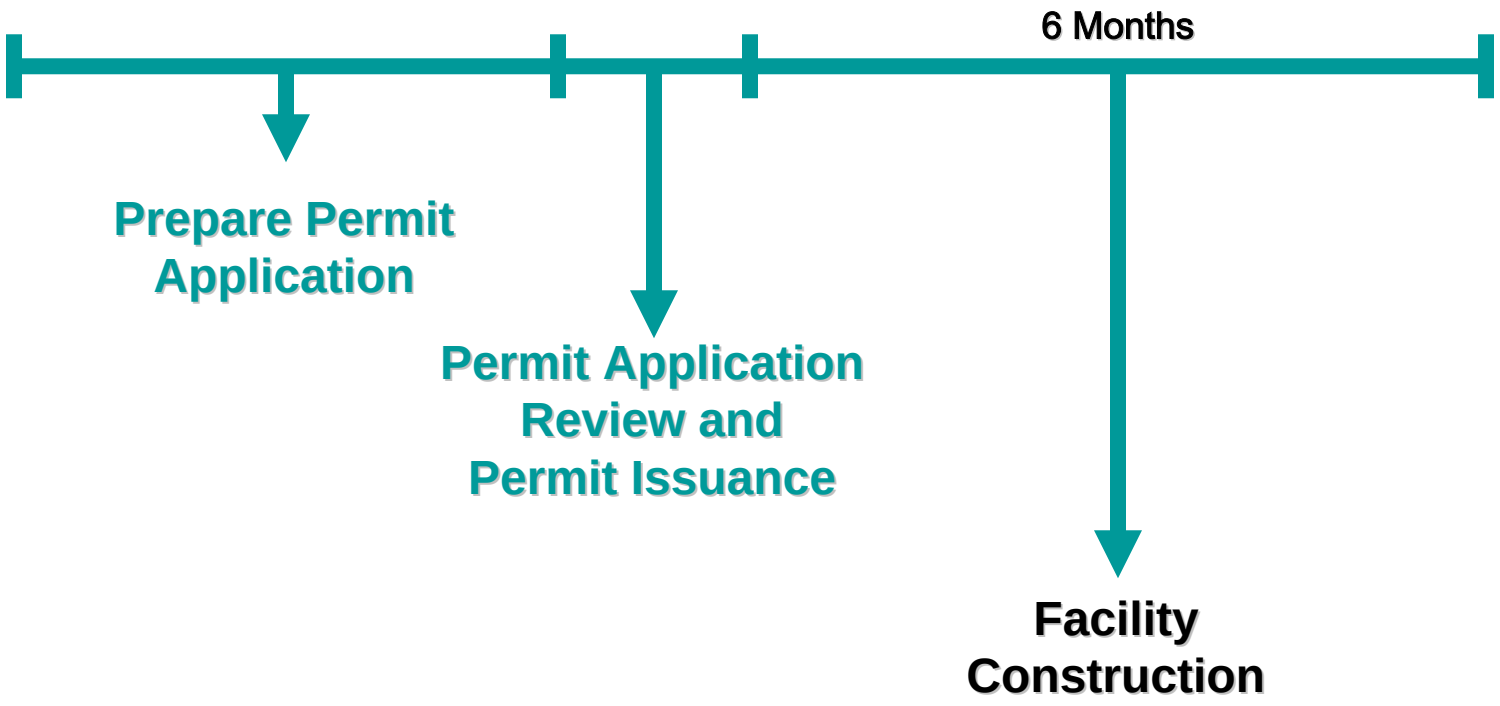
SCHEDULING TO MEET THE OCTOBER 2007 COMPLIANCE DATE (cont'd)



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SCHEDULING TO MEET THE OCTOBER 2007 COMPLIANCE DATE (cont'd)

- Facility construction:
  - Commences after permit is issued
  - Final construction drawings may be developed prior to permit issuance
  - Construction may be complete within 6 months (may vary based on coincidence of permit issuance with construction season)

TRANSFER STATION ECONOMICS: DESIGN, CONSTRUCTING & OPERATING

SCHEDULING TO MEET THE OCTOBER 2007 COMPLIANCE DATE (cont'd)

- A permit application may be filed, a permit may be issued and construction of the facility may be completed within 1 year or less
- The regulatory timeframe is much shorter than that required for a new disposal cell, as outlined in Workshop #1
- Additional time may be required for:
  - Site selection
  - Land acquisition
  - Local approval
  - Delayed start of construction

QUESTION & ANSWER