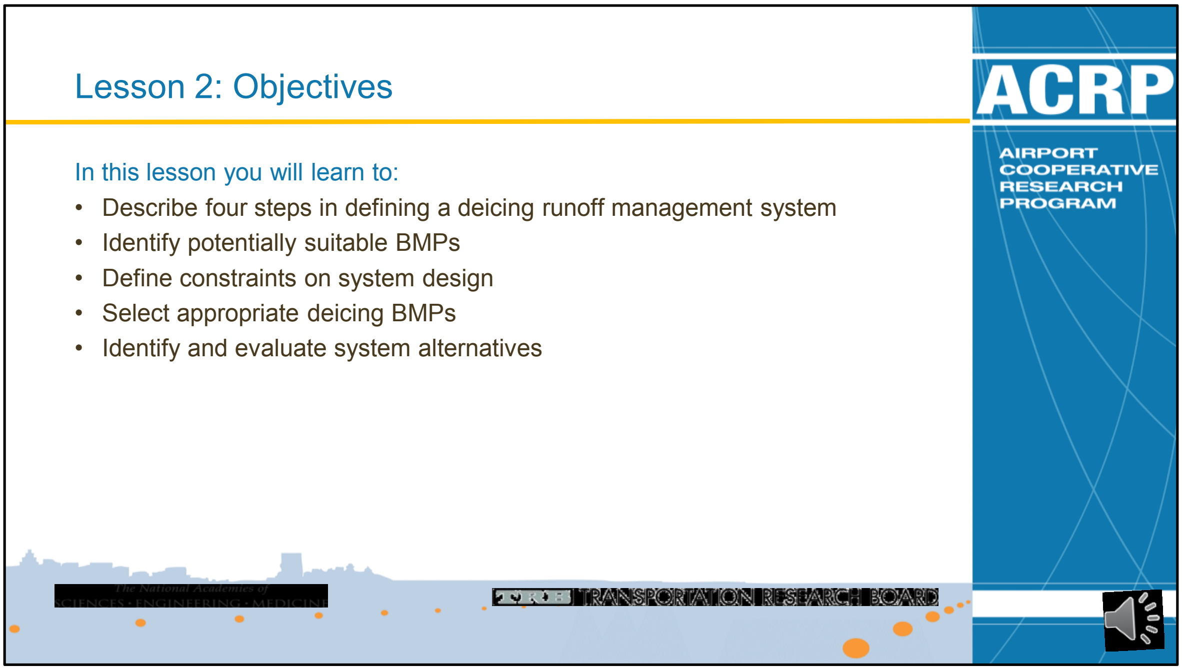
Say: Welcome to Lesson 2 on defining a deicing runoff management system.
[Click to proceed to next slide]



In lesson 2 you will learn to:
[Click] Describe the four steps in defining a deicing runoff management system
[Click] Identify potentially suitable BMPs
[Click] Define constraints on system design
[Click] Select appropriate deicing BMPs
[Click] Identify and evaluate system alternatives
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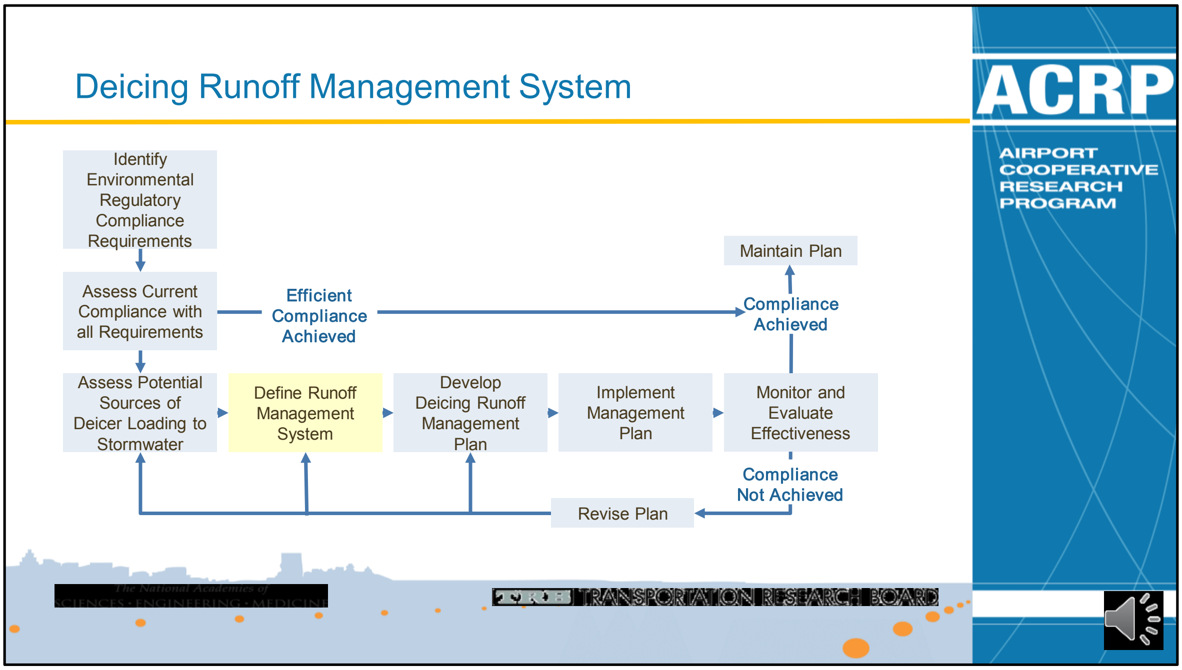

Say: Now its time to define a deicing management system by selecting the right set of BMPs from the Deicing Runoff Management Toolbox that will meet regulatory requirements. This process typically involves engineering analysis and design, which is beyond the scope of this training. However, you should be aware of the four steps involved.
[Click to proceed to next slide]

4 Steps: Defining a Runoff Management System

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Identify potentially suitable controls (BMPs)

- Source reduction
- Collection / containment
- Storage
- Treatment / recycling / disposal

The Decision Support tool may be useful in initial screening of BMPs to:

- Identify constraints on system design
- Select appropriate BMPs for your situation and constraints
- Design and evaluate alternative configurations of BMPs

Refer to ACRP Report 14 for insight on the process, descriptions of BMP are found in Fact Sheets in Volume 2 of Report 14

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Say: At an overview level, there are four steps in Defining a Deicing Runoff Management System. *They are:*
[Click] Identify potentially suitable controls, or BMPs. These fall into the four toolbox categories of
[Click] Source reduction,
[Click] Collection/containment
[Click] Storage, and
[Click] Treatment/recycling/disposal

The Decision Support Tool that accompanies ACRP Report 14 may be useful in the initial screening of potentially suitable BMPs to:
[Click] Identify constraints on system design.
[Click] Select appropriate BMPs for your particular situation and constraints. Typically, a design ends up being a compromise between what you'd like to do and what is possible to be done
[Click] And finally, design and evaluate alternative configurations of appropriate BMPs.
[Click] Refer to ACRP Report 14 for additional insight on the process described in this lesson. Descriptions of various BMPs are found in the Fact Sheets in Volume 2 of Report 14.
[Click to proceed to next slide]

1. Identify Potentially Suitable BMPs

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Source Reduction: Blend to Temperature (BtT), Forced Air/Hybrid (FA/H)

Collection/Containment: Glycol Recovery Vehicles (GRV), Apron Collection, Central Deicing Pad

Storage: Portable Tanks, Aboveground Ground Storage Tank, Pond

Treatment / Recycling: Publicly-Owned Treatment Works (POTW), Anaerobic Fluidized Bed Reactor, Recycling

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Say: Returning to our hypothetical example, initial screening identifies several Best Management Practices (BMPs) in each category of the BMP Toolbox that MAY be suitable for the airport's situation and setting. The icons represent the different BMP categories. Recall that the analysis of sources showed that the majority of BOD in runoff is generated from aircraft deicing. For that reason, we initially consider aircraft deicing BMPs like:

[Click] Source Reduction options are Blend to Temperature fluid blending operations and Forced Air/Hybrid deicing truck technologies

[Click] Identified Collection/Containment options that are Glycol Recovery Vehicles at the gates, Apron Collection and a Central Deicing Pad.

[Click] For Storage, the analysis identified Portable Tanks, an Aboveground Storage Tank, and a pond as possible options

[Click] Finally, Treatment/Recycling/Disposal alternatives are discharge to a Publicly-owned Treatment Works, an on-site Anaerobic Fluidized Bed Reactor plant, and Recycling.

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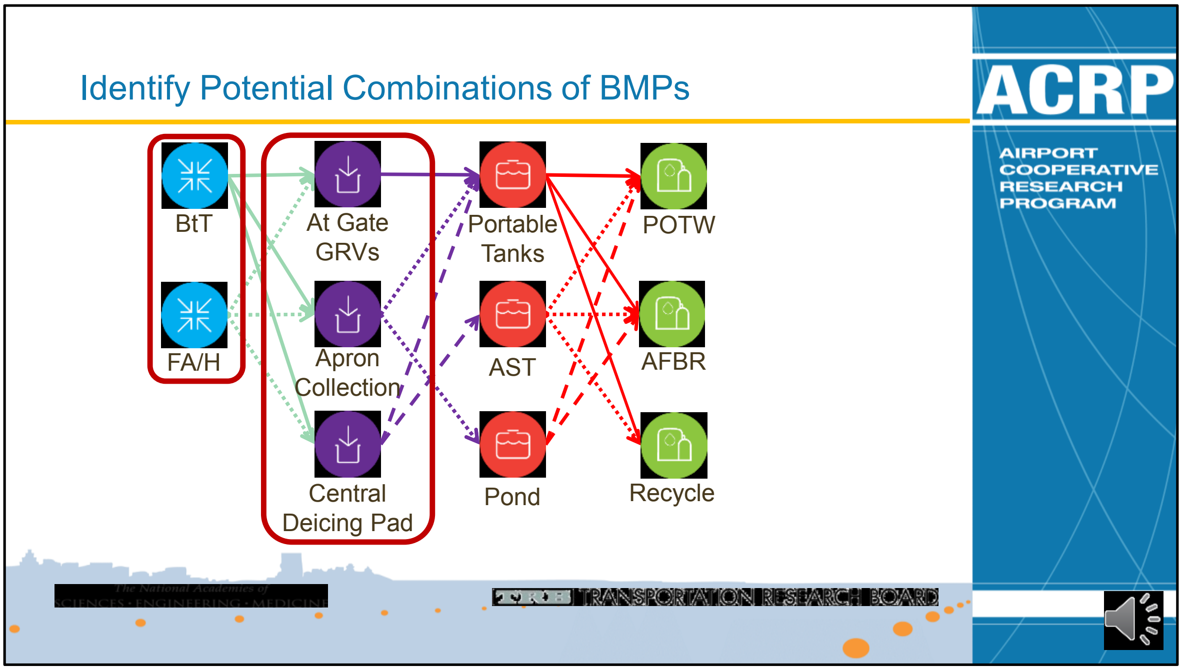
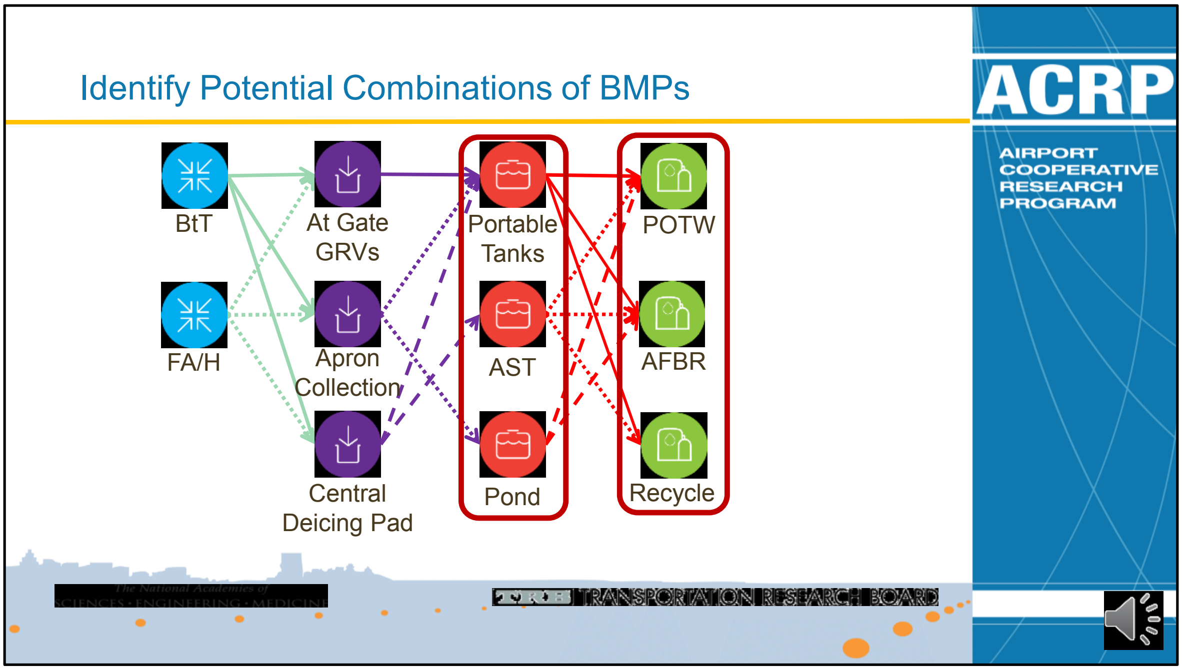


Say: Potential combinations of BMPs are then identified and evaluated to determine which ones deserve more attention and detailed analysis. You can mix and match the BMP types into many reasonably feasible configurations. In our example, there are potential options for each decision point. **[Click]** Both of the source reduction options were identified as potentially viable technologies through collaboration with the airlines and FBO operating at the airport. It is important to note that implementation of these technologies may impact the economic and/or operational viability of subsequent disposal options such as recycling which requires a highly concentrated process stream. Thus, although not shown, a scenario with no or limited source controls should also be considered.

[Click] Either GRVs or an apron collection system were identified as potentially feasible collection options at the terminal gates, and there appears to be a suitable parcel of land on the airfield for a central deicing pad. These are all good practices for containment.



Say: [Click] Three options for storage have been identified here, depending on the type of collection being considered. Portable Tanks were found to be potentially usable with all three collection options, but an aboveground storage tank is only suitable with the central deicing pad option because of the space requirements. There is space for an open detention pond outside of the airfield where wildlife attraction wouldn't be an issue, and it is the only storage option that could provide the capacity needed for the apron collection option in our hypothetical situation. Some combination of these is also possible.

[Click] Here are three identified options for disposal of collected deicing runoff. The airport is served by a publicly-owned treatment works with available capacity, and this might be used for treatment of all collected runoff. There is also space available for an on-site anaerobic fluidized bed reactor system, which would be best suited to higher concentration runoff collected by GRVs or at a deicing pad. Finally, there is a regional glycol recycling facility and airport management is interested in pursuing recycling as part of an airport-wide deicing management program. The higher concentration runoff collected by at gate GRVs or a centralized deicing pad could be suitable for recycling. In many cases, a combination of disposal options works well.

[Click to proceed to next slide]

2. Evaluate General Constraints

- Minimize impacts on airport and tenant operations
- Consider effect of source reduction on downstream BMPs
- Capacity/willingness of POTW to treat deicing runoff
- Areas identified in Master Plan for future use
- Constraints associated with environmental features

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Say: The second step is to evaluate general constraints on potential combinations of BMPs The most important constraint is Aircraft and Airfield Safety, which cannot be compromised. Possible constraints are:
[Click] Desire to minimize impacts on airport and tenant operations. This will include increased operational and safety concerns due to increased vehicular congestion around busy gates.
[Click] Consider possible impacts of source reduction BMPs on downstream collection and treatment BMPs.
[Click] The capacity and willingness of the local POTW to treat deicing runoff. Treatment plant operators are often wary of accepting industrial waste streams that they are not familiar with.
[Click] Areas identified in the airport master plan for future use. Those areas are not going to be available for placement of deicing runoff management facilities.
[Click] Finally, there may be constraints associated with environmental features, such as wetlands and sensitive water bodies.
[Click to proceed to next slide]

Other Potentially Important Constraints

- Accessibility
- Funding
- Operational Complexity

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Say: Other potentially important constraints to consider include:
[Click] Accessibility: If you are considering storage of deicing runoff prior to hauling offsite, it should be located where tankers can conveniently move in and out.
[Click] Funding: is always a constraint. What are the capital costs and / or ongoing operating expenses? Are the system components eligible for FAA funding?
[Click] Operational complexity: Some options may require that airport staff obtain additional licenses or certifications, or that staff be retained or that new staff or contractors can be hired to operate system components?

Say: [Click] Constructability: Will additional storm pipes be needed,
[Click]or is it in an area with many existing utility lines and potential disruption of utility services or airport operations to install new system components?
[Click] Aesthetics: Considerations include negative impacts, such as odors on the traveling public or people working at the airport.
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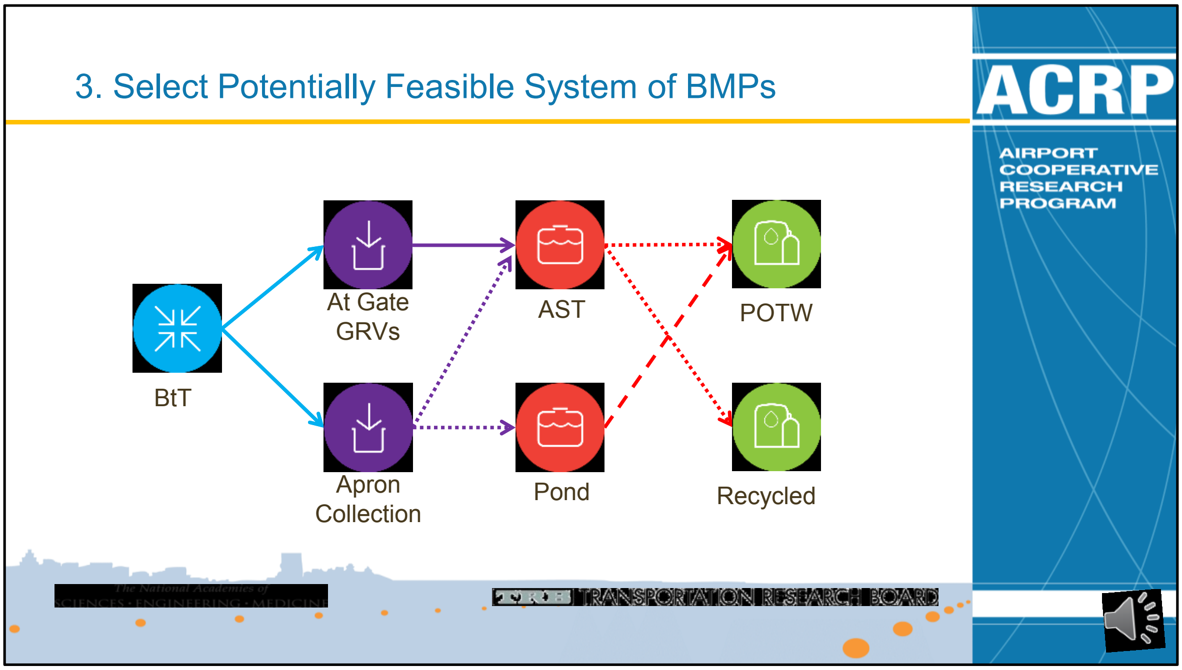
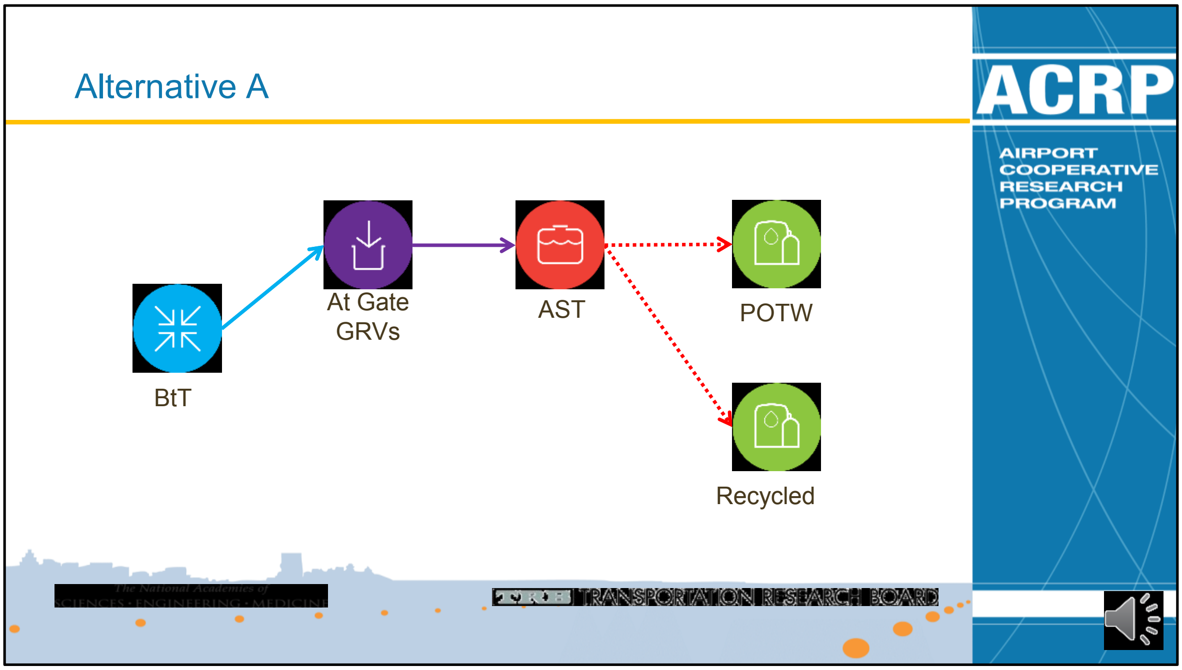


Say: In our hypothetical example, four combinations of BMPs were identified as being potentially feasible within the constraints.
Starting from treatment, to collection, to storage and finally to disposal options
[Click to proceed to next slide]



Say: We're calling this Alternative A. - Blend to Temperature source controls with Apron Collection then, discharge to an above ground storage tank or Pond and finally discharged to Publicly owned treatment works or recycled. - Selection of the storage location for collected stormwater would be done automatically using in-line monitoring technologies with high strength stormwater stored in an above ground storage tank and low strength stormwater stored in a pond.

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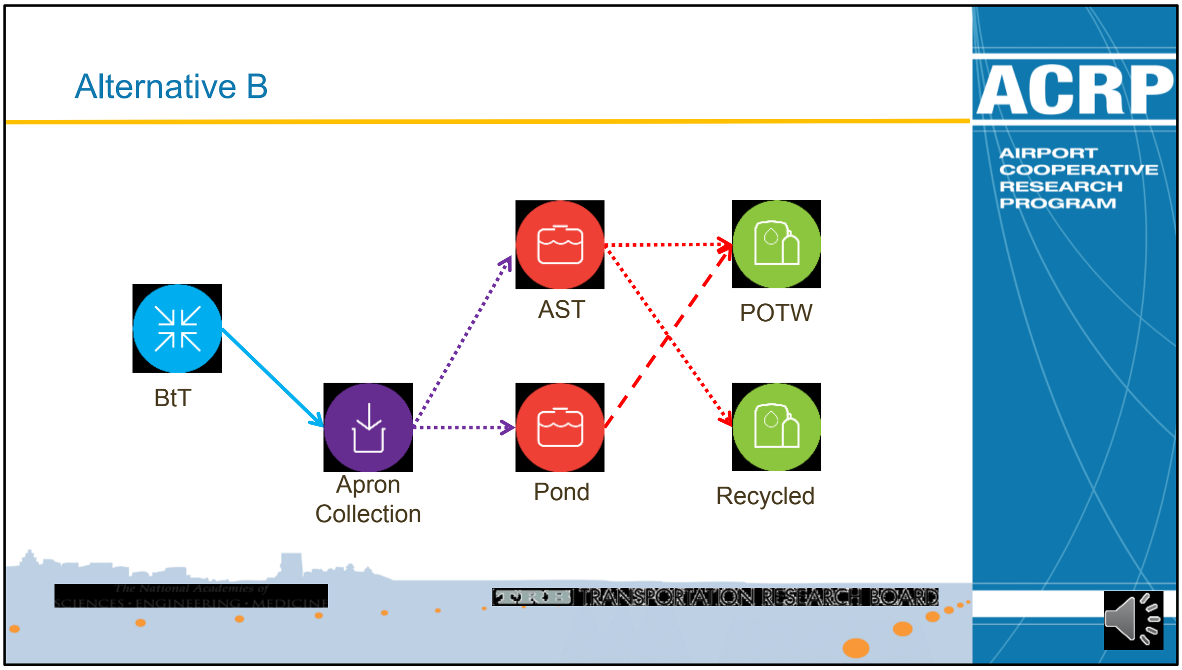
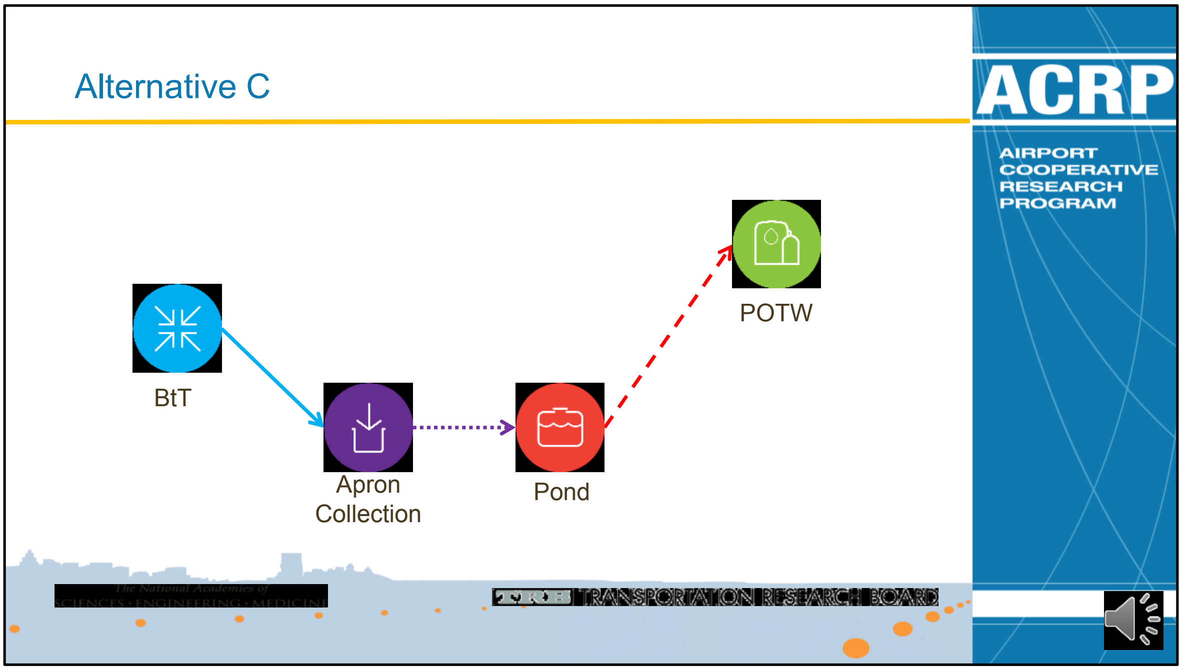


Say: Alternative B - Blend to Temperature treatment with Apron Collection then discharge to an Underground storage tank or Pond
and finally discharged to Publicly owned treatment works or recycled
[Click to proceed to next slide]



Say: Alternative C which is similar to Alternative B, but without the availability of recycling of concentrated runoff. - Blend to Temperature source controls with Apron Collection, discharge to a Pond and finally discharged to Publicly owned treatment works
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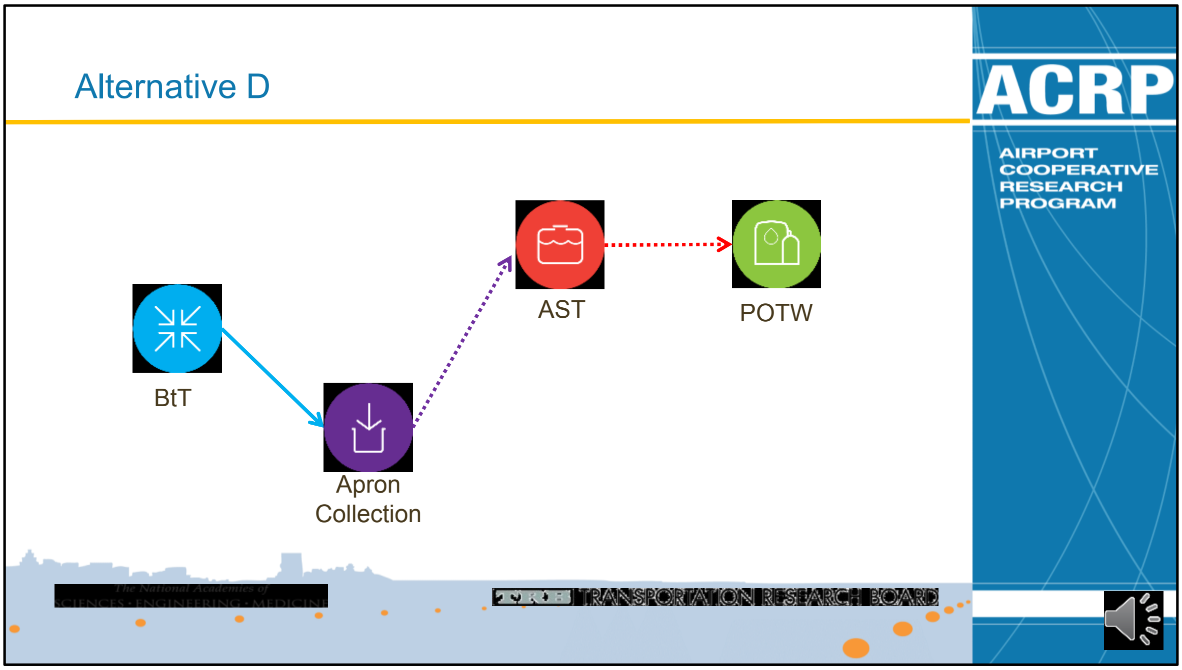

Say: And Alternative D where only an above ground tank is used for storage. - Blend to Temperature source controls with Apron Collection, discharge to an above ground tank and finally discharged to Publicly owned treatment works
[Click to proceed to next slide]

4. Evaluate Alternative Configurations

Alternative	A	B	C	D
Ability to Meet Goals	2	1	1	1
Capital Costs	1	4	2	3
Operating Cost	3	3	2	1
Airline Operational Impacts	2	2	1	1
Airport Operational Impacts	2	2	3	2
SUM	10	12	9	8

Key
- 1=Excellent
- 2=Good
- 3=Fair
- 4=Poor

EXAMPLE: *Alt A - GRV, AST, POTW, Recycling*
- Operation has higher likelihood of bypass
- Lower capital cost, but higher operational cost
- GRVs create excess ramp traffic – safety concern
- Ponding on surface - create snow management challenges

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Say: The identified potential alternatives are then evaluated in detail and compared in terms of parameters that are important to the airport. This matrix compares alternatives in our hypothetical case.

[Click] The left-hand column lists the key evaluation factors. The alternatives are summarized in the matrix and scored against evaluation criteria to identify the preferred alternative. The scoring system in this example ranks the alternative with the lowest total score as being the highest ranked. Take the time to create a matrix like this when comparing alternatives. Visual representation makes it easier to see the big picture. Considering a range of possible solutions usually leads to a better outcome. The preferred runoff control system will typically undergo a process of refinement during which configurations, sizes, and cost estimates are refined.

[Click] For example, Alternative A received a score of 2 under ability to meet goals because it has a higher likelihood of periodic bypasses. It received a 1 for its low capital cost, but a 3 for higher operating costs.

[Click] The use of GRVs which increase ramp traffic and raise safety concerns resulted in a score of 2 for airline operational impacts. A score of 2 was also assigned under Airport operational impacts, where ponding could create snow management challenges. - Some evaluation factors may be more important to an airport than others, and the decision should be weighted toward alternatives that score better with the more important factors. Depending on the number of feasible options, and relative importance of evaluation factors, a relative involved feasibility investigation may be required.

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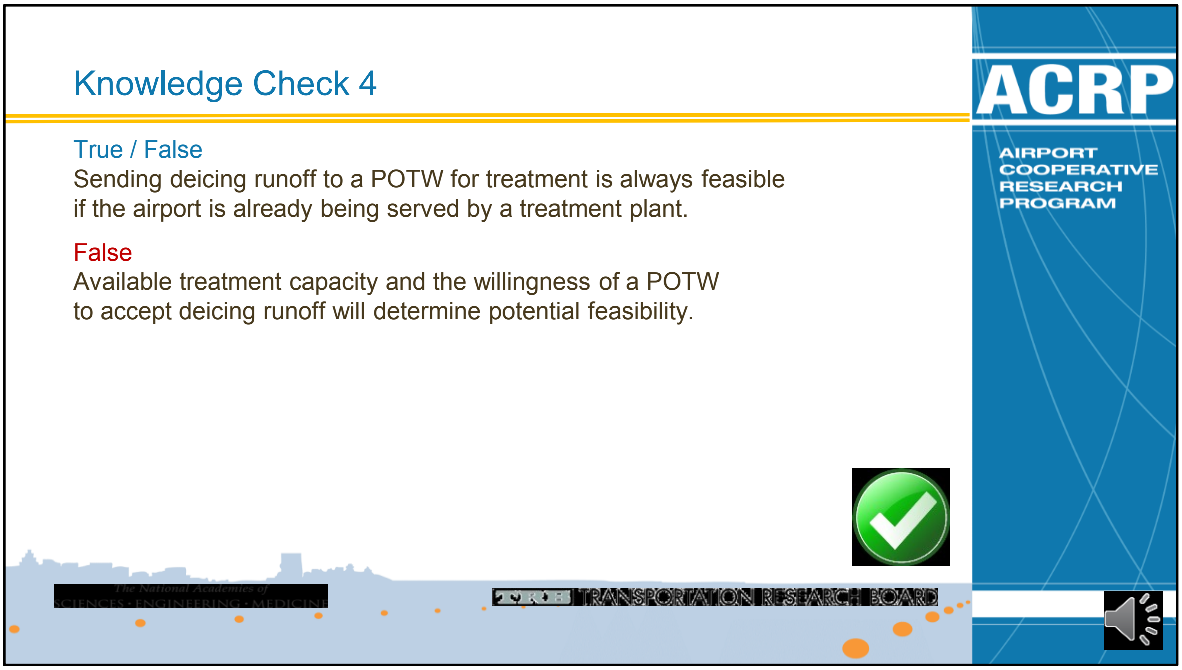

Is this statement: True / False
Sending deicing runoff to a Publicly-owned Treatment Works for treatment is always feasible if the airport is already being served by a treatment plant.
[Click to reveal correct answer]
The Correct Answer is: False
Available treatment capacity and the willingness of a Publicly-owned Treatment Works to accept deicing runoff will determine potential feasibility.

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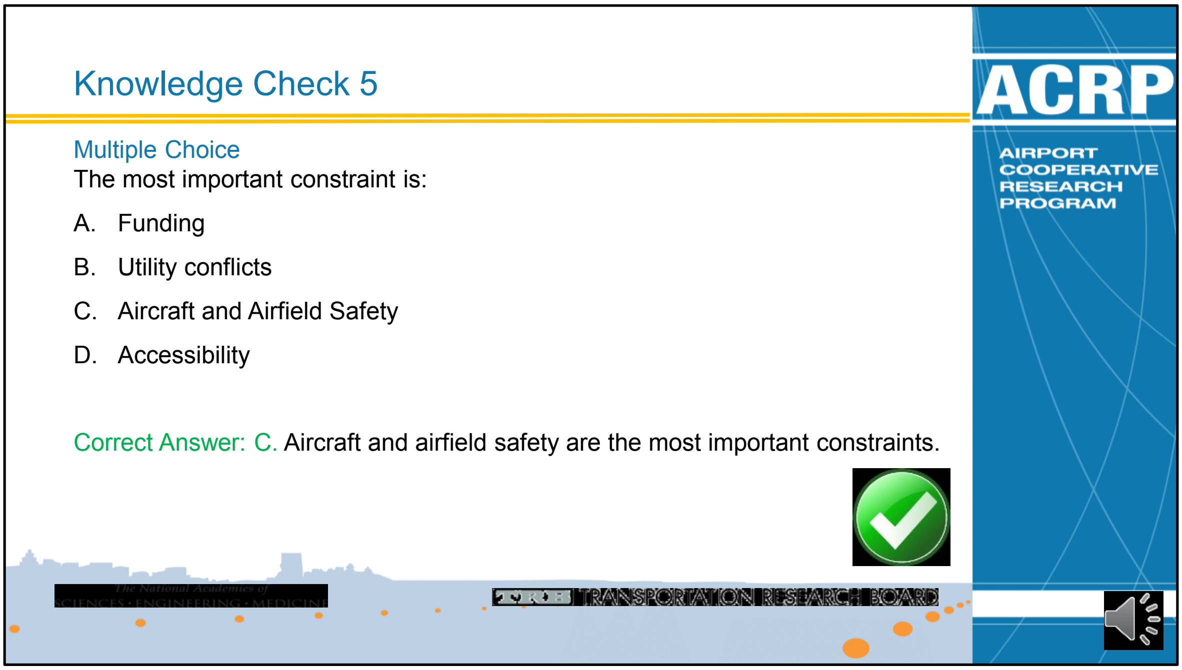
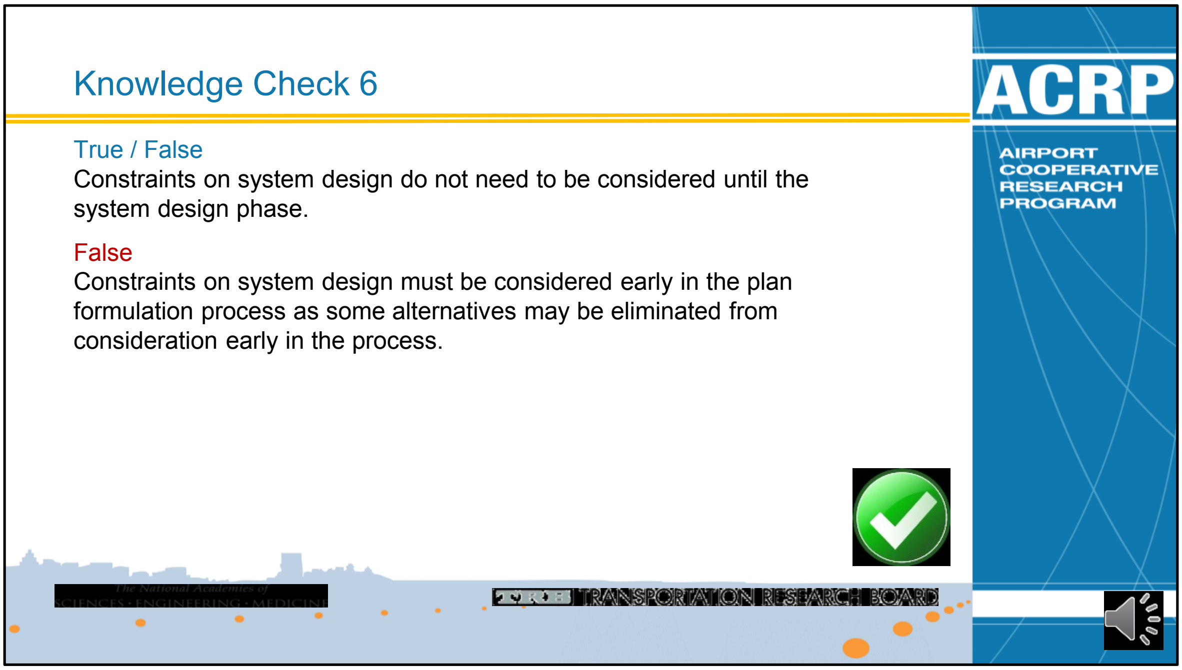


Multiple Choice
The most important constraint is:

A. Funding
B. Utility conflicts
C. Aircraft and Airfield Safety
D. Accessibility

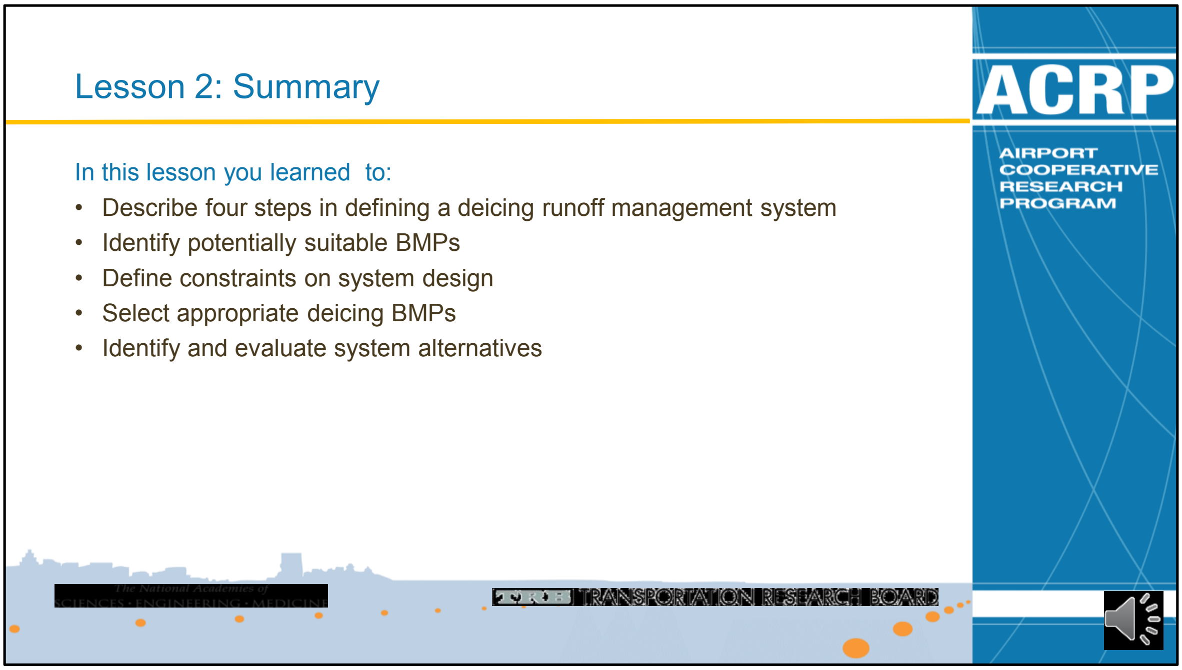
The correct answer is: C. Aircraft and airfield safety are the most important constraints.



Is this statement True or False?

Constraints on system design do not need to be considered until the system design phase.

The correct answer is False: Constraints on system design must be considered early in the plan formulation process as some alternatives may be eliminated from consideration early in the process. For example, significant restrictions on Publicly-owned Treatment Works discharge would eliminate that disposal alternative from consideration.



In summary, in lesson 2 you learned to:
[Click] Describe the four steps in defining a deicing runoff management system
[Click] Identify potentially suitable BMPs
[Click] Define constraints on system design
[Click] Select appropriate deicing BMPs
[Click] Identify and evaluate system alternatives

You have completed Lesson 2, proceed to the Lesson 3, the final lesson.

- **[Click to proceed to next slide]**