Section 2.150 SNOW DISPOSAL SITE DESIGN CRITERIA

2.150 A. Introduction

Snow disposal sites provide storage areas for snowfall that exceeds the storage capacity of street rights-of-way and other public facilities. The criteria established in this section are for snow disposal sites managed by MOA, the State of Alaska and as well as large, private disposal sites operating under conditional use permits.

1. Objective

The objective of these design criteria is to provide project managers and site designers with information needed to site and design snow disposal sites that are safe, efficient, and protective of surface water and groundwater quality. Water quality concerns for meltwater includes chloride and other salts, suspended sediment, turbidity, and metals associated with sediment and turbidity.

Besides storing snow, snow disposal sites are designed to discharge meltwater through a combination of infiltration and surface discharge. Siting criteria, design features, and operational procedures described in this section are all intended to manage the impacts of discharges on receiving waters by these three principals:

- maximize infiltration,
- minimize sediment and other pollutants in meltwater
- provide for pollutant dilution.

2. Codes and Review Process

These siting, design, and operational criteria function as a framework for preparing plans for commission reviews or approvals required under various portions of the Anchorage Municipal Code (AMC), as listed below. Note that the Anchorage Municipal Code is continually being revised; always refer to the most recently printed edition.

For all sites:

- AMC Section 21.15.015 - Public facility site review requires a review by the planning and zoning commission of any snow disposal site.
- AMC Section 21.15.025 - Public facility project landscaping review by the urban design commission is required for public facilities and land use permits.

In addition, for private and state sites:

- AMC Section 21.40.200.B.1. - I-1 Light Industrial District, lists snow disposal sites as a conditional use that requires an annual administrative permit.
- AMC Section 21.15.055 - Annual administrative permit establishes the annual administrative permit.
- AMC 21.15.030 - Approval of site plans and conditional uses outlines general requirements for site plan approval.

- AMC 21.50.270 - Conditional use standards - snow disposal sites outlines specific requirements for snow disposal sites. In particular, this section requires submitting a drainage and water quality plan and a dust and litter control plan.
- AMC 21.67 – Stormwater discharge establishes stormwater discharge restrictions and requires a system plan review.
- AMC 15.70.080 - Property line noise emission standards establishes noise standards.
- AMC 21.05.115 – Implementation – Anchorage Wetlands Management Plan establishes guidelines for managing wetlands.

2.150 B. Site Selection Criteria

Site selection criteria consider effects of on-site infiltration and effects of surface discharges on surface water, including lakes, streams, and wetlands.

1. Snow disposal sites are not permitted within 200 feet of a Class A or B well or within 100 feet of a Class C well [18 Alaska Administrative Code 80.020, Table A]. For disposal sites that are located more than 200 feet and less than 1,000 feet upgradient from a Class A or B well, or more than 100 feet and less than 1,000 feet upgradient from a Class C well, perform an engineering evaluation of the potential impact of dissolved solids on ground water.
2. Snow disposal sites are not permitted within 500 feet upgradient of an on-site sewage disposal system.
3. Avoid areas with high potential for contaminating potable water aquifers. The intent is to prevent meltwater having a high salt content from entering and contaminating these aquifers.

   Assess potential for such infiltration for both the site itself and for the complete flow path of the meltwater. Anchorage's surface geology is typically quite complex and locally highly variable over short distances. This siting criterion should be addressed by a hydrogeologist experienced in Anchorage area surficial geology, and in the hydrology and interaction of ground water and surface water.
4. Avoid areas with high potential for contaminating "closed" lake or wetland systems.

   The intent is to prevent salt buildup in these types of surface water features, where dilution can not mitigate this effect. Meltwater from snow disposal sites should not be discharged to "closed" basin surface water features that have little or no surface water outlet.
5. Avoid sites that would discharge to streams with a base (winter) flow of less than 3 cubic feet per second (cfs). The minimum receiving water discharge is based on probable adequacy for assimilation of chloride releases from snowmelt to achieve compliance with EPA water quality criteria. MOA PM&E can provide maps of streams, site-specific channel geometry, baseline stream chemistry, and estimates of stream baseflow throughout the municipality.

   On-site dilution of snow site meltwater may be performed prior to discharge to meet treatment goals (listed in 2.150 D.2).

6. Select sites that offer optimum opportunity for infiltration to shallow, non-potable ground water systems.

   The intent is to provide the maximum opportunity for diluting salt (chloride) in shallow ground waters, thus minimizing the scale of site detention and dilution facilities that might otherwise be required. This siting criterion is secondary to criteria protecting potable aquifers, wetlands, lakes, and streams.

7. Avoid sites that would negatively impact wetlands. Meltwater from snow disposal sites should not be discharged to wetlands such that the discharge significantly reduces overall functionality (as catalogued in the Anchorage Wetlands Management Plan and its cited documents) of either the entire contiguous wetland feature or the impacted fraction alone.

   The intent is to ensure that meltwater quality and discharge volume is managed to support an acceptable long-term threshold functionality of the receiving wetland, while allowing some adjustment in species composition in a small fraction of the wetland. Research of storm water impacts to Anchorage wetlands is continuing. Planners and designers should view the criteria as preliminary guidance and contact MOA PM&E for site-specific and/or more current information.

8. Select sites that offer optimum opportunity for slope and aspect orientation. Sites should be selected that are generally suitable for constructing storage pads that are sloped down from south to north.

   The intent is to provide optimum opportunity for conformance with site design and operation criteria. Note that the aspect of the site need not be northerly, but the site should be amenable to constructing a pad sloping generally from south to north.

2.150 C. Design Information

The following information is required for snow disposal site design:

1. Soil Investigation

   A soil investigation is performed to provide knowledge of the soil and potential problems with geotechnical concerns such as freeze/thaw effects and other constraints to site construction. Soils analysis shall conform to information criteria in Chapter 1 of this Design Criteria Manual.

   A detailed soils report is required if the site is suspected of marginal conditions for site stability due to high ground water, high potential for saturation or erosion concerns.

2. Surveying and Mapping

   A map shall be formed to document watercourses, storm water features and other criteria that may be affected by the site. Mapping should include the following features:

   - Site topography with 2-foot contour intervals
   - Existing roads, culverts, ditches, storm drains, and other drainage features
   - Location and depth of domestic wells and on-site sewage disposal systems within 500 feet of site boundaries

- Surface water features within 500 feet of the site, including wetlands, creeks, and lakes

3. Groundwater Investigation

   A site-specific ground water investigation is conducted to protect potable aquifer supplies and receiving waters. Site-specific ground water level (seasonal high and low), gradient, direction, and the uses of the local aquifer should be compiled or determined.

2.150 D. Specific Design Criteria

In the snow disposal site design, include a constructed pad for snow storage, separate area(s) for wastes, and design features for water retention and discharge. Manage discharged water to meet stated water quality objectives. These site-specific design criteria serve as the basis of the drainage and water quality plan required under AMC 21.50.270.

1. Snow Storage Pads – See Figure 2-26.

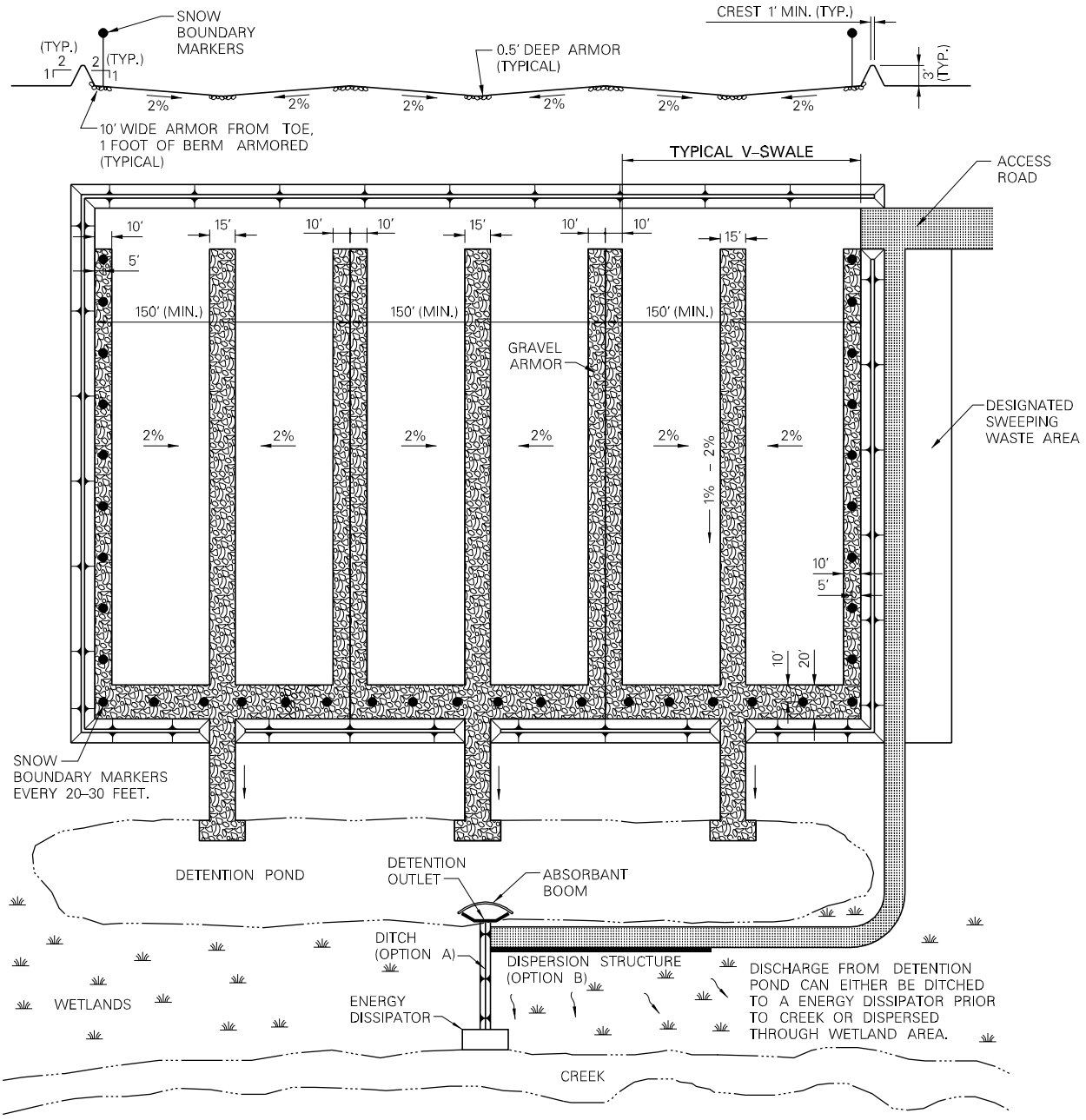
   a. Pad Design. Snow disposal should take place on an engineered working surface composed of competent native material or select imported fill. Construct snow disposal pads to have single or multiple "V"-swale cross-sections. A "V"-swale shall have a 2 percent side slope and a longitudinal slope of 1 to 2 percent. Each "V"-swale shall have a minimum width from crest to crest of 150 feet (45 meters). Pads may be constructed of a single "V"-swale spanning the width of an entire site, or of a continuous series of "V"-swales. However, given the operational requirements of "V"-swales, and the required side slope, a series of minimum-sized "V"-swales may be generally preferable to one large swale.

      The intent of "V"-swales is to maintain movement of meltwater inside the snow pack away from fine sediments generated on top of and adjacent to the pack. This minimizes contact of flowing water with easily eroded sediments and reduces turbidity released from the site. Properly operated and constructed "V"-swale snow disposal pads are anticipated to limit turbidity at pad discharge points to a seasonal average of about 50 nephelometric turbidity units (NTU).

   b. Pad Orientation. Orient V-swale snow storage pads preferentially with the downslope (discharge) end of the swale axis to the north.

      The intent is to promote melt of the snow pack (due to a more favorable aspect and proper site operation) to progress preferentially from the uphill side of the stored snow towards the downhill (discharge) side. Promoting this melt progression minimizes exposure of loose sediment to flowing meltwater.

   c. Pad Vegetation. Vegetate all unarmored snow storage pad surfaces. A vegetated surface is essential to properly operate a snow disposal site. Vegetation resists pad erosion, traps fine sediments mobilized in snowmelt, and promote absorption of metals and other pollutants. Select and design a vegetative mix that is resistant to seasonal shallow burial [1 to 2 inches (2 to 5 cm) of loose sand fill annually] and to elevated salt and metals soil concentrations.



MULTIPLE V- SWALE SNOW SITE DESIGN CONCEPT

FIGURE 2-26

When constructing the pads, "trackwalk" all "V"-swale side slopes immediately prior to their vegetation. Trackwalking consists of imprinting the ground surface with crawler tractor tread marks along the fall line (i.e., trafficking directly up-slope and downslope).

d. Channel and Berm Armoring. Armor all critical pad surfaces and flow channels, provide permanent and temporary setback markers, and accommodate for icing storage in select armored channels. In particular: perform the following:

- Construct armored surfaces along the centerline of each "V"-swale; along the crests of all multiple, interior "V"-swales; along the toe of all perimeter and interior berms; along all discharge channels; and at all discharge points (Figure 2-26).
- Armor from an elevation of 1 foot (0.3 meters) up from the toe of each berm and extending down the side of the berm and across the pad surface for a distance of 10 feet (3 meters) from the toe of the berm. Armor the central (longitudinal) channel of each "V"-swale to a minimum width of 15 feet (4.5 meters).
- Armor both sides of the crest of each interior "V"-swale for a distance of 10 feet (3 meters) from the top of the crest.
- Armor a 20-foot (6-meter) wide band in front of the toe of the end perimeter berm for the full width of the lower end of each "V"-swale.
- Armor shall be at least four inches (10 centimeters) thick.

Maintain the elevation of all armored surfaces slightly depressed below the vegetated pad surfaces to assure flow of meltwater onto and through the armored surface and not parallel to it. Size armoring material according to expected flow velocities and Figure 2-17. Peak discharge of snowmelt from snow disposal sites can be up to 1 cfs.

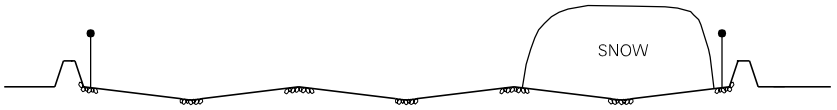
Provide subdrain or other design elements along all discharge channels to accommodate decreased channel flow capacity lost to icing storage early in the melt season.

e. Mark limits of snow storage area. Provide permanent snow poles as snow storage setback guides at a distance of 10 feet (3 meters) from the toe of the end perimeter berm and 5 feet (1.5 meters) from the toe of all interior and lateral berms. Where multiple "V"-swales are constructed, provide supports for temporary setback poles along the interior crests of all "V"-swales.

2. Meltwater Detention and Discharge

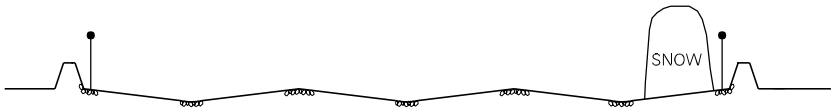
Provide dry ponds for early season meltwater detention and/or infiltration and for late season sedimentation. Specific design criteria for detention basins are included in Section 2.100. Supplementary criteria and criteria deserving emphasis are described below.

RIGHT



CROSS SECTION
NOT TO SCALE

WRONG



CROSS SECTION
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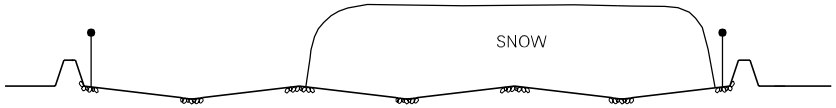
PLACE SNOW CREST TO CREST IN INDIVIDUAL V-SWALE



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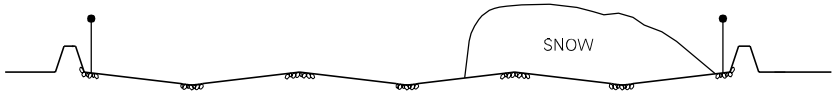
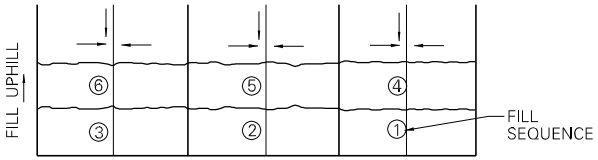


CROSS SECTION
NOT TO SCALE

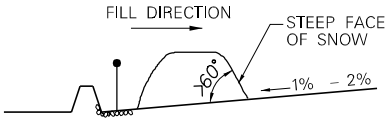
SNOW CAN SPAN MORE THAN ONE V-SWALE; EACH V-SWALE SHOULD BE FILLED CREST TO CREST



PLAN VIEW
NOT TO SCALE

PLAN VIEW
NOT TO SCALE

FILL LATERALLY ACROSS ALL V-CRESTS BEFORE FILLING LONGITUDINALLY DOWN THE SLOPE OF THE PAD



LONGITUDINAL SECTION
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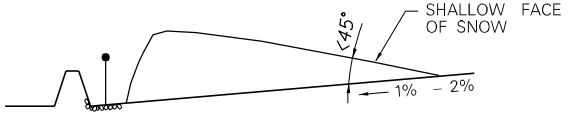

LONGITUDINAL SECTION
NOT TO SCALE

THE ADVANCING FACE OF THE SNOW MASS SHOULD BE STEEP TO KEEP THE FOOTPRINT OF THE SNOW AS SMALL AS POSSIBLE

SNOW SITE FILL PROCEDURE

FIGURE 2-27

a. Detention Pond Design. Detention pond design is primarily based on hydrologic characteristics of the meltwater from snow sites and secondarily sedimentary removal rates. Design for minimum storage volume at the beginning of the winter. Minimum storage volume in the pond above the allotted sediment and ice/snow storage shall include all runoff from the March 23, 1974, snowmelt hyetograph for a 40-hour duration (Figure 2-13).

   Storage volume goals for the pond above the allotted sediment and ice/snow storage shall provide for dilution of meltwater so that treatment goals for chloride are met.

   Meltwater properties for design purposes are:

   - 1-hour concentration of 8,000-ppm in 1 cfs of meltwater
   - 4-day average concentration of 6,000-ppm chloride in 1 cfs of meltwater
   - 30-day average concentration of 1,000-ppm in 0.5 cfs of meltwater

   Treatment goals for chloride (based on EPA recommendations), as measured at the end of any allowable stream mixing zones, include the following: (1) a 4-day average concentration of <230 parts per million (ppm) exceeded less than once in 3 years, and (2) a 1-hour average concentration of <860 ppm exceeded less than once in 3 years.

   The treatment goal for chloride as measured at the point of site discharge into wetlands is a 30-day average concentration of <3,200 ppm to maintain wetland functionality and minimum impact zones.

   The intent is to ensure that meltwater quality and discharge is maintained to support an acceptable long-term threshold functionality of the entire receiving wetland while allowing some local species change and adjustment in a small fraction of the wetland. These values may change; check with MOA PM&E for current chloride threshold values.

   The pond treatment goal for sediment, as measured at the point of pond discharge, is 95 percent removal of all particle sizes $\geq$100µ (0.1mm) in diameter.

b. Outlets. Provide floating oil-absorptive booms guyed around all detention pond outlets. Provide cleanout access aprons at all inlets to detention ponds. Provide heavy maintenance vehicles access to all pond control structures. Provide for dispersion of all meltwater discharge into wetlands and for flow energy dissipation at discharge points into lakes and streams. Design wetland dispersion structures to limit the size of the wetland impact zone while assuring flows low enough to prevent erosion and extended, artificial ponding.

3. Waste Sediment Areas

   Provide a separate storage area with proper drainage and access for any waste sediment storage proposed for the site. Access to the storage area should not require traverse of any part of the snow storage area or its immediate access routes. Drainage from any sediment storage areas may be directed to the snow site detention pond but should not be directed across any portion of the snow storage pad.

2.150 E. General Design Criteria

General site design criteria, including lighting, noise control, parking, signage, landscaping, fencing and traffic access, are specified in AMC 21.50.270 and in Chapters 3 and 5 of this Design Criteria Manual. Supplementary criteria are described below.

1. Traffic Access

    a. Prohibit uncontrolled vehicular access to the site. A lockable gate should be provided.
    b. Construct access driveway with a minimum width of 24 feet and a maximum width of 34 feet.
    c. If site access is from a paved road, pave the approach at least 450 feet into the site. The maximum grade is 8 percent. Approach centerline radii shall be 40 feet and match the off-site access road.

2. Lighting/Illumination

    a. Install permanent lighting at all disposal sites anticipated to be operated while dark. Safety is the primary reason for lighting; lighting for disposal operations is a secondary concern.
    b. Strategically locate lighting at vehicular access points, retention basins, or other necessary areas. Provide a minimum of 0.3 foot-candles at these locutions. Give particular attention to adjoining property users to avoid stray lighting annoyances. Additional information on lighting is provided in Chapter 5 of this Design Criteria Manual.

3. Landscaping

The urban design commission must approve the landscaping plan for snow disposal sites; Chapter 3 of this Design Criteria Manual provides guidelines. Supplementary criteria are described below.

    a. Ensure that landscaping on the outside of the berms and buffer areas of the site provides year-round visual enhancement where possible. Plant woody vegetation away from equipment circulating and maneuvering areas.
    b. Provide a vegetative ground cover for the non-armored areas of the snow disposal pads, which is necessary for the proper functioning of the pad. Select salt-tolerant plants and perform maintenance as necessary on an annual basis.
    c. Install an inexpensive irrigation system to be used at least during plant establishment periods.

2.150 F Operational Considerations

Operations include managing litter, placing snow in winter, and maintaining vegetation in summer. While not part of design criteria, operational considerations are essential to the

objectives of snow disposal site performance. In the case of private sites, these considerations are incorporated into the dust and litter control plan required under AMC 21.50.270.

1. Snow placement (see Figure 2-27).
    a. Place snow across the full width of each "V"-swale. Do not place snow along the length of swales. If multiple interior swales are used in a site design, fill must be placed across either the full width of all the swales or across the complete width of one or more of the swales. Swales must not be filled across some fraction of their width or on one side along their length. Non-conformance will increase turbidity in meltwater.

       Supports to allow use of temporary setback staking along interior swale crests can help operators prevent partial filling of adjacent swales when operations call for filling just one interior swale.

       Sequence placement of hauled snow starting at the downhill side of the site and filling uphill (always across the full width of each swale cross section) to minimize erosion of the dirt released from the snow pack during the latter stages of melt.

       Maintain the snow fill in as compact and thick a mass as possible. This will reduce the footprint of the residual dirt when it is finally released from the snowmass to the pad, and therefore substantially reduce the total mass of sediment mobilized by the final meltwater flows.

    b. Maintain a snow fill setback from all berms. Maintain a 10-foot setback from the end of a "V"-swale and a 5-foot setback from all side berms. Snow fill should overlap the armor placed along berms but should not extend past setback markers.
2. Maintain vegetation of all non-armored pad surfaces. With proper initial application of an appropriate seed mix, very little attention should be required to promote seasonal growth of vegetation across the surface of the snow storage pad. Little or no mowing should be required. However, trafficking and regrading of the site should be absolutely minimized, particularly in the late melt season. Confine access to the pad or to control structures to trafficking along armored features.
3. Maintain all materials storage, including waste sediment, separate from the snow storage pad. No temporary storage of any sort should be allowed on the pad surface. No trafficking should be allowed during the melt season and access should be restricted throughout the year.