

Street Sweeping Management Plan: Anchorage MS4

February 2021

Submitted by:

Maintenance and Operations, Central Region
Alaska Department of Transportation and Public Facilities

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1. Purpose

As a co-permittee, the Alaska Department of Transportation and Public Facilities (DOT) operates municipal drainages and streets within the Anchorage vicinity under municipal separate storm sewer system (MS4) permit AKS-052558 (hereinafter “permit”). Part 3.4.4 of this permit specifies that the permittees ‘..update and implement their respective street sweepings management plans..’ by March 1, 2021 (p27). Updated plans are to designate streets, roads and public parking lots that fit within the street sweeping frequency schedule designated by the permit. Mapping showing all MS4 streets and public parking lots and their categories relative to the street sweeping frequency classification scheme established by the permit are included in appendices. Additional mapping (a) designating specific streets and public parking lots for sweeping frequency [part 3.4.4.1] and (b) specifying those streets that are technically infeasible for sweeping [part 3.4.4.3] is due at the end of the first permit year and will be appended to this plan at that time.

In addition to MS4 streets mapping, this plan summarizes the general street sweeping management approach employed by the Central Region DOT Operation and Maintenance Division. It also describes the street categorization system used in assigning particular sweeping practices, the specific street sweeping practices themselves, and the waste management practices used in collecting and disposing of swept street wastes. The management practices described herein are in place as of the date of this document.

2. Anchorage MS4 Streets and Parking Lots

Part 3.4.4 requires that the permittees “..designate streets, roads, and public parking lots within their jurisdiction that fit within..” each of the street sweeping frequency categories assigned by EPA as follows:

- Residential: streets and road segments that include, but are not limited to, light traffic zones and residential zones.
- Arterial and all others: streets and road segments with high traffic volumes serving commercial or industrial districts.
- Parking lots: large lots serving schools and cultural facilities, plazas, sports and event venues or similar facilities.

The permittees interpret this requirement to apply to any street or road that is owned or operated by them and that is part of the Anchorage municipal separate storm sewer system (MS4) under their combined jurisdictions. As provided for in part 3.4.4 of the permit, on the basis of “..land use, traffic volumes, or other factors..” the permittees have further qualified the EPA-assigned street sweeping frequency categories described above as follows:

- Residential and Collectors: streets and roads serving light traffic zones; all those streets and roads defined and mapped in the State of Alaska Statewide Functional

- Classification as collectors or local roads or where otherwise not specifically identified as a high-traffic, arterial-type street.
- Arterials and all others: streets and roads serving high traffic zones and commercial and industrial areas; all those streets and roads defined and mapped in the State of Alaska Statewide Functional Classification as high-traffic, arterial-type streets.
 - Parking: any closely related physical complex of impervious, uncovered public parking that has a total combined ground footprint within a single parcel or a complex of closely associated parcels that is larger than two acres (87,120 square feet) in area, that is owned or operated by the DOT, and that serves schools, cultural facilities, plazas, sports and event venues, or similar facilities. Parking lots are considered part of the same closely related physical complex if they are physically close, drain to a similar location on the same receiving water, and are owned or operated by the same permittee.

Appendix A includes maps of Anchorage MS4 streets and roads owned by the DOT that fall within their MS4 operational jurisdiction under APDES permit AKS-052558.

Appendix B contains additional mapping classifying each street according to the sweeping frequency categorization scheme proposed in this document. Appendix C, includes maps locating all MS4 public parking lots that meet the criteria as specified at Part 3.4.4 and are larger than the threshold size as proposed by the permittees in this document. Appendix D will be populated with maps locating MS4 streets scheduled for sweeping by the permittees different operational agencies during the 2020 annual report submittal.

3. Street and Parking Lot Sweeping Frequencies

Street and public parking lot sweeping frequencies for DOT reflect EPA sweeping frequencies described at Part 3.4.4.2 Table 4, adjusted based on inspections that will be performed during the actual sweeping undertaken during the intervals as specified in Table 4. Sweeping frequency adjustments will be made based on operational inspections as follows:

- Spring sweep period, before June 15: All streets designated for sweeping will be swept according to the frequency specified in Table 4, or more frequently.
- Summer sweep period, June 15 to September 15: All streets designated for sweeping will be swept according to the frequency specified in Table 4, or more frequently.
- Fall sweep period, After September 15: All streets designated for sweeping will be swept according to the frequency specified in Table 4, or more frequently.
- Parking lots: During the spring sweeping period, all parking lots designated for sweeping will be swept according to the frequency specified in Table 4, or more frequently. During the late summer sweeping period, all parking lots designated for sweeping will be swept at a frequency based on parking lot inspections performed during this period. Parking lots requiring sweeping based on inspections will be swept according to the frequency specified in Table 4, or more frequently.

Adjustments to the spring sweeping schedule may also be made when early spring weather conditions result in delay of the beginning of the spring sweeping event due to frozen conditions along street gutters or other MS4 surfaces (including sidewalks and medians). Residential and collector streets are particularly susceptible to such conditions. Delay in the beginning of the start of the spring sweeping event under such circumstances may result in a matching extension in the scheduled completion date of the spring sweeping period. Such delays are expected whenever 20% or more of gutter pans or adjacent MS4 surfaces (sidewalks, medians, etc.) remain snow covered or frozen at the start date of the spring sweep event.

4. Street Sweeping Practices

Part 3.4.4, Table 4, stipulates permittees use a ‘tandem’ sweeping practice, defined as one mechanical sweeper followed immediately by one vacuum sweeper, to sweep designated streets having curb and gutter drainage. However, DOT has designated streets for sweeping that have open channel drainage, as well as those that have curb and gutter drainage. In addition, DOT sweeping practices are adjusted to reflect significant differences in pollutant loading on Anchorage streets for different traffic volumes.

Thus street sweeping performed by DOT reflects sweeping needs and methods specific to two distinctive drainage configurations as well as to differences in pollutant loading as reflected in traffic volumes. Street sweeping under these ranges of conditions drives selection of significantly different combinations and uses of equipment types. The range in sweeping practices (as reflected in major drainage type and pollutant loading/traffic volume differences) employed by operators of the DOT MS4 are summarized below. Discussion of these practices and the logic used in their selection is organized as follows:

- Subsection 4.1: Description of **Street classifications** based on a combination of traffic and drainage types used in selecting sweeping practices.
- Subsection 4.2: Description of basic **equipment types** used in Anchorage MS4 sweeping practices.
- Subsection 4.3: Description of **sweeping practices**—combinations of equipment and methods used in Anchorage MS4 sweeping.
- Subsection 4.4: Description of approaches used in **selecting sweeping practices** for specific sweeping applications.

4.1. *Street Classifications for Sweeping*

Sweeping practices to be used by operators of the DOT MS4 for a particular street are selected on the basis of the combined characteristics of the drainage type and traffic volume of the street. Drainage type is defined as either open channel or curb and gutter. Open channel drainage is present anywhere sheet flows from the road surface are drained directly across unpaved, typically vegetated road shoulders and channel side slopes into an adjoining open channel drainage system. Curb and gutter drainage is present anywhere sheet flows from the road surface are collected and conveyed as channel flows against an elevated paved or concrete gutter structure along the margin of the paved road surface. Traffic volume of a street is categorized as either arterial or residential/collector as described in Section 2 above. Categories of combinations of drainage type and traffic

volume characteristics for streets used in selecting sweeping practices by operators of the DOT MS4 are summarized as follows:

1. Arterial
 - 1.1. Arterial—Curb and Gutter (Art-C&G, also Mains)
 - 1.2. Arterial—Open Channel (Art-OC, also Strip Mains)
2. Residential/Collector
 - 2.1. Residential/Collector—Curb and Gutter (Res/Col-C&G, also Residential)
 - 2.2. Residential/Collector—Open Channel (Res/Col-OC, also Strip Paved)

For identifying traffic volumes, mapping of DOT streets using this classification is based on functional mapping performed by others. Drainage type characteristics (curb and gutter and open channel) are mapped by various agencies within the DOT and mapped classifications may be based on as-built records or field observations. However, sweeping practice selection is based on actual conditions at the time sweeping is performed.

4.2. Sweeping Equipment

Because of the wide range in MS4 surfaces, street drainage configurations, and pollutant loading encountered across the Anchorage MS4, a related range in equipment is required to safely and effectively sweep these surfaces. However, use and selection of equipment for sweeping the Anchorage MS4 follows procedures that are common across the United States. All street sweeping practices apply a “train” concept in equipment selection and use. A sweeping train is the sequential application of different equipment types along a street as it is swept. All MS4 sweeping trains in Anchorage include equipment to lightly wet the street surface immediately before actual sweeping begins; one and typically several sweepers operated back to back to loosen, accumulate and remove particulates from the street; and additional equipment to lightly wash the street to remove very fine particulates from the trafficking surface that the sweepers cannot remove. Wetting and lightly washing the street surface to control dust is such an integral and important part of all street sweeping that water sprinkling equipment is usually carried and applied by separate watering vehicles as well as fed from on-board tanks and spray bars mounted on the sweeping equipment themselves. Finally, dependent upon the equipment in the train and the traffic volume on the street, the train might also include one or more dump trucks (for use with side-dump sweepers), and one or more crash attenuators and/or signaling trucks (for traffic safety and control).

Despite the complexity and range of equipment used in every sweeping train, the piece of equipment central to a specific sweeping practice is often the sweeper itself. In all practices sweeping equipment typically includes use of one or more of the following sweeping devices.

- Kick broom: these are devices consisting of a variety of mechanically-driven brushes primarily used to impact, dislodge and move, but not collect, street debris and particulates. Sweeping with these devices is typically intended to: (1) help dislodge compacted street sediments and debris, (2) accumulate street debris into windrows or concentrations that will be more readily accessible to other sweepers

that will then be used to collect the debris, and/or (3) move the debris off the road surface and into temporary storage in adjacent vegetated shoulders and side-slopes where it can be later removed during shoulder and ditch redressing activities. Light application of water immediately prior to operation of kick brooms is usually necessary to control dust and is often accomplished through use of separate watering vehicles.

- Mechanical pickup sweeper: this is a sweeper that typically operates through use of side brooms that sweep street debris into the path of a main broom that then sweeps the debris onto a conveyor that moves the collected sediments off the street and into the sweeper storage hopper. A mechanical pickup sweeper differs most significantly from a kick broom in that it ultimately collects and removes street sediments from the street surface. Modern mechanical sweepers are more effective than vacuum-assisted sweepers at collecting and removing heavy sediment and debris loads particularly from highly uneven road surfaces, but are significantly less efficient than vacuum sweepers in removing finer—‘washload’—sediments (-250μ). Similar to kick brooms, mechanical pickup sweepers are typically operated with water to control dust generation.
- Vacuum-assisted sweeper: also known generally as vacuum sweepers; this is a sweeper that operates similar to the mechanical pickup sweeper in its use of brooms to accumulate and concentrate street sediments into the path of the sweeper but uses a vacuum, rather than a collector broom, to lift sediments into the sweeper storage hopper. Vacuum-assisted sweepers are much more efficient than mechanical sweepers at removing finer sediments (-250μ) from the street surface but at the cost of increased sweeping times, equipment maintenance, and operator expertise. These types of sweepers also lose efficiency in sweeping highly uneven street surfaces (as, for example, along streets rutted by studded tire wear) as a result of vacuum break. Vacuum-assisted sweepers are typically described as ‘wet’ (using water to assist the initial sweeping process prior to vacuuming) or ‘dry’ (using blasts of air to loosen and lift street sediments prior to vacuuming). Operators of the DOT MS4 typically use ‘wet’ vacuum-assisted sweepers.

Operators of the DOT MS4 use one or more of these types of devices in all its sweeping practices. To function at their peak efficiency, sweepers, and mechanical pickup and vacuum-assisted sweepers particularly, must be regularly maintained and retired after so many years of service. The DOT requires all devices used in DOT practices, whether owned and operated by DOT or by contractors, to be properly maintained and within the manufacturer’s recommended operational life of the device. DOT also require all devices used in their sweeping practices to be operated within manufacturer’s recommended parameters, including sweeping speeds, water use, and filter maintenance.

4.3. Sweeping Practices

DOT uses a range of sweeping practices selected to match the sweeping category of the street (as outlined in previous subsections) and the sweeping needs specific to the

circumstances of the sweeping event. A sweeping practice consists of selected combinations of equipment applied in specific patterns to remove accumulated sediment and debris from street surfaces. All practices have some characteristics in common. As indicated above, these include use of watering vehicles to prevent dust generation and to lightly wash the street surface at the end of the process to remove from the trafficking surface those fine particles not able to be removed by the sweepers. Applications of water are kept to that required to control dust, to maximize efficiency of the sweeping process and to prevent mobilization of sediments down gutters. Use of safety and traffic control vehicles are also common where a practice is performed along a high traffic volume street. For some sweeping activities, signage may be placed prior to sweeping to discourage parking along a scheduled sweeping route, but otherwise parking prohibitions are not typically enforced. Otherwise, principle differences in sweeping practices are in the combinations of sweepers and brooms selected for use. Standard sweeping practices selected for use by operators of the DOT MS4 are described below in terms of these combinations.

4.3.1. Tandem Vacuum Practices

The tandem vacuum sweeping practice employed by operators of the DOT MS4 essentially matches the sweeping practice described at Table 4 of the permit. The practice as defined here is also similar to those labeled nationwide as ‘tandem’ sweeping practices. The DOT practice entails the use of a sweeping equipment train typically including one or more gutter, tube, angled, or other ‘kick’ brooms; a mechanical pickup sweeper; and a vacuum-assisted sweeper used in series during a single sweeping event. As noted earlier, the train also includes water sprinkling equipment, either carried and applied by separate vehicles or fed from on-board tanks and spray bars mounted on the sweeping equipment. Dependent upon the equipment in the train and the street, the train might also include one or more dump trucks (for use with side-dump sweepers), and one or more crash attenuator and/or signaling trucks (for traffic safety and control).

Equipment and sweeping strategy for a tandem practice are essentially the same in all its applications. It includes one set of overlapping sweeping passes across the full street width performed first by the mechanical pickup sweeper followed immediately by the vacuum-assisted sweeper. In general, one set of overlapping passes by both sweepers constitute a ‘sweeping event’ and is considered equivalent to the single sweeping event as expressed in Note 1 in Table 4 in the current permit. However, dependent upon the street drainage type (curb and gutter or open channel) elements of the equipment train are deployed somewhat differently to accomplish the overlapping sweeping passes. Variants of tandem sweeping in this context are described below.

Curb and Gutter

Curb and gutter streets are well suited to the use of a tandem sweeping practice. Sweeping is carried out by orchestration of all the equipment within the train to first pre-wet the surface (applied minimally so as to control dust but not encourage adherence of fine particulates to the road surface) followed by brushing, brooming and vacuuming to loosen and collect the street debris. To do this the train is maneuvered over the entire cross section of street surface in a series of passes of both the mechanical and vacuum-

assisted sweepers along the street length. Where sidewalks or adjacent paved surfaces are present or where gutter loads are heavy, kick brooms are used to move sidewalk debris loads out onto the adjacent traffic surface prior to actual street sweeping. Sweeping is performed using partially overlapping passes typically made from the road center out to either both roadside gutters (where there is no median gutter) or to both the roadside and median gutters (where there are median gutters). To prevent dust and air quality impacts, a final light wash using a 5% solution of magnesium chloride and water may be applied across the swept surface to agglomerate and move into the gutter pan those fine particulates unable to be captured with the sweeping technology.

Strip Paved

A variant of the tandem practice described for curb and gutter streets is also used for strip paved roads that do not have adequate shoulder storage for application of a kick broom strategy (see following subsection). As in all tandem sweeping practices, pre-wetting is done as an initial step to control dust. However in the case of strip paved tandem sweeping practice, the first step in actual sweeping is use of kick brooms to maneuver debris loads from the near shoulder and pavement margin fully onto the paved street surface. Once this is accomplished, one or more tandem passes with pickup sweepers (specifically, mechanical sweeper followed by vacuum-assisted sweeper) are then made to remove debris from the full width of the road as well as to remove the load swept onto the pavement margin by the initial kick broom pass. As for curb and gutter streets, a light wash may be used to remove fine particulates from the road surface onto the shoulder.

4.3.2. Tandem Mechanical Practices

The ‘tandem mechanical’ sweeping practice employed by operators of the DOT MS4 is similar to the tandem vacuum practice described above but uses two consecutive passes of mechanical pickup sweepers rather than a combination of mechanical/vacuum sweepers. Otherwise the tandem mechanical sweeping practice is used similarly to the tandem vacuum practice, for both curb and gutter and strip paved (open-channel drainage type) street segments.

4.3.3. Single Mechanical Practices

The single mechanical sweeping practice uses a single pass of a mechanical pickup sweeper to sweep and collect sediments from swept surfaces. This practice is usually limited to use across public parking lots when sediment loading is light.

4.4. Selection of Street Sweeping Practices

Selection of DOT street sweeping practices are guided predominantly by the combined character of a road’s drainage type and traffic volume as defined above. Practices used by operators of the DOT MS4 for different combinations are as follows:

Table 1: Sweeping Practices Selection			
Practice	Table 4 Category	Traffic Volume¹	Drainage Type
Tandem Vacuum or	Arterial	Arterial	Curb and gutter

Tandem Mechanical ²			
Tandem Vacuum or Tandem Mechanical ²	Residential	Residential/Collector	Curb and gutter
Tandem Vacuum or Tandem Mechanical ²	Arterial or Residential	Arterial or Residential/Collector	Restricted open channel ⁴
Tandem Vacuum or Tandem Mechanical ²	Arterial Residential	Arterial Residential/Collector	Open channel Open channel
Single Mechanical	Parking	na	na

Notes:

1. based on Statewide Functional Classification
2. selection based on visual estimate of performance adequacy

Selection of use of tandem vacuum versus tandem mechanical practices is made on the basis of performance inspection. Where use of tandem mechanical practices is determined by visual inspection to be equal in removal efficiency to use of tandem vacuum practices, tandem mechanical practices may be applied.

5. Street Sweeping Waste Management Practices

Street sweeping wastes include all materials collected directly during any sweeping activity, either on parking lots or streets.

5.1. *Collected Street Sweepings Waste Management*

Collected street sweepings include all those materials immediately collected during use of any sweeping practice. Of course, for sweeper practices that immediately remove sediment and debris from a street surface, swept street materials are initially collected in the sweepers’ hoppers. Dependent upon site location and equipment capabilities, wastes may be directly transferred from the hoppers into trucks for transport to a central collection facility, discharged from the sweeper hopper at a local staging area to await transport to the collection facility, or transported directly to the collection facility by the sweeper. Collection facilities are operated either directly by DOT or by contractors to DOT. For facilities operated by contractors, DOT requires contractors to manage and dispose of or reuse all collected street sweeping wastes in conformance with all State, federal and local law.

Street sweeping wastes transported to central collection facilities operated directly by DOT are sorted as appropriate for potential re-use or disposal. Materials designated for disposal are briefly stored at the central location facility and are then transported to the Alaska Regional Landfill for final disposal.

6. Appendices:

- Appendix A: MS4 Jurisdiction Maps
- Appendix B: MS4 Street Classification Maps
- Appendix C: MS4 Swept Streets Maps

Appendix A: MS4 Street Sweeping Jurisdiction Maps

Figure 1: MS4 Street Jurisdictions - Anchorage Bowl

Figure 2: MS4 Street Jurisdictions - Eagle River Vicinity

Figure 3: MS4 Street Jurisdictions - Turnagain Arm

APDES MS4 Street Sweeping Jurisdiction Anchorage Bowl 2020

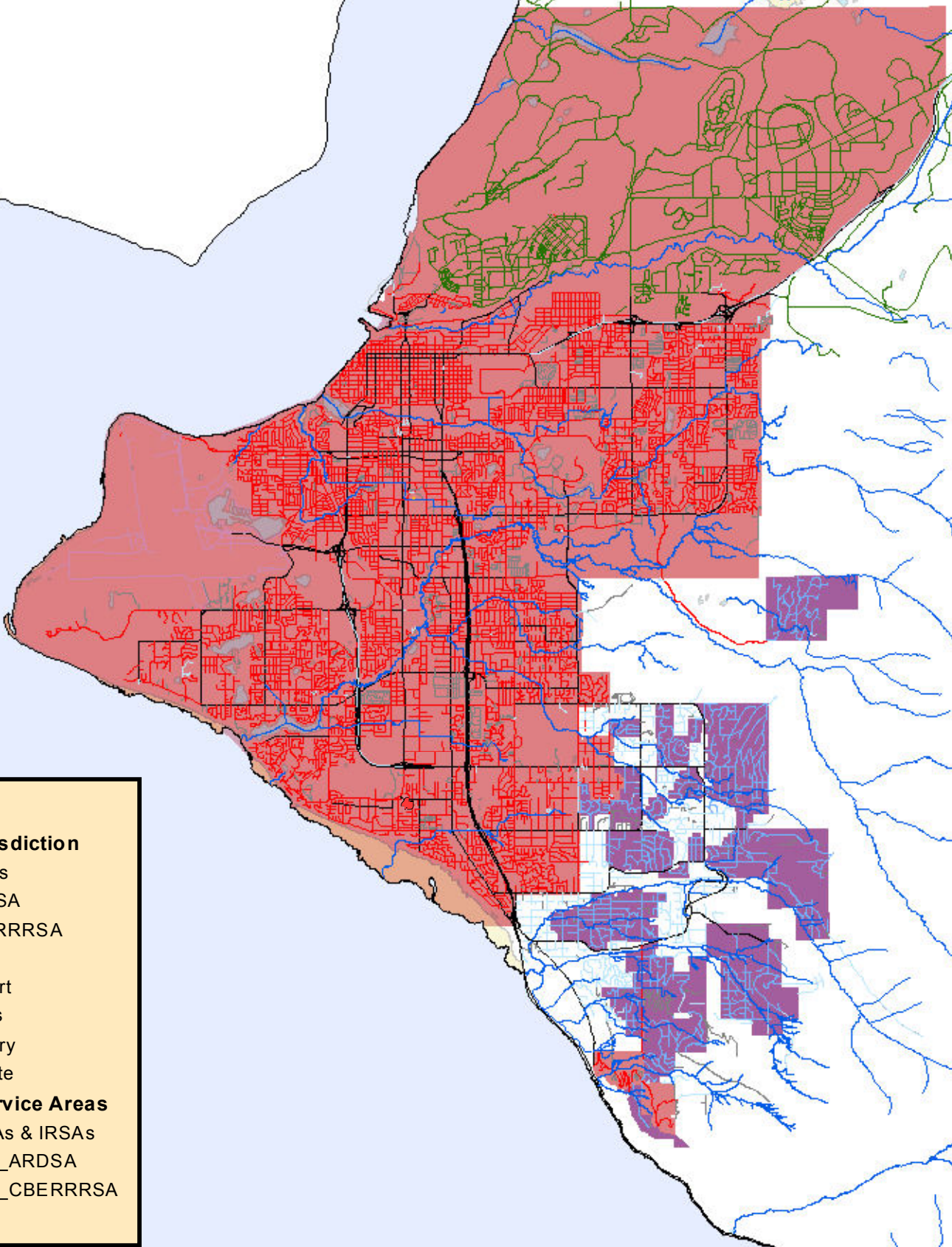
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MS4 Jurisdiction

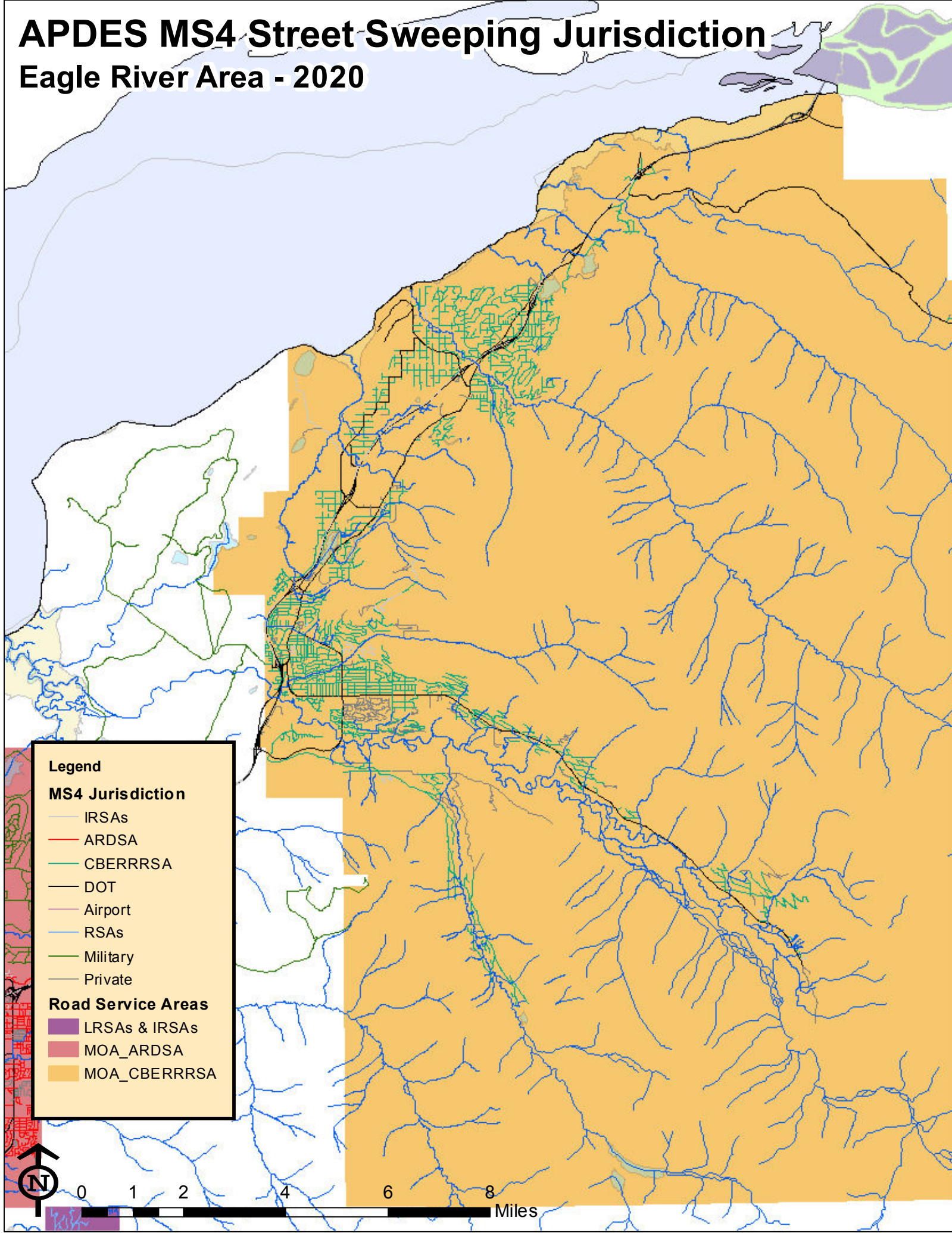
- IRSAs
- ARDSA
- CBERRRSA
- DOT
- Airport
- RSAs
- Military
- Private

Road Service Areas

- LRSAs & IRSAs
- MOA_ARDSA
- MOA_CBERRRSA



APDES MS4 Street Sweeping Jurisdiction Eagle River Area - 2020



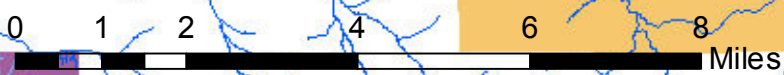
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MS4 Jurisdiction

- IRSAs
- ARDSA
- CBERRRSA
- DOT
- Airport
- RSAs
- Military
- Private

Road Service Areas

- LRSAs & IRSAs
- MOA_ARDSA
- MOA_CBERRRSA



APDES MS4 Street Sweeping Jurisdiction

Turnagain Arm - 2020

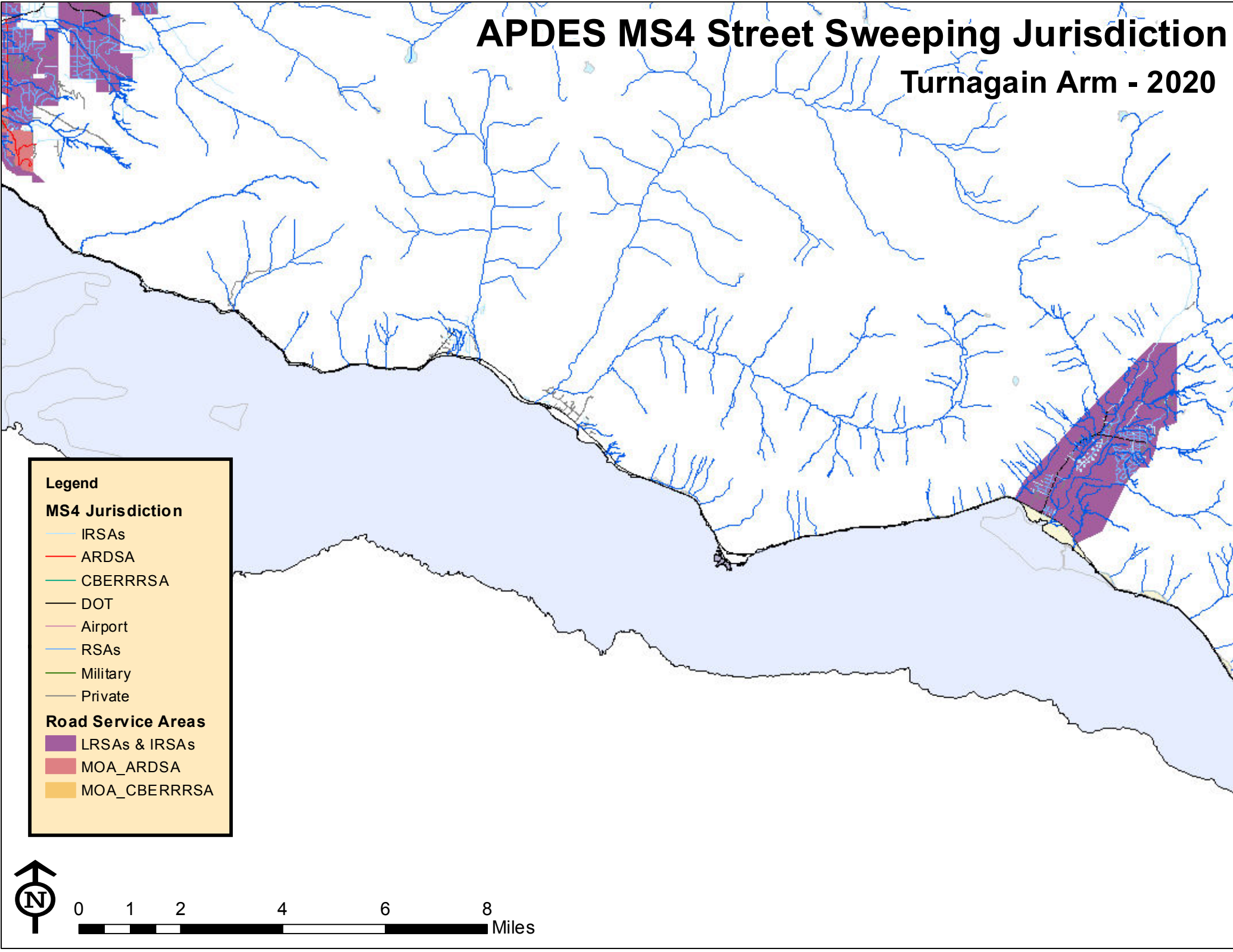
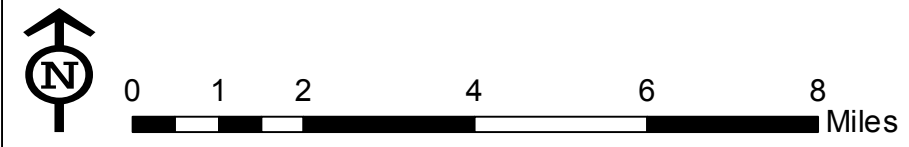
Legend

MS4 Jurisdiction

- IRSA
- ARDSA
- CBERRRSA
- DOT
- Airport
- RSAs
- Military
- Private

Road Service Areas

- LRSAs & IRSAs
- MOA_ARDSA
- MOA_CBERRRSA



Appendix B: MS4 Street Classification Maps

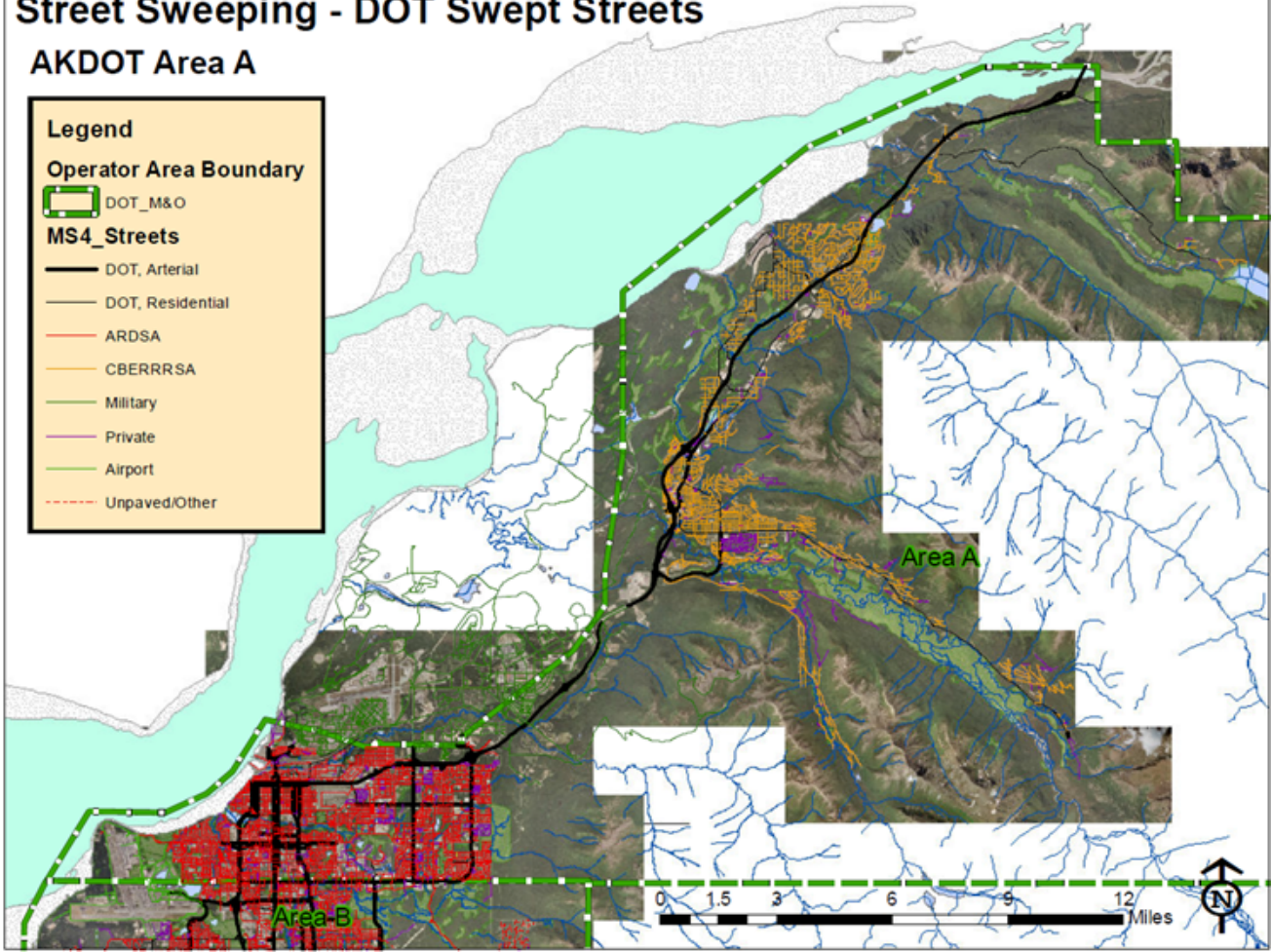
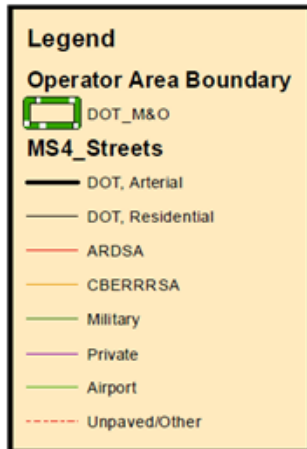
Figure 4: Street Classifications – North Anchorage to Eklutna, DOT Area A

Figure 5: Street Classifications – South Anchorage Bowl, DOT Area B

Figure 6: Street Classifications – Turnagain Arm and Girdwood, DOT Area C

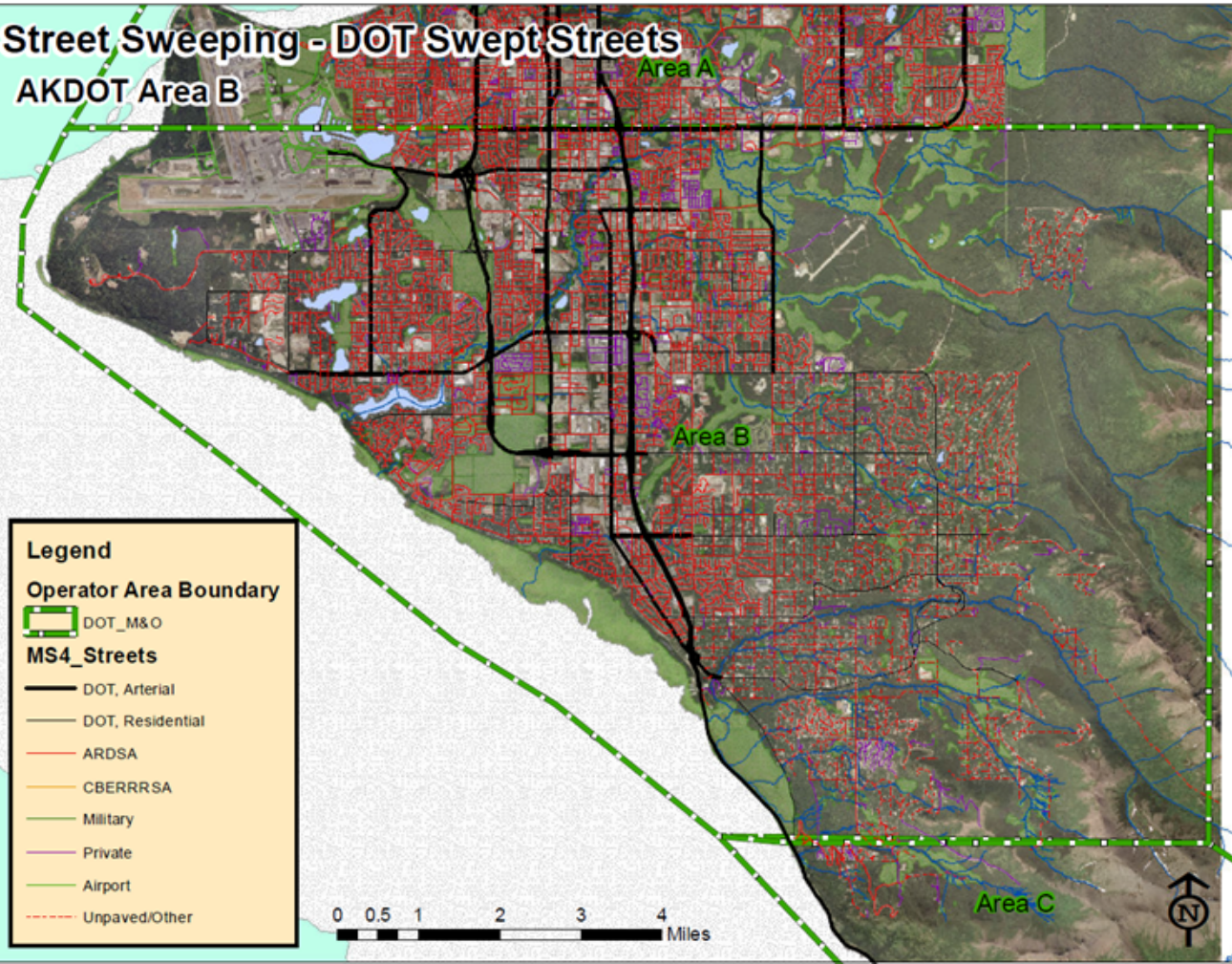
Street Sweeping - DOT Swept Streets

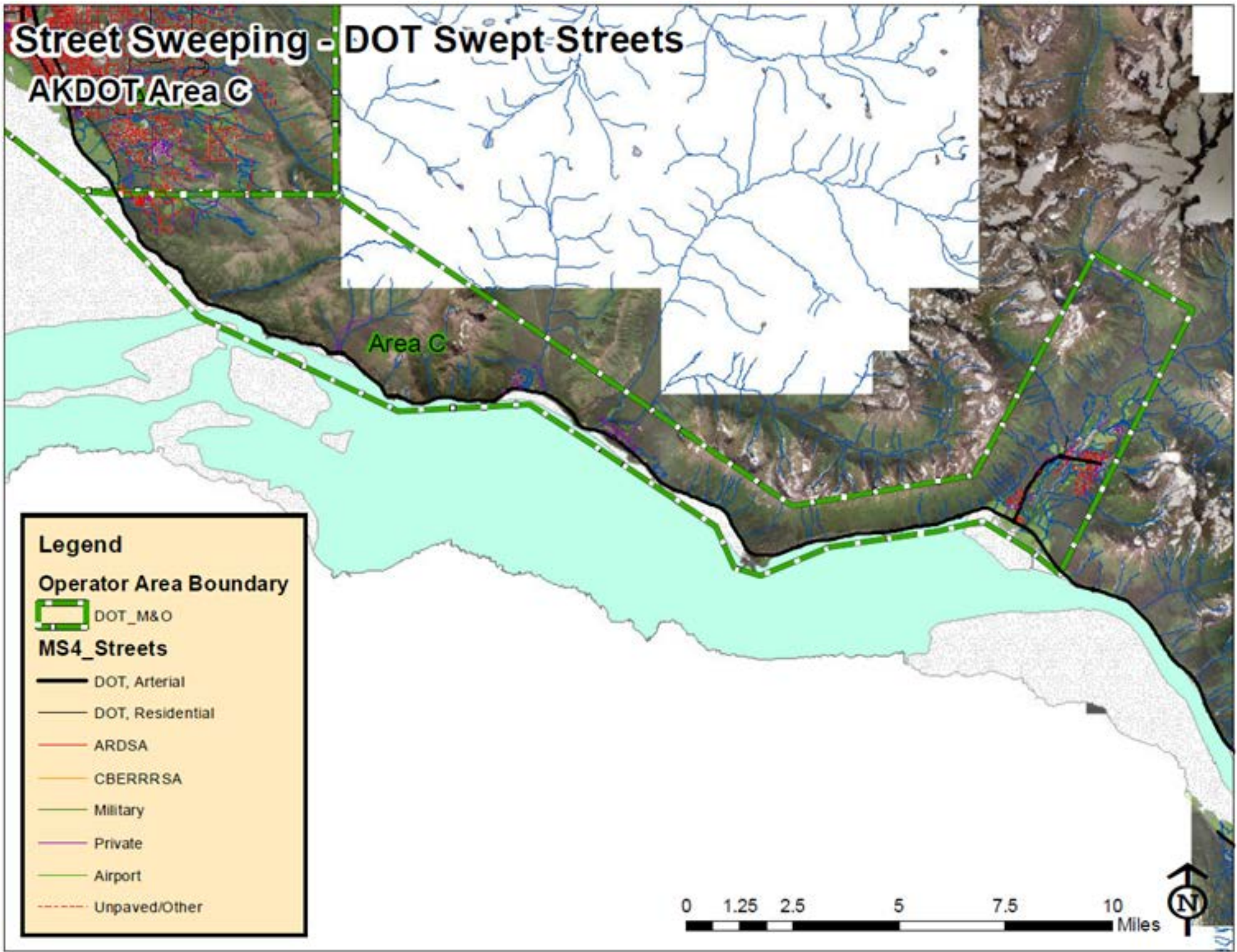
AKDOT Area A



Street Sweeping - DOT Swept Streets

AKDOT Area B





Appendix C: MS4 Swept Streets Maps - 2020

(TO BE SUBMITTED IN 2020 ANNUAL REPORT per 3.4.4.4.1).