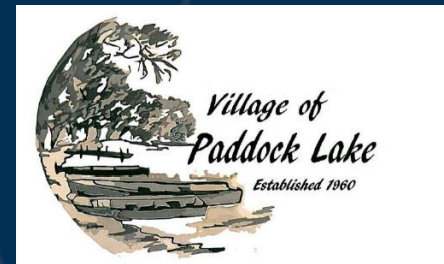


Paddock Lake's Chloride Reduction

Update, Results & Lessons Learned

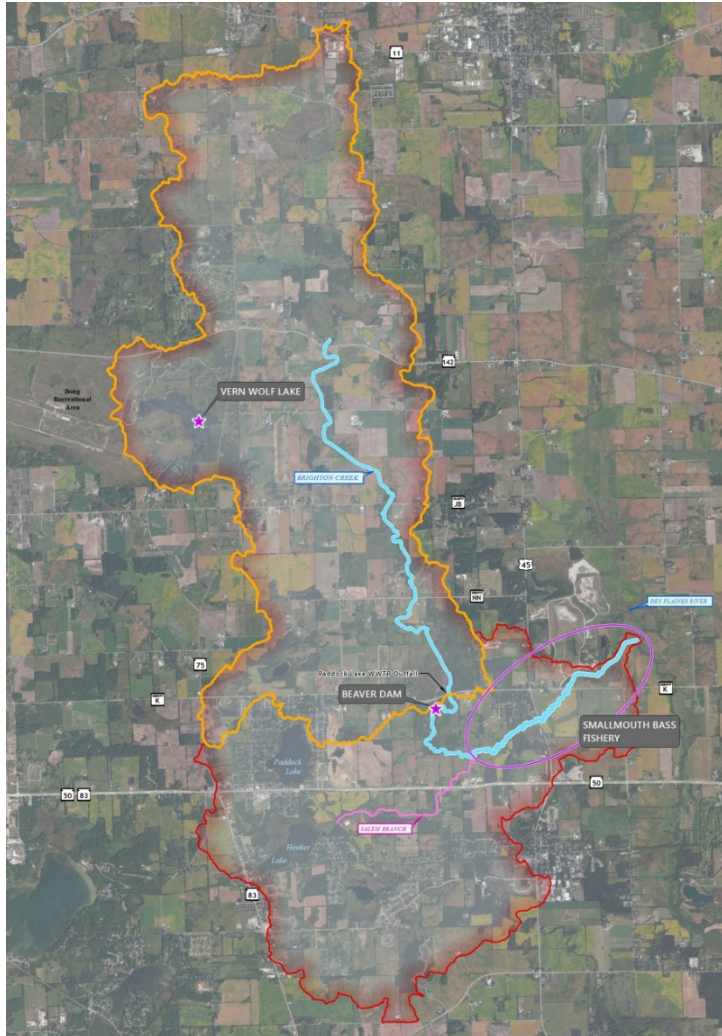
Lila Johnson – Baxter & Woodman

Tim Popanda – Village of Paddock Lake

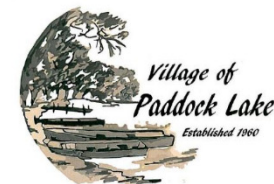


BAXTER & WOODMAN
Consulting Engineers

Overview



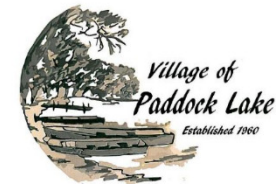
- Population 3,000
- Sanitary sewer users 1,475
 - 290 users served by sanitary sewer and municipal water
 - 1,185 users with private wells



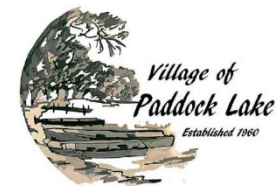
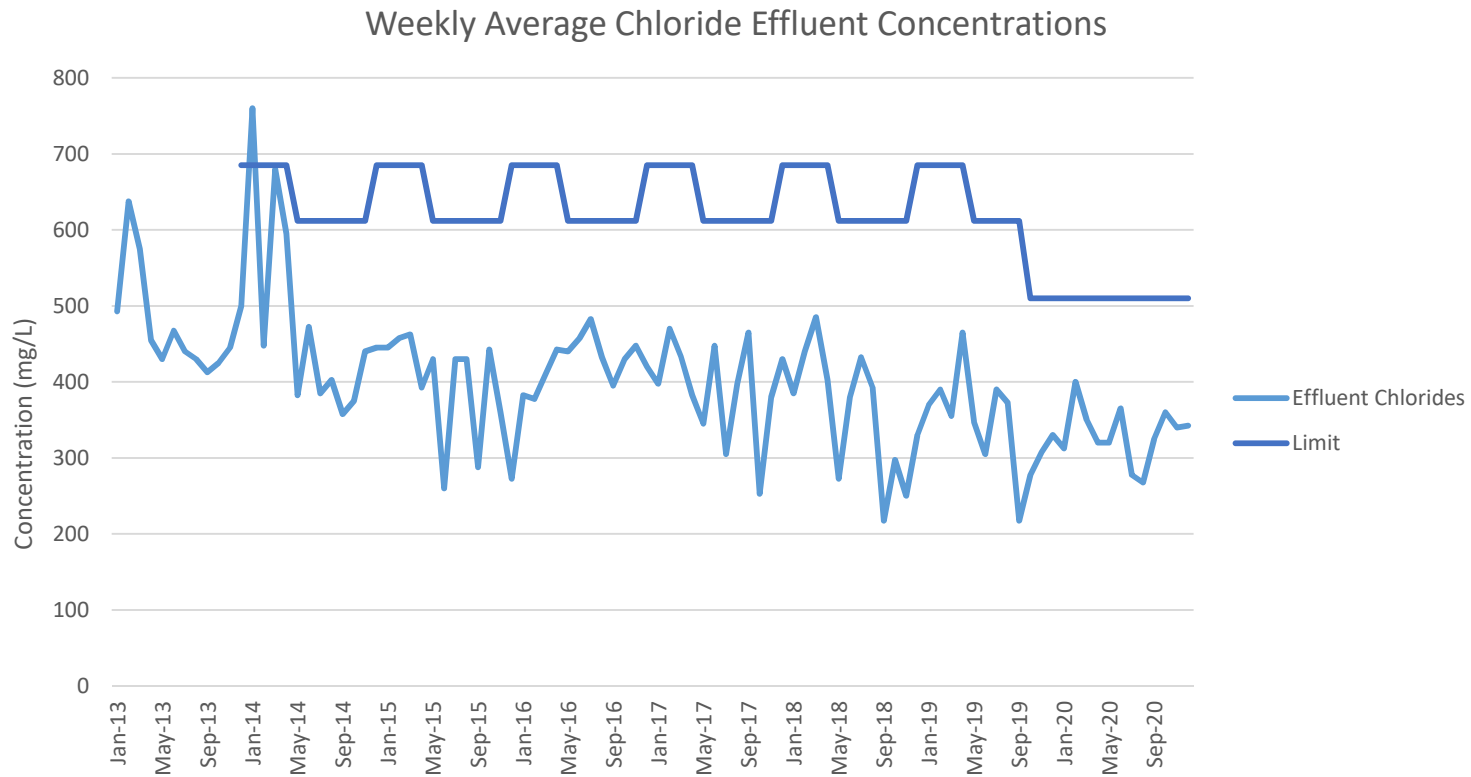
Overview



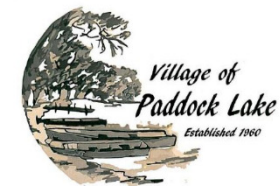
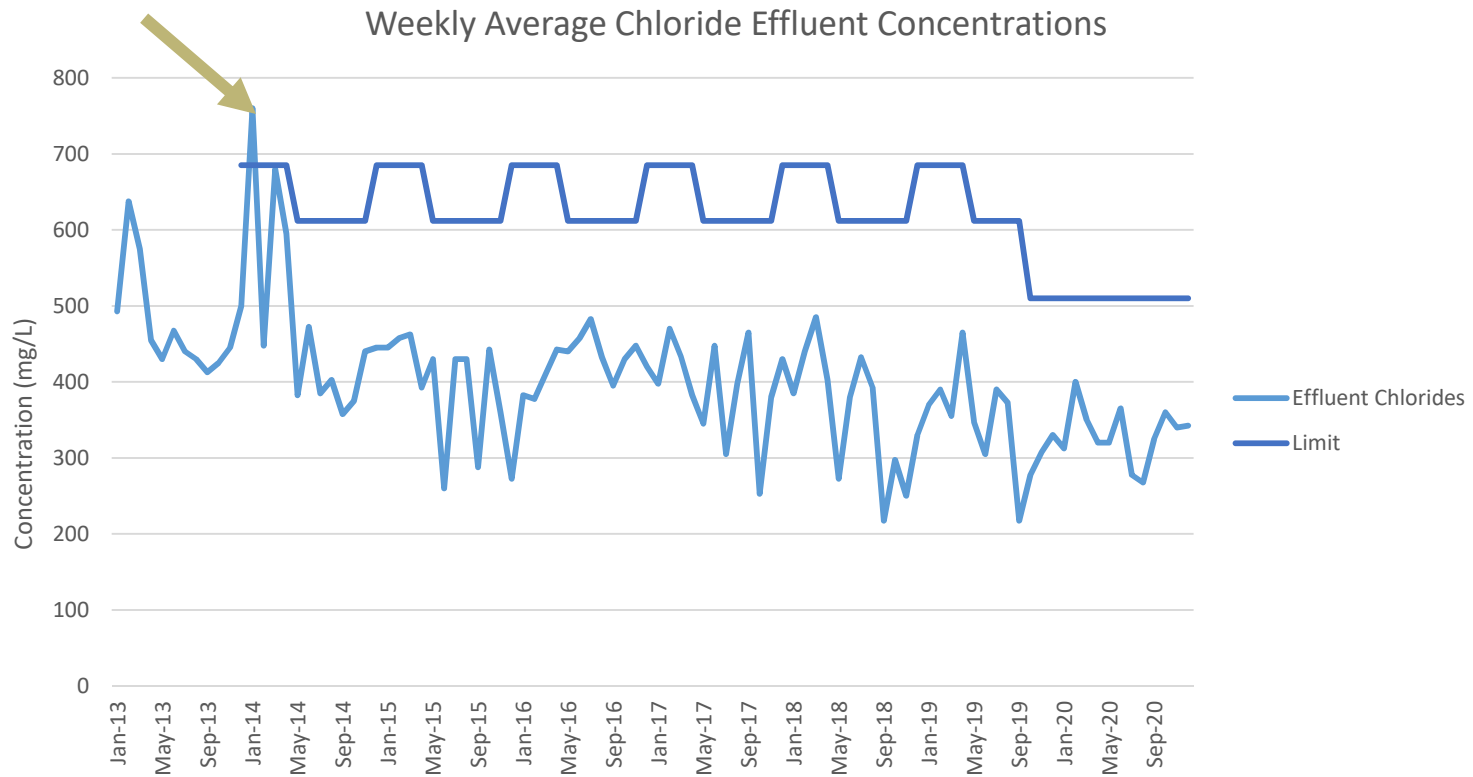
- Design Average Flow 0.8 MGD
- Previous permit chloride interim limits
 - 612 mg/L weekly average - May to November
 - 683 mg/L weekly average - December to April
- Current permit
 - 510 mg/L weekly average



Historic Chloride Concentration

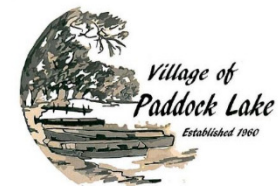


Historic Chloride Concentration



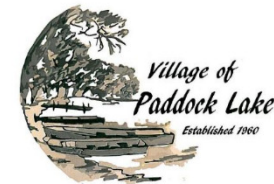
2013 Source Reduction Measures

- Public education and outreach
- Reduction for municipal operation
- Study



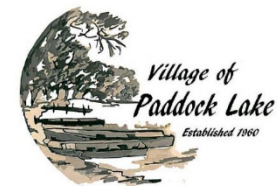
Public Education and Outreach

- Developed FAQ's
 - Village's plans to reduce use of road salt
 - Encouraging reduction of water softener use and salt
- Newsletters and web page – residents
- Business and institutional users
 - Proper use of deicing materials
 - Efficient water softeners



Chloride Reduction for Municipal Operations

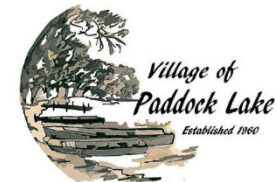
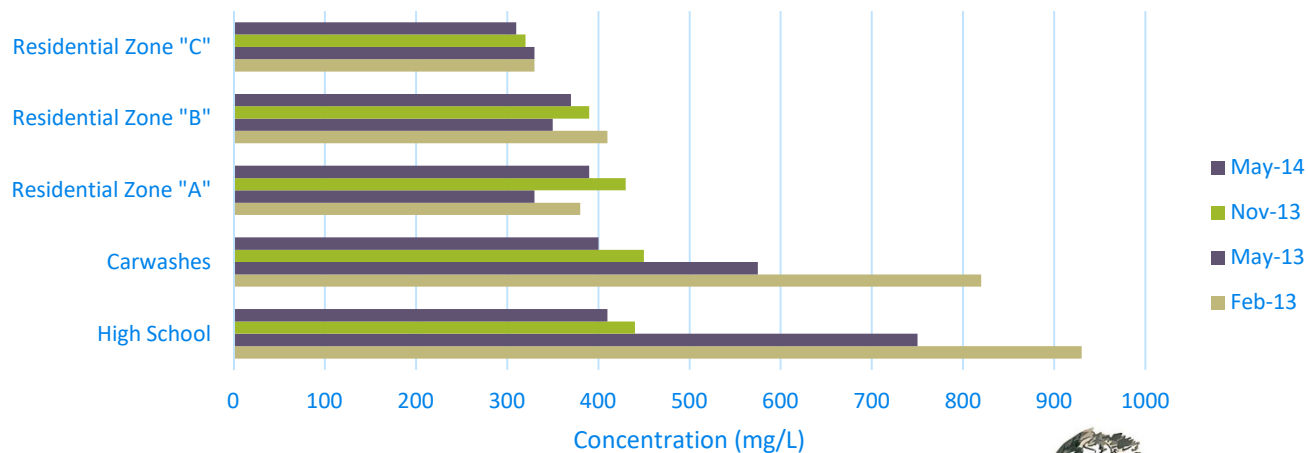
- Audit of Snow Removal Operations
 - 40 % Reduction Target
 - Plow then Salt
 - Southern Exposure Reductions
- Snow Removal and Salt Use Policy
 - Priority Zones
 - Snow Fence in Selected Locations
- Annual Training
- Road Salt Additives-Mixture
 - Birds Eye Stone
 - 40 % to 50 % Ratio
- Equipment Purchases
 - Spill Guards
 - Infrared Thermometers
- County Coordination-Spring Road Cleaning



2013 Study

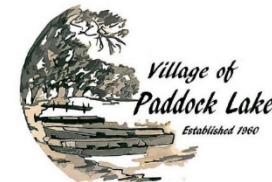
- Evaluation of possible sources of chloride
 - 3 residential neighborhoods
 - Village commercial business district
 - Impact from institutional occupancies

2013-2014 Chloride Grab Samples



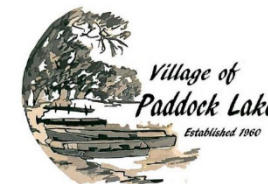
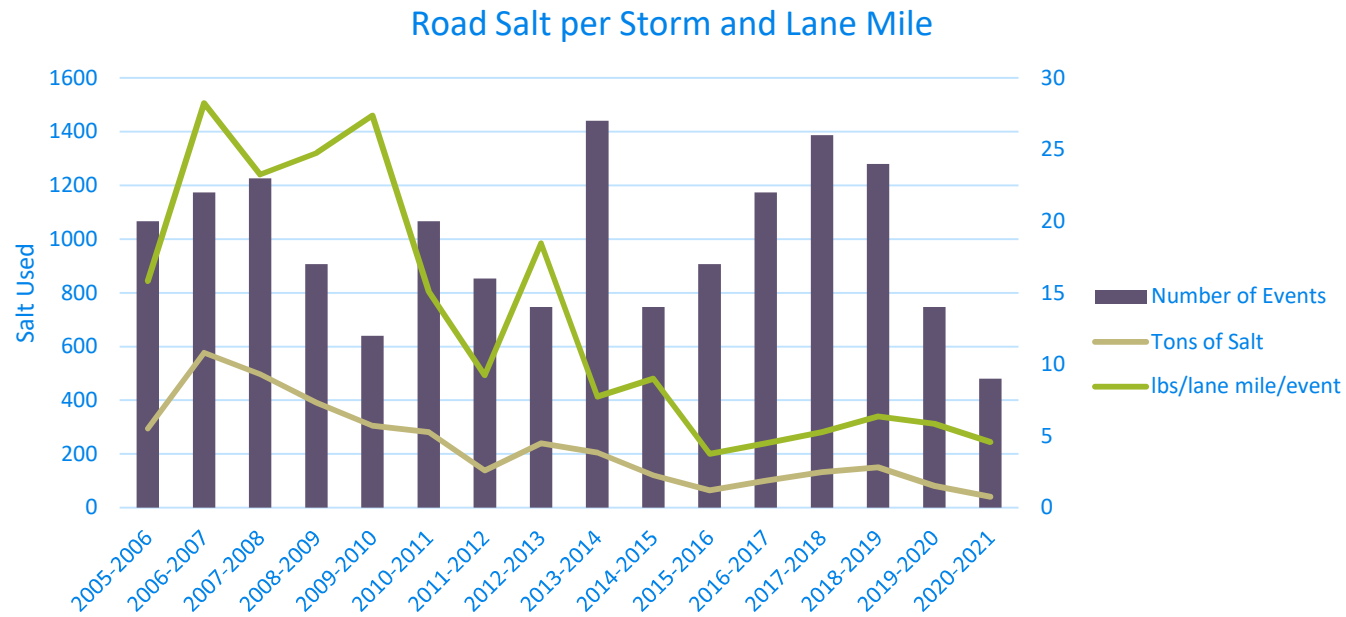
Outcome of 2013 Study

- Met with commercial and public users contributing greatest concentration of chlorides to system
 - School replaced two inefficient manual water softeners with new automated brine reclamation systems – 35% reduction in salt use
 - School removed irrigation water lines from softened water
 - Car washes modified process to use reclaimed and recirculated under body wash system – 15% reduction in water use



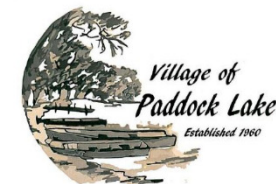
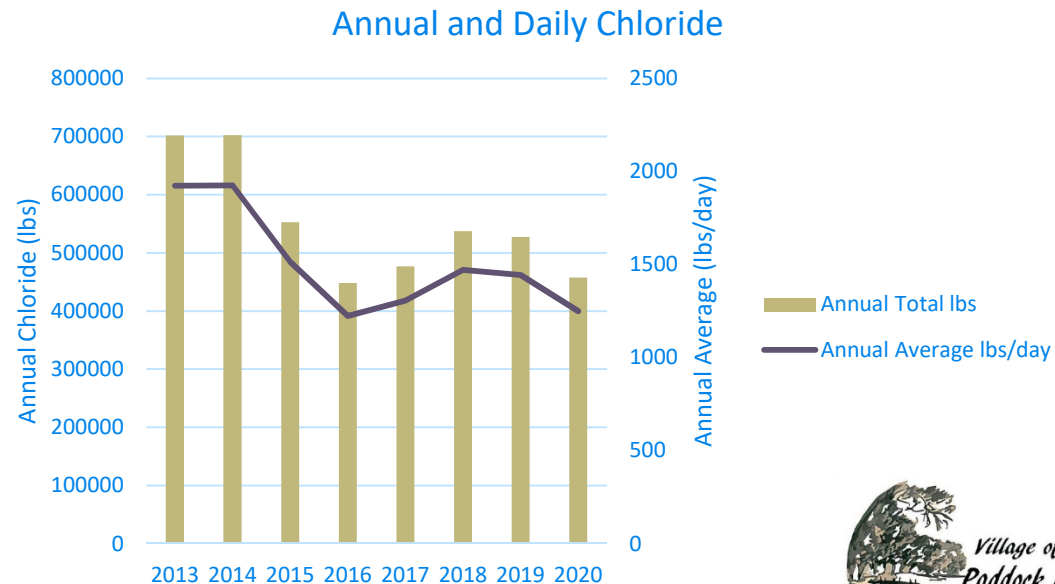
Road Salt

- Reduction of use by 35%



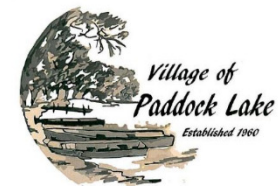
Results of 2013 Source Reduction Measures

- Overall
 - 23.42% reduction in chlorides
 - 450 pounds reduce per day
 - Reduction of 70,000 pounds annually from 2019-2020



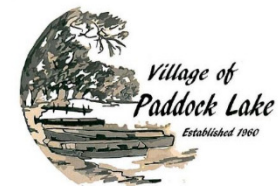
2019 Source Reduction Measures

- Public education and outreach
- Continued municipal operation reduction
- Expansion of water system
- Study



Residential Softening

- 71% of residential users have water softeners
 - Softeners regenerate 1-2 times per week and use 5-10 pounds of salt per regeneration
 - Load from homes 1,400-2,700 pounds daily



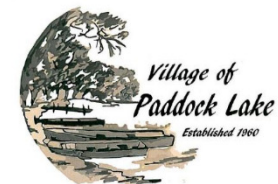
Strategies for Compliance

- Residential water softener optimization program
 - Anticipated participation – 40%
- Further reduction of road salt use
- Implementation of commercial business water softener optimization program
- Continue repairs of collection system to reduce I/I
- Water main expansion



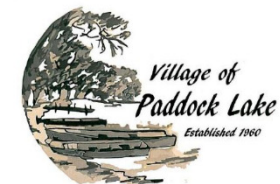
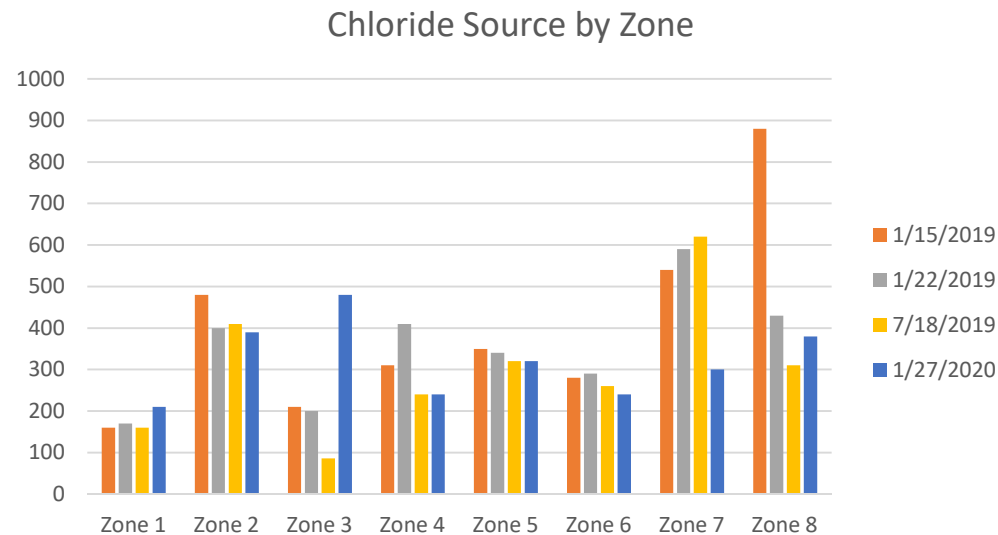
2019-2023 Source Reduction Study

- Gather samples from all 8 zones
- Test private water wells and zones for water hardness, levels of iron, manganese and hydrogen sulfides
- Install groundwater sampling wells



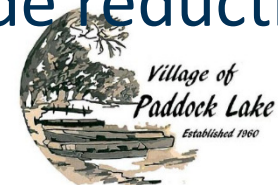
Preliminary Zone Sampling Results

- Zone 7 – Village business district
- Zone 8 – businesses and residential
- Average hardness 210 mg-CaCO₃/L



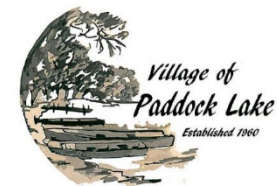
Future Actions

- Ongoing optimization of deicing
- Continuation of source reduction measures
- Continuation of source studies
- Mandate – demand initiated regeneration for new residences
- Mandate – residential softener tune-up program
- Mandate – water softener bypass to outside hose bib
- Mandate – new businesses chloride reduction plan



Lessons Learned

- Proactive approach resident communication
- Focus on institutional, commercial and industrial customers
- Optimize deicing



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