Juneau Air Quality and Cruise ship Emissions Monitoring

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF AIR QUALITY and DIVISION OF WATER QUALITY
January 29, 2019
Who at DEC Monitors Cruise Ships?

- Yellow – Division of Water Quality; Cruise Ships - Ed White
- Green – Division of Air Quality; Air Monitoring - Barbara Trost
2018 Concerns and Questions

Public complaints and questions

- Large increase in 2017 and 2018
- Complaints from outside Juneau
- Types of complaints
- Increase in ship traffic and size of ships
- Changes in ship operations
Public concerns and questions

Number Public Complaints Per Year

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Public Complaints</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>20</td>
</tr>
<tr>
<td>2005</td>
<td>23</td>
</tr>
<tr>
<td>2006</td>
<td>19</td>
</tr>
<tr>
<td>2007</td>
<td>24</td>
</tr>
<tr>
<td>2008</td>
<td>36</td>
</tr>
<tr>
<td>2009</td>
<td>54</td>
</tr>
<tr>
<td>2010</td>
<td>10</td>
</tr>
<tr>
<td>2011</td>
<td>9</td>
</tr>
<tr>
<td>2012</td>
<td>19</td>
</tr>
<tr>
<td>2013</td>
<td>13</td>
</tr>
<tr>
<td>2014</td>
<td>23</td>
</tr>
<tr>
<td>2015</td>
<td>4</td>
</tr>
<tr>
<td>2016</td>
<td>0</td>
</tr>
<tr>
<td>2017</td>
<td>71</td>
</tr>
<tr>
<td>2018</td>
<td>152</td>
</tr>
</tbody>
</table>
Opacity

- All ships must comply with State’s Opacity limits
- State of Alaska has been monitoring vessel air emissions since 1970s
Ambient Air Quality

- In 2000 an Ambient Air Quality study was conducted in Juneau due to concern about cruise ship opacity.
  - No exceedances of air quality standards were found in the 2000 study.
Information

DEC Cruise Ship website
https://dec.alaska.gov/water/cruise-ships/
Cruise Ship Industry Impact on Air Quality

DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF AIR QUALITY and DIVISION OF WATER QUALITY
January 29, 2019
2019 Ambient Air Quality Screening Level Study

Objectives:

• To address ambient air quality complaints centered on the cruise ship emissions

• To determine which areas of downtown Juneau are most affected

• To assess if the scale in terms of frequency, duration, spatial variability and severity of these impacts have the potential to significantly affect public health and/or violate Clean Air Act air quality standards.
2019 Ambient Air Quality Saturation Study

Saturation study:
study floods a small area with a large number of low-cost non-regulatory sensors for a short period of time, typically to answer a defined set of questions

• 20 non-regulatory PM2.5 sensors set up in a grid in downtown area

• 10 non-regulatory passive SO$_2$ samplers at selected sites on days with many cruise ships in port

• Site selections yet to be made: city and state buildings; volunteers

• Results of screening level study and available funding will determine future actions.
Saturation Study Equipment

- **PM$_{2.5}$ → Purple Air**
  - Continuous
  - Non-regulatory
  - Posts real-time data on website
  - 20 sites –
    - Mar-May 2019 pre season
    - Jun-Oct 2019 maximum impact

- **SO$_2$ → Ogawa Passive Sampler**
  - Integrated (12-24 hours)
  - Non-regulatory
  - Detection limit (24 hours) ~3.8 ppb (depends on lab analysis)
  - 10 sites; 2 per week for 4 weeks
Access to data

Purple Air PM$_{2.5}$
- Wireless communication & SD cards
- DEC will develop website for the study
- May look something like this
- Still in planning phase

Ogawa Passive SO$_2$ monitors
- Not ‘real time’
- Exposed 12 - 24 hours
- Wait for lab analysis
Preliminary monitoring plan

Background Monitoring

• Before the start of the cruise ship season on April 28, 2019
• Purple Air:
  • grid pattern covering downtown Juneau
  • Power cost ~ $1/ month
  • Operating entire study period
• Passive SO$_2$ sampler:
  • 3 days chosen to have similar weather conditions to expected ‘worst’ days

Plume identification monitoring

• Passive Ogawa SO$_2$ monitoring
  • Located at a subset of Purple Air sites
  • Targeted sampling at days with large number of cruise ships in port (example 6 cruise ships in port on 5/28/19)
  • No power required
Passive Ogawa SO\textsubscript{2} monitoring

Targeted at days with large number of cruise ships in port (example 6 cruise ships in port on 5/28/19)
Example Sensor Grid

PM$_{2.5}$ sensor locations (Purple Air)

SO$_2$ samplers will be collocated with some of the Purple Air sensors.
Help us help you…

Add information to the laminated map with sticky flags

Are you willing to host a monitor?

.... please leave your name, phone number, email and address & location proposed on the green signup sheet

Contact us!

**Barbara Trost**
AMQA Program Manager
barbara.trost@alaska.gov
907-269-6249

**Anna Breuninger**
Saturation Study Coordinator
anna.breuninger@alaska.gov
907-269-7573
Commercial Passenger Vessel Environmental Compliance Program
“Cruise Ship Program”
January 29, 2019

Large Cruise Ships (>250 passengers)
Small Cruise Ships (50 to 249 passengers)
Alaska State Ferries
Background Information

• 18 AAC 50.070 – Marine Vessel Visible Emission Standards
• Exemptions are granted for initial startup & maneuvering
• EPA Reference Method 9
18 AAC 50.070. Marine vessel visible emission standards

1)(A) While vessel is at berth or anchor (over 20% for up to three minutes)

(1)(B) While vessel is at berth during initial startup of the vessel preparing to cast off or weigh anchor (over 20% for up to six minutes)

(2) During the hour immediately after weighing anchor or casting off (up to 40% for an hour or up to 100% for nine minutes)

(3) During the hour before completion of maneuvering to anchor or making fast to shore (up to 40% for an hour or up to 100% for nine minutes)

(4) Vessel underway and not covered under 1-3 above (over 20% for up to three minutes)
Opacity Monitoring of Cruise Ships & State Ferries
Opacity Monitoring Program

- ADEC staff
- ADEC Contractor
  - Minimum of 225 reading per cruise ship season
- US Forest Service Rangers

- Address Public Complaints
  - Conduct a Method 9
  - Contact the cruise line

- Self-monitor (Continuous Emissions Monitoring)
- Self-report under 18 AAC 50.240
### Opacity Monitoring in 2018

#### Opacity Readings Per Year Summary

<table>
<thead>
<tr>
<th>Year</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Readings</td>
<td>382</td>
<td>343</td>
<td>388</td>
<td>552</td>
<td>480</td>
</tr>
</tbody>
</table>

#### DEC and Contractor Opacity Reading Count by Port (2018)

<table>
<thead>
<tr>
<th>Port</th>
<th>Number of Readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchorage</td>
<td>2</td>
</tr>
<tr>
<td>Haines</td>
<td>2</td>
</tr>
<tr>
<td>Hoonah</td>
<td>2</td>
</tr>
<tr>
<td>Juneau</td>
<td>233</td>
</tr>
<tr>
<td>Ketchikan</td>
<td>196</td>
</tr>
<tr>
<td>Seward</td>
<td>3</td>
</tr>
<tr>
<td>Sitka</td>
<td>16</td>
</tr>
<tr>
<td>Skagway</td>
<td>26</td>
</tr>
<tr>
<td>Wrangell, AK</td>
<td>3</td>
</tr>
</tbody>
</table>
### Opacity Enforcement Action Per Year Summary

<table>
<thead>
<tr>
<th>Year</th>
<th>2010-2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violations</td>
<td>49</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Settlement totals</td>
<td><strong>$533,125</strong></td>
<td><strong>$0</strong></td>
<td><strong>$0</strong></td>
<td><strong>$75,000</strong></td>
<td><strong>TBD</strong></td>
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</table>

### Opacity Violations Issued (2018)

<table>
<thead>
<tr>
<th>Vessel</th>
<th>Date</th>
<th>Port</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAL Nieuw Amsterdam</td>
<td>6/19/18</td>
<td>Skagway</td>
<td>Pending</td>
</tr>
<tr>
<td>HAL Westerdam</td>
<td>6/20/18</td>
<td>Haines</td>
<td>Pending</td>
</tr>
<tr>
<td>NCL Norwegian Jewel</td>
<td>7/11/18</td>
<td>Ketchikan</td>
<td>Settled</td>
</tr>
<tr>
<td>PCL Emerald Princess</td>
<td>7/31/18</td>
<td>Ketchikan</td>
<td>Pending</td>
</tr>
<tr>
<td>PCL Golden Princess</td>
<td>7/31/18</td>
<td>Juneau</td>
<td>Pending</td>
</tr>
<tr>
<td>HAL Eurodam</td>
<td>8/2/18</td>
<td>Ketchikan</td>
<td>Pending</td>
</tr>
<tr>
<td>RCL Radiance of the Seas</td>
<td>8/8/18</td>
<td>Ketchikan</td>
<td>Pending</td>
</tr>
<tr>
<td>RCL Radiance of the Seas</td>
<td>8/17/18</td>
<td>Seward</td>
<td>Pending</td>
</tr>
<tr>
<td>HAL Amsterdam</td>
<td>8/24/18</td>
<td>Ketchikan</td>
<td>Pending</td>
</tr>
</tbody>
</table>
Questions?

Contact us!

**Ed White**
CPVEC Program Manager
[edward.white@alaska.gov](mailto:edward.white@alaska.gov)
907-465-5138

**Denise Wiltse**
Program Specialist
[denise.wiltse@alaska.gov](mailto:denise.wiltse@alaska.gov)
907-465-5278