

Exhibit A: Autonomous Track Assessment Cars (ATACs) Characteristics

CSX recently put two “ATACs,” ATAC-1 (CSX994370) and ATAC-2 (CSX994371) into production. These cars travel in revenue service, measuring track geometry conditions while transiting from origin to destination. It measures gage, profile, crosslevel, warp, and alinement. The ATACs are essentially converted boxcars, with concrete added to increase the weight of the car and the testing quality (110 tons total weight).

The data collected by the cars is sent in near real-time to a vendor who reviews the data collection; as geometry exceptions are flagged, they flow into CSX’s integrated track inspection system for the tracking of defects, repairs, and remediation, and are corrected in accordance with CSX standards for how a similar exception found by a manned geometry car would be remediated.



Exhibit A2: Information on CSX the Autonomous Track Geometry Measurement System (ATGMS)

1. Manufacturer information including system documentation meeting requirements of 49 CFR Part 213.333(b-e) Automated Vehicle-based inspection systems,
 - a. The CSX ATGMS systems are built by ENSCO. The CSX ATGMS systems are the exact same as the ATGMS systems on FRA DOTX-225 and DOTX-226 and have the same fundamental design as all the other FRA ATIP vehicle's Track Geometry Measurement Systems (TGMS).
 - b. The measurement systems are Non-contact, Optical Laser and Inertial
 - c. Sampling and testing is at 1 foot intervals.
 - d. Accuracy (Reproducibility) Standard Deviation of Difference Values:
 - Gage: +/- 0.04"
 - Crosslevel/Superelevation: +/- 0.06"
 - Warp/Twist: +/- 0.1"
 - Longitudinal Profile 31 ft +/- 0.06"
 - Alinement 31 ft +/- 0.06"
 - Curvature +/-0.15 Degrees
 - e. Measurement Speed:
 - 0-80 mph for gage, crosslevel/superelevation, twist, curvature
 - 8-80 mph for horizontal alinement and longitudinal profile
2. Calibration procedures and proposed frequency
 - a. The ENSCO ATGMS systems only require field calibration for the rail scanner laser heads. This field calibration is done annually using a calibration bar. Additionally, this calibration is done when a rail scanner laser head is replaced. The ATGMS inertial system does not require field calibration. ENSCO Rail, Inc. performs the inertial system calibration at the laboratory. This calibration approach used on the CSX ATGMS units is the same as used with the FRA ATGMS systems on the FRA ATIP vehicles track geometry measurement systems.
 - b. Field verification of defects will validate quality of data and data will be compared to CSX manned cars when available.
3. Track geometry data validation procedures and proposed frequency,
 - a. The CSX ATGMS units undergo Reproducibility testing. This testing procedure is surveying on the same track at different speeds and directions. Then, the data is compared to each other to calculate the error between surveys and quantified by calculating the standard deviation of the error. The standard deviation of the error is compared to pass/fail thresholds. The Reproducibility testing process and pass/fail thresholds will be measured annually.
4. Data handling procedures and proposed validation process, and
 - a. The data handling and validation for the CSX ATGMS units is streamed in real-time off the vehicle to a remote server. Data is automatically processed on the server, then a final human review of the detected exceptions are reviewed prior to transmission to field personnel.
 - b. Field verification of defects will be tracked in CSX Integrated Track Inspection System and will be evaluated weekly.
5. Exception filtering procedures and proposed validation process.
 - a. The exception filtering procedures and validation for the CSX ATGMS units utilize automated track determination and automated exception editing algorithms to generate and confirm valid exceptions. Human review of data when validating is used for quality control of data. Final human review of the detected exceptions are reviewed prior to transmission to field personnel.

Exhibit B: Proposed Pilot Test Program Route and Characteristics

The pilot routes requested contain the following subdivisions,

<u>Sub</u>	<u>Route Miles</u>
Barr	12.1
Garrett	174.1
Willard	57.7
Greenwich	40.6
Cleveland Short Line	23.6
Cleveland Terminal	3.6
Erie West	155.6
Buffalo Terminal	70.6
Rochester	86.0
Syracuse Terminal	33.1
Mohawk	94.0
Selkirk	25.5
Fitzgerald	199.3
<u>Total Pilot</u>	<u>972.6 miles</u>

Barr Subdivision

Pilot will involve main tracks on the Barr subdivision which runs through the cities of Gary, IN and Portage, IN. The route includes main tracks on CSX's "Barr" Subdivision in Chicago Zone, MidWest Region.

Milepost Ranges: BI 236.9 to BI 249.0

Total Route Miles: 12.1 miles

- 24.2 miles of double track

Tonnage (2019):

- Track 1 – 37 MGT
- Track 2 – 54 MGT

Garrett Subdivision

Pilot will involve main tracks on the Garrett Subdivision which runs through the city of Garrett, IN, and Auburn, IN. CSX's "Garrett" Subdivision is in Chicago Zone, MidWest Region.

Milepost Ranges: BI 62.8 to 236.9

Total Route Miles: 174.1 miles

- 348.2 Total miles of double track

Tonnage (2019):

- Track 1 - 54 MGT
- Track 2 - 64 MGT

Cleveland Short Line Subdivision

Pilot will involve main tracks on the Cleveland Short Line Subdivision which runs around the downtown area of metropolitan Cleveland, OH. The route is from Berea, OH, to Collinwood, OH, on CSX's "Cleveland Short Line" Subdivision, Great Lakes Zone, MidWest Region.

Milepost Ranges: QDS 0.0 to QDS 23.7

Total Route Miles: 23.7 miles

- 45.5 miles of Double Track
- .8 miles of Single Track

Tonnage (2019):

- Track 1 – 51 mgt
- Track 2 – 57 mgt
- Single – 108 mgt

Cleveland Terminal Subdivision

Pilot will involve main tracks on the Cleveland Terminal Subdivision which runs between the Collinwood, OH, and Euclid, OH. The route is around east side of Cleveland, OH, on CSX's "Cleveland Terminal" Subdivision on Great Lakes Zone, MidWest Region.

Milepost Ranges: QD 171.2 to QD 174.8

Total Route Miles: 3.6 miles

- 7.2 miles of double track

Tonnage (2019):

- Track 1 - 18 mgt
- Track 2 – 38 mgt

Erie West Subdivision

Pilot will involve main tracks on the Erie West Subdivision which runs from Euclid, OH to Hamburg, NY. The route includes main tracks on CSX's "Erie West" Subdivision Great Lakes Zone, MidWest Region.

Milepost Ranges: QD 15.6 to QD 171.2

Total Route Miles: 155.6 miles

- 311.2 miles of double track

Tonnage (2019):

- Track 1 – 46 mgt
- Track 2 – 51 mgt

Buffalo Terminal Subdivision

Pilot will involve main tracks on the Buffalo Terminal Subdivision which runs between the cities of Hamburg, NY, and Chili, NY. The route is through Buffalo, NY on CSX's "Buffalo Terminal" Subdivision on Great Lakes Zone, MidWest Region and Northern Zone, Northeast Region.

Milepost Ranges: QD 0.0 TO QD 15.6

QC 382.8 TO 437.8

Total Route Miles: 70.6 miles

- 141.2 miles of double track

Tonnage (2019):

- Track 1 – 42 mgt
- Track 2 – 47 mgt

Rochester Subdivision

Pilot will involve main tracks on the Rochester Subdivision which runs between the city of Chili, NY, and Belle Isle. The route is through the city of Rochester, NY on CSX's "Rochester" Subdivision Northern Zone, Northeast Region.

Milepost Ranges: QC 296.8 to QC 382.8

Total Route Miles: 86 miles

- 172 miles of double track

Tonnage (2019):

- Track 1 – 40 mgt
- Track 2 – 49 mgt

Syracuse Terminal Subdivision

Pilot will involve main tracks on the Syracuse Terminal Subdivision which runs between Belle Isle, NY, and Dewitt, NY. The route is through Syracuse, NY on CSX's "Syracuse Terminal" Subdivision Northern Zone, Northeast Region.

Milepost Ranges: QC 263.7 to QC 296.8

Total Route Miles: 33.1 miles

- 66.2 miles of double track

Tonnage (2019):

- Track 1 – 37 mgt
- Track 2 – 49 mgt

Mohawk Subdivision

Pilot will involve main tracks on the Mohawk Subdivision which runs between Oneida, NY to Amsterdam, NY. The route goes through Utica, NY on CSX's "Mohawk" Subdivision Northern Zone, Northeast Region.

Milepost Ranges: QC 169.7 to 263.7

Total Route Miles: 94.0 miles

- 188 miles of double track

Tonnage (2019):

- Track 1 - 45 mgt
- Track 2 – 52 mgt

Selkirk Subdivision

Pilot will involve main tracks on the Selkirk Subdivision which runs between Pattersonville, NY to Selkirk, NY. The route goes through Schenectady, NY on CSX's "Selkirk" Subdivision Northern Zone, Northeast Region.

Milepost Ranges: QG 16.9 to QG 42.4

Total Route Miles: 25.5 miles

- 51 miles of double track

Tonnage (2019):

- Track 1 - 50 mgt
- Track 2 – 51 mgt

Fitzgerald

Pilot will involve main tracks on the Fitzgerald Subdivision which runs between the cities of Waycross, Georgia, and Manchester, Georgia. The route includes main tracks from Waycross, Georgia, to Manchester, Georgia, which is CSX's "Fitzgerald" Subdivision (Jacksonville Zone, South Region).

Milepost ranges: ANB 586.8 to 786.1

Total Route Miles: 199

- 169 miles of single main
- 61 miles of double main
- 35 miles of sidings

Tonnage (2019): Average tonnage in 2019 was 80 MGT

Exhibit C: Phased Implementation of the Test Program

<u>Phase</u>	<u>Month</u>	<u>Inspection Frequency</u>	<u>Performance Measure</u>
1	1-6	<ul style="list-style-type: none"> • 2x/ week manual visual inspection (current FRA requirement) • Target weekly ATAC route coverage • Target monthly Sperry Joint Bar Crack Detection 	At or below 0.0565 FRA threshold exceptions per test mile (2018 average)
2	6-12	<ul style="list-style-type: none"> • 1x/week manual visual inspection • Target weekly ATAC route coverage • FRA ATIP inspection near end of phase 2 • 1x/month Sperry Joint Bar Crack Detection • Introduction 1x/quarter machine vision for fasteners and spikes • 1x/year Aurora Automated Tie Inspection 	At or below 0.05 FRA threshold exceptions per test mile (12% improvement vs. 2018)
3	12-18	<ul style="list-style-type: none"> • 2x/month manual visual inspection • Target weekly ATAC route coverage • FRA ATIP inspections as desired • 1x/month Sperry Joint Bar Crack Detection • 1x/quarter machine vision for fasteners and spikes • 1x/year Aurora Automated Tie Inspection 	At or below 0.05 threshold exceptions per test mile (12% improvement vs. 2018)