

**NEW CAR ASSESSMENT PROGRAM
LANE DEPARTURE WARNING CONFIRMATION TEST
NCAP-DRI-LDW-21-03**

2021 Chevrolet Trailblazer FWD 4dr LT

DYNAMIC RESEARCH, INC.

355 Van Ness Avenue, STE 200
Torrance, California 90501



23 February 2021

Final Report

Prepared Under Contract No. DTNH22-14-D-00333

**U.S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
New Car Assessment Program
1200 New Jersey Avenue, SE
West Building, 4th Floor (NRM-110)
Washington, DC 20590**

Prepared for the Department of Transportation, National Highway Traffic Safety Administration, under Contract No. DTNH22-14-D-00333.

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings, and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturer's names or products are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products of manufacturers.

Prepared By: J. Lenkeit and A. Ricci

Program Manager

Test Engineer

Date: 23 February 2021

1. Report No. NCAP-DRI-LDW-21-03	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Final Report of Lane Departure Warning Confirmation Test of a 2021 Chevrolet Trailblazer FWD 4dr LT.		5. Report Date 23 February 2021	
		6. Performing Organization Code DRI	
7. Author(s) J. Lenkeit, Program Manager A. Ricci, Test Engineer		8. Performing Organization Report No. DRI-TM-20-177	
9. Performing Organization Name and Address Dynamic Research, Inc. 355 Van Ness Ave, STE 200 Torrance, CA 90501		10. Work Unit No.	
		11. Contract or Grant No. DTNH22-14-D-00333	
12. Sponsoring Agency Name and Address U.S. Department of Transportation National Highway Traffic Safety Administration New Car Assessment Program 1200 New Jersey Avenue, SE, West Building, 4th Floor (NRM-110) Washington, DC 20590		13. Type of Report and Period Covered Final Test Report February 2021	
		14. Sponsoring Agency Code NRM-110	
15. Supplementary Notes			
16. Abstract These tests were conducted on the subject 2021 Chevrolet Trailblazer FWD 4dr LT in accordance with the specifications of the New Car Assessment Program's (NCAP) most current Test Procedure in docket NHTSA-2006-26555-0135 to confirm the performance of a Lane Departure Warning system. The vehicle passed the requirements of the test for all three lane marking types for both directions.			
17. Key Words Lane Departure Warning, LDW, New Car Assessment Program, NCAP		18. Distribution Statement Copies of this report are available from the following: NHTSA Technical Reference Division National Highway Traffic Safety Administration 1200 New Jersey Avenue, SE Washington, DC 20590	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 147	22. Price

TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
I. INTRODUCTION	1
II. DATA SHEETS	2
Data Sheet 1: Test Results Summary	3
Data Sheet 2: Vehicle Data	4
Data Sheet 3: Test Conditions	4
Data Sheet 4: Lane Departure Warning System Operation	7
III. TEST PROCEDURES	9
A. Test Procedure Overview	9
B. Lane Delineation Markings	10
C. Test Validity	12
D. Pass/Fail Criteria	13
E. Instrumentation	13
APPENDIX A Photographs	A-1
APPENDIX B Excerpts from Owner's Manual	B-1
APPENDIX C Run Log	C-1
APPENDIX D Time Histories	D-1

Section I

INTRODUCTION

The purpose of the testing reported herein was to confirm the performance of a Lane Departure Warning (LDW) system installed on a 2021 Chevrolet Trailblazer FWD 4dr LT. The LDW gives a warning in the form of an icon that changes from green to amber. It also gives an audible warning, but this warning is much later than the icon color change. The vehicle passed the requirements of the test for all three lane marking types for both directions.

The test procedure is described in detail in the National Highway Traffic Safety Administration (NHTSA) document "LANE DEPARTURE WARNING SYSTEM CONFIRMATION TEST" dated February of 2013 (Docket No. NHTSA-2006-26555-0135). Its purpose is to confirm the performance of LDW systems installed on light vehicles with gross vehicle weight ratings (GVWR) of up to 10,000 lbs. Current LDW technology relies on sensors to recognize a lane delimiting edge line. As such, the test procedures described in the document rely on painted lines, taped lines, or Botts Dots being present on the test course to emulate those found on public roadways. Although it is impossible to predict what technologies could be used by future LDW systems (e.g., magnetic markers, RADAR reflective striping, ultra violet paint, infrared, etc.), it is believed that minor modifications to these procedures, when deemed appropriate, could be used to accommodate the evaluation of alternative or more advanced LDW systems.

Section II
DATA SHEETS

LANE DEPARTURE WARNING
DATA SHEET 1: TEST RESULTS SUMMARY

(Page 1 of 1)

2021 Chevrolet Trailblazer FWD 4dr LT

VIN: KL79MPSL5MB06xxxx

Test Date: 2/8/2021

Lane Departure Warning setting: On - Auditory secondary alert

Test 1 – Continuous White Line Left: Pass Right: Pass

Test 2 – Dashed Yellow Line Left: Pass Right: Pass

Test 3 – Botts Dots Left: Pass Right: Pass

Overall: Pass

Notes:

LANE DEPARTURE WARNING
DATA SHEET 2: VEHICLE DATA

(Page 1 of 1)

2021 Chevrolet Trailblazer FWD 4dr LT

TEST VEHICLE INFORMATION

VIN: KL79MPSL5MB06xxxx

Body Style: MPV

Color: Dark Copper Metallic

Date Received: 2/1/2021

Odometer Reading: 281 mi

DATA FROM VEHICLE'S CERTIFICATON LABEL

Vehicle manufactured by: GM Korea Company

Date of manufacture: 09/20

Vehicle Type: MPV

DATA FROM TIRE PLACARD

Tires size as stated on Tire Placard: Front: 225/60R17 H

Rear: 225/60R17 H

Recommended cold tire pressure: Front: 240 kPa (35 psi)

Rear: 240 kPa (35 psi)

TIRES

Tire manufacturer and model: Continental Procontact TX

Front tire size: 225/60R17 99H

Rear tire size: 225/60R17 99H

Front tire DOT prefix: 16Y0F98YW

Rear tire DOT prefix: 16Y0F98YW

LANE DEPARTURE WARNING
DATA SHEET 3: TEST CONDITIONS

(Page 1 of 2)

2021 Chevrolet Trailblazer FWD 4dr LT

GENERAL INFORMATION

Test date: 2/8/2021

AMBIENT CONDITIONS

Air temperature: 12.8 C (55 F)

Wind speed: 0.0 m/s (0.0 mph)

- X Wind speed ≤ 10 m/s (22 mph)
- X Tests were not performed during periods of inclement weather. This includes, but is not limited to, rain, snow, hail, fog, smoke, or ash.
- X Tests were conducted during daylight hours with good atmospheric visibility (defined as an absence of fog and the ability to see clearly for more than 5000 meters). The tests were not conducted with the vehicle oriented into the sun during very low sun angle conditions, where the sun is oriented 15 degrees or less from horizontal, and camera "washout" or system inoperability results.

VEHICLE PREPARATION

Verify the following:

All non-consumable fluids at 100% capacity: X

Fuel tank is full: X

Tire pressures are set to manufacturer's recommended cold tire pressure: X

Front: 240 kPa (35 psi)

Rear: 240 kPa (35 psi)

LANE DEPARTURE WARNING
DATA SHEET 3: TEST CONDITIONS

(Page 2 of 2)

2021 Chevrolet Trailblazer FWD 4dr LT

WEIGHT

Weight of vehicle as tested including driver and instrumentation

Left Front: 483.1 kg (1065 lb)

Right Front: 443.2 kg (977 lb)

Left Rear: 289.4 kg (638 lb)

Right Rear: 292.1 kg (644 lb)

Total: 1507.8 kg (3324 lb)

LANE DEPARTURE WARNING
DATA SHEET 4: LANE DEPARTURE WARNING SYSTEM OPERATION

(Page 1 of 2)

2021 Chevrolet Trailblazer FWD 4dr LT

Name of the LDW option, option package, etc.:

Lane Keep Assist with Lane Departure Warning. It is standard on all trims.

Type and location of sensor(s) used:

Mono camera located behind the windshield near the rear-view mirror.

Lane Departure Warning Setting used in test:

On - Auditory secondary alert

How is the Lane Departure Warning presented to the driver? Warning light
 Buzzer or audible alarm
(Check all that apply) Vibration
 Other _____

Describe the method by which the driver is alerted. For example, if the warning is a light, where is it located, its color, size, words or symbol, does it flash on and off, etc. If it is a sound, describe if it is a constant beep or a repeated beep. If it is a vibration, describe where it is felt (e.g., pedals, steering wheel), the dominant frequency, (and possibly magnitude), the type of warning (light, audible, vibration, or combination), etc.

The visual alert is presented in the heads-up display and shows the rear view of an automobile between dashed lane lines. See Appendix A, Figure A10.

The auditory alert is a repeated set of beeps that sounds from the front.

LANE DEPARTURE WARNING

DATA SHEET 4: LANE DEPARTURE WARNING SYSTEM OPERATION

(Page 2 of 2)

2021 Chevrolet Trailblazer FWD 4dr LT

Is the vehicle equipped with a switch whose purpose is to render LDW inoperable? Yes
 No

If yes, please provide a full description including the switch location and method of operation, any associated instrument panel indicator, etc.

System menus are used to interact with the settings. The menu hierarchy is:

Settings

Vehicle

Collision/Detection Systems

Lane Change Alert

Select from: Off, On

See Appendix A, Figure A9.

Is the vehicle equipped with a control whose purpose is to adjust the range setting or otherwise influence the operation of LDW? Yes
 No

If yes, please provide a full description.

Are there other driving modes or conditions that render LDW inoperable or reduce its effectiveness? Yes
 No

If yes, please provide a full description.

System limitations are described on page 230 of the Owner's Manual, shown in Appendix B, page B-10.

Notes:

Section III

TEST PROCEDURES

A. Test Procedure Overview

Each LDW test involved one of three lane marking types: solid white lines, dashed yellow lines, or Botts Dots. Lane departures were done both to the left and to the right, and each test condition was repeated five times, as shown in Table 1.

Table 1. LDW Test Matrix

Lane Geometry	Line Type	Departure Direction	Number of Trials
Straight	Solid	L	5
		R	5
	Dashed	L	5
		R	5
	Botts Dots	L	5
		R	5

Prior to the start of a test series involving a given lane marking type and departure direction combination, the accuracy of the distance to lane marking measurement was verified. This was accomplished by driving the vehicle to the approximate location at which the lane departure would occur and placing the tire at the lane marking edge of interest (i.e., distance to lane marking = 0). The real-time display of distance to the lane marking was then observed to verify that the measured distance was within the tolerance (5 cm). If the measured distance was found to be greater than the tolerance, the instrumentation setup was checked and corrected, if necessary. If the measured distance was found to be within the tolerance, the instrumentation setup was considered appropriate and the test series was begun.

To begin the maneuver, the vehicle was accelerated from rest to a test speed of 72.4 km/h (45 mph), while being driven in a straight line parallel to the lane marking of interest, with the centerline of the vehicle approximately 1.83 m (6.0 ft) from the lane edge (i.e., such that the vehicle would pass through the center of the start gate). The test speed was achieved at least 60 m (200 ft) before the start gate was reached. Striking any start gate cones was not permitted, and any run in which a cone was struck was considered to be invalid. Also, during the initialization and test phases, the test driver avoided using turn signals and avoided applying any sudden acceleration, sudden steering, or sudden braking, and any use of the turn signals, sudden acceleration, sudden steering, or sudden braking invalidated the test trial.

Data collection began with the vehicle at least 60 m (200 ft) from the start gate, which was configured using a pair of non-reflective, low-contrast color traffic cones. A second set of cones, placed 6 m (20 ft) longitudinally before the start gate, was used to guide the driver into the start gate. The lateral width between the cone pairs was 20 cm (8 in) greater than the width of the vehicle, and the centerline of each pair was laterally offset from the lane marking by 1.8 m (6 ft).

Once the driver passed the gate, the driver manually input sufficient steering to achieve a lane departure with a target lateral velocity of 0.5 m/s with respect to the lane line. As shown in Figure 1, two additional non-reflective cones were used to guide the driver in making this steering maneuver. Throughout the maneuver, the driver modulated the throttle or used cruise control, as appropriate, such that vehicle speed remained at constant speed. The test was considered complete when the vehicle crossed at least 1 m (3.3 ft) over the lane edge boundary.

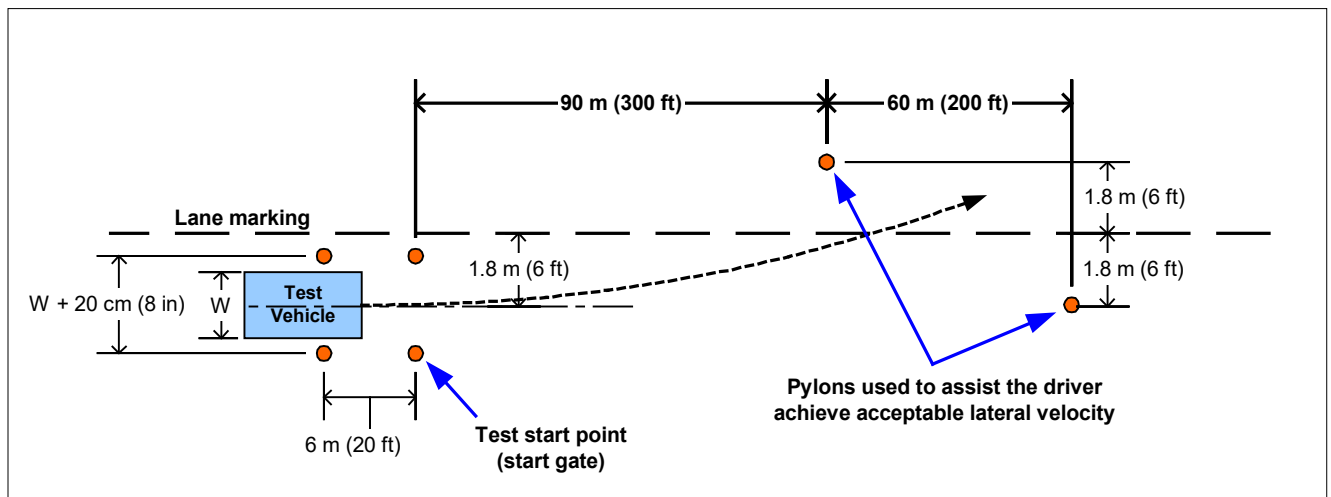


Figure 1. Position of Cones Used to Assist Driver

Data collected included vehicle speed, position, and yaw rate. In addition to cone strikes, vehicle speed and yaw rate data were used to identify invalid runs as described in Section C below. Data from trials where speed or yaw rate were outside of the performance specification were not considered valid.

B. Lane Delineation Markings

The New Car Assessment Program's Test Procedure for the confirmation of a Lane Departure Warning system contains a requirement that all lane markings meet United States Department of Transportation (USDOT) specifications as described in the Manual on Uniform Traffic Control Devices (MUTCD) and be considered in "very good condition".

1. Lane Marker Width

The width of the edge line marker was 10 to 15 cm (4 to 6 in). This is considered to be a normal width for longitudinal pavement markings under Section 3A.05 of the MUTCD.

2. Line Marking Color and Reflectivity

Lane marker color and reflectivity met all applicable standards. These standards include those from the International Commission of Illumination (CIE) for color and the American Society for Testing and Materials (ASTM) on lane marker reflectance.

3. Line Styles

The tests described in this document required the use of three lane line configurations: continuous solid white, discontinuous dashed yellow, and discontinuous with raised pavement markers.

- Continuous White Line

A continuous white line is defined as a white line that runs for the entire length of the test course.

- Dashed Yellow Line

As stated in the MUTCD, and as shown in Figure 2, a discontinuous dashed yellow line is defined as by a series of 3 m (10 ft) broken (dashed) yellow line segments, spaced 9.1 m (30 ft) apart.

- Raised Pavement Marker Line (Botts Dots)

California Standard Plans indicates raised pavement markers are commonly used in lieu of painted strips for marking roads in California. Other states, mainly in the southern part of the United States, rely on them as well. These markers may be white or yellow, depending on the specific application, following the same basic colors of their analogous white and yellow painted lines. Following the California 2006 Standard Plans, three types of raised pavement markings are used to form roadway lines. It is believed that these types of roadway markings are the hardest for an LDW sensor system to process. Type A and Type AY are non-reflective circular domes that are approximately 10 cm (4 in) in diameter and approximately 1.8 cm (0.7 in) high. Type C and D are square markings that are retro reflective in two directions measuring approximately 10 x 10 x 5 cm (4 x 4 x 0.5 in), and Type G and H that are the same as C and D only retro reflective in a single direction.

For the tests described in this document, raised pavement markers were set up following California Standard Plan A20A, Detail 4, as shown in Figure 3. Note that in this figure, the squares are Type D yellow reflectors and the circles are yellow Type AY discs.

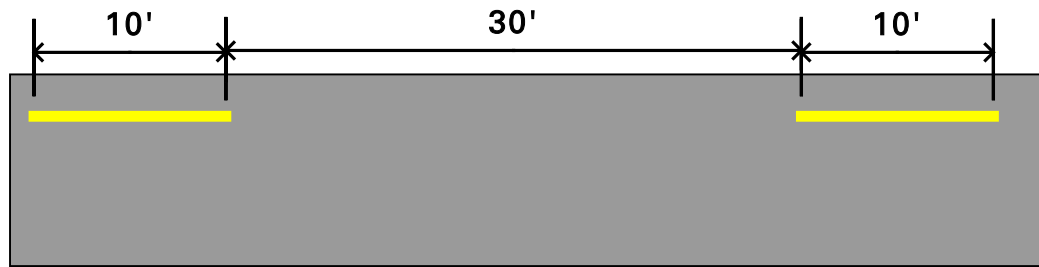


Figure 2. MUTCD Discontinuous Dashed Line Specifications

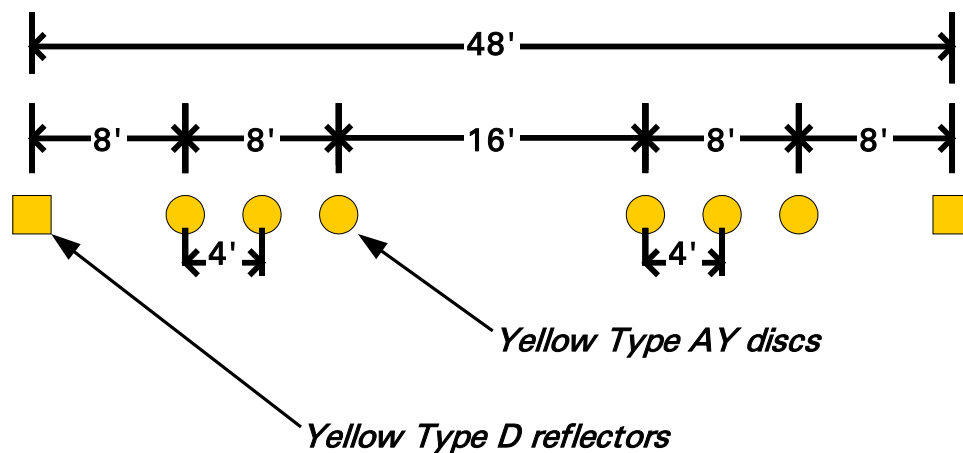


Figure 3. California Standard Plan A20A, Detail 4

C. Test Validity

1. Speed

All LDW tests were conducted at 72.4 km/h (45 mph). Test speed was monitored and a test was considered valid if the test speed remained within ± 2 km/h (± 1.2 mph) of the 72.4 km/h (45 mph) target speed. It was required that the speed must remain within this window from the start of the test until any part of the vehicle crossed a lane line by 1 m (3.3 ft) or more.

2. Lateral Velocity

All tests were conducted with a lateral velocity of 0.1 to 0.6 m/s (0.3 to 2.0 ft/s), measured with respect to the lane line at the time of the alert. To assist the test driver in being able to efficiently establish the target lateral velocity, cones were positioned in the manner shown in Figure 1.

3. Yaw Rate

It was required that the magnitude of the vehicle's yaw rate could not exceed 1.0 deg/sec at any time during lane departure maneuver, from the time the vehicle passes through the start gate to the instant the vehicle has crossed a lane line by 1 m (3.3 ft).

D. Pass/Fail Criteria

The measured test data were used to determine the pass/fail outcome for each trial. The outcome was based on whether the LDW produced an appropriate alert during the maneuver. In the context of this test procedure, a lane departure is said to occur when any part of the two-dimensional polygon used to represent the test vehicle breaches the inboard lane line edge (i.e., the edge of the line close to the vehicle before the departure occurs). In the case of tests performed in this procedure, the front corner of the polygon, defined as the intersection of the center of the front wheels (longitudinally) with the outboard edge of the front tire (laterally), crossed the line edge first. So, for example, if the vehicle departed its lane to the left, the left front corner of the polygon would first breach the lane line edge.

For an individual trial to be considered a "pass":

- Test speed, lateral velocity, and yaw rate validity conditions must be satisfied.
- The LDW alert must not occur when the lateral position of the vehicle is greater than 0.75 m (2.5 ft) from the lane line edge (i.e., prior to the lane departure).
- The LDW alert must occur before the lane departure exceeds 0.3 m (1.0 ft).

For an overall, "Pass" the LDW system must satisfy the pass criteria for 3 of 5 individual trials for each combination of departure direction and lane line type (60%), and pass 20 of the 30 trials overall (66%).

E. Instrumentation

Table 2 lists the sensors, signal conditioning, and data acquisition equipment used for these tests.

Table 2. Test Instrumentation and Equipment

Type	Output	Range	Accuracy, Other Primary Specs	Mfr, Model	Serial Number	Calibration Dates Last Due
Tire Pressure Gauge	Vehicle Tire Pressure	0-100 psi 0-690 kPa	0.5 psi 3.45 kPa	Ashcroft, D1005PS	17042707002	By: DRI Date: 8/18/2020 Due: 8/18/2021
Platform Scales	Vehicle Total, Wheel, and Axle Load	8000 lb 35.6 kN	±1.0% of applied load	Intercomp, SWII	0410MN20001	By: DRI Date: 4/20/2020 Due: 4/20/2021
Differential Global Positioning System	Position, Velocity	Latitude: ±90 deg Longitude: ±180 deg Altitude: 0-18 km Velocity: 0-1000 knots	Horizontal Position: ±1 cm Vertical Position: ±2 cm Velocity: 0.05 km/h	Trimble GPS Receiver, 5700 (base station and in-vehicle)	00440100989	N/A
Multi-Axis Inertial Sensing System	Position: Longitudinal, Lateral, and Vertical Accels: Lateral, Longitudinal and Vertical Velocities: Roll, Pitch, Yaw Rates: Roll, Pitch, Yaw Angles	Latitude: ±90 deg Longitude: ±180 deg Altitude: 0-18 km Velocity: 0-1000 knots Accel: ±100 m/s ² Angular Rate: ±100 deg/s Angular Disp: ±180 deg	Position: ±2 cm Velocity: 0.05 km/h Accel: ≤ 0.01% of full range Angular Rate: ≤ 0.01% of full range Roll/Pitch Angle: ±0.03 deg Heading Angle: ±0.1 deg	Oxford Technical Solutions (OXTS), Inertial+	2258	By: Oxford Technical Solutions ¹ Date: 5/3/2019 Due: 5/3/2021
Real-Time Calculation of Position and Velocity Relative to Lane Markings	Distance and velocity to lane markings	Lateral Lane Dist: ±30 m Lateral Lane Velocity: ±20 m/sec	Lateral Distance to Lane Marking: ±2 cm Lateral Velocity to Lane Marking: ±0.02m/sec	Oxford Technical Solutions (OXTS), RT-Range	97	N/A

¹ Oxford Technical Solutions recommends calibration every two years.

Type	Output	Range	Accuracy, Other Primary Specs	Mfr, Model	Serial Number	Calibration Dates Last Due
Microphone	Sound (to measure time at alert)	Frequency Response: 80 Hz – 20 kHz	Signal-to-noise: 64 dB, 1 kHz at 1 Pa	Audio-Technica AT899	N/A	N/A
Light Sensor	Light intensity (to measure time at alert)	Spectral Bandwidth: 440-800 nm	Rise time < 10 msec	DRI designed and developed Light Sensor	N/A	N/A
Coordinate Measurement Machine	Inertial Sensing System Coordinates	0-8 ft 0-2.4 m	±.0020 in. ±.051 mm (Single point articulation accuracy)	Faro Arm, Fusion	UO8-05-08-06636	By: DRI Date: 1/6/2021 Due: 1/6/2022
Type	Description			Mfr, Model	Serial Number	
Data Acquisition System	Data acquisition is achieved using a dSPACE MicroAutoBox II Data from the Oxford IMU, including Longitudinal, Lateral, and Vertical Acceleration, Roll, Yaw, and Pitch Rate, Forward and Lateral Velocity, Roll and Pitch Angle are sent over Ethernet to the MicroAutoBox. The Oxford IMUs are calibrated per the manufacturer's recommended schedule (listed above).			D-Space Micro-Autobox II 1401/1513		
				Base Board	549068	
				I/O Board	588523	

For systems that implement audible or haptic alerts, part of the pre-test instrumentation verification process is to determine the tonal frequency of the audible warning or the vibration frequency of the tactile warning through use of the PSD (Power Spectral Density) function in Matlab. This is accomplished in order to identify the center frequency around which a band-pass filter is applied to subsequent audible or tactile warning data so that the beginning of such warnings can be programmatically determined. The band-pass filter used for these warning signal types is a phaseless, forward-reverse pass, elliptical (Cauer) digital filter, with filter parameters as listed in Table 3.

Table 3. Audible and Tactile Warning Filter Parameters

Warning Type	Filter Order	Peak-to-Peak Ripple	Minimum Stop Band Attenuation	Passband Frequency Range
Audible	5 th	3 dB	60 dB	Identified Center Frequency \pm 5%
Tactile	5 th	3 dB	60 dB	Identified Center Frequency \pm 20%

APPENDIX A

Photographs

LIST OF FIGURES

	Page
Figure A1. Front View of Subject Vehicle.....	A-3
Figure A2. Rear View of Subject Vehicle	A-4
Figure A3. Window Sticker (Monroney Label).....	A-5
Figure A4. Vehicle Certification Label	A-6
Figure A5. Tire Placard	A-7
Figure A6. DGPS, Inertial Measurement Unit, and MicroAutoBox Installed in Subject Vehicle.....	A-8
Figure A7. Sensors for Detecting Visual and Auditory Alerts	A-9
Figure A8. Computer Installed in Subject Vehicle	A-10
Figure A9. LDW Menus.....	A-11
Figure A10. Visual Alert	A-12
Figure A11. LDW on/off Switch	A-13



Figure A1. Front View of Subject Vehicle



Figure A2. Rear View of Subject Vehicle



2021 Trailblazer FWD 4dr LT

VIN: KL79MPSL5MB06
MODEL: TRAILBLAZER
ENGINE: ECOTEC 1.3L TURBO
PORT OF ENTRY:
EXTERIOR COLOR: DARK COPPER METALLIC
INTERIOR/SEAT COLOR: JET BLACK
TRANSPORT: TRUCK
ACCESSORY WEIGHT: 16 lbs./ 7 kgs.

GOVERNMENT 5-STAR SAFETY RATINGS

Overall Vehicle Score ★★★★★
Based on the combined rating of frontal, side and rollover. Should ONLY be compared to other vehicles of similar size and weight.

Frontal	Driver	★★★★★
Crash	Passenger	★★★★
<small>Based on the risk of injury in a frontal impact. Should ONLY be compared to other vehicles of similar size and weight.</small>		
Side	Front seat	★★★★★
Crash	Rear seat	★★★★★
<small>Based on the risk of injury in a side impact.</small>		
Rollover		★★★★★
<small>Based on the risk of rollover in a single-vehicle crash.</small>		

Star ratings range from 1 to 5 stars (★★★★★) with 5 being the highest.
 Source: National Highway Traffic Safety Administration (NHTSA).
www.safercar.gov or 1-888-327-4236

STANDARD FEATURES:		Manufacturer's Suggested Retail Price: \$23,700.00
ENTERTAINMENT		ADDED FEATURES:
- Audio system, Chevrolet Infotainment 3 system 7" diagonal color touchscreen, AM/FM stereo. Additional features for compatible phones include Bluetooth audio streaming for 2 active devices, voice command pass-through to phone, Apple CarPlay and Android Auto capable. (8" screen when (ZL3) Convenience Package and (ZL5) Driver Confidence Package are ordered.)	INCLUDED	PREMIUM SEATING PACKAGE includes (HVL/HVM) Leatherette interior, (N34) leather-wrapped steering wheel, (VY7) leather-wrapped shift knob and (DA5) rear center armrest
- Audio system feature, 6-speaker system, enhanced performance	INCLUDED	LPO, ALL-WEATHER FLOOR MATS
- Display, 7" diagonal color touchscreen	INCLUDED	LICENSE PLATE BRACKET, FRONT
- 4G LTE Wi-Fi hotspot capable (Terms and limitations apply. See onstar.com or dealer for details.)	INCLUDED	LPO, CARGO SHADE, SOFT
- Wireless Apple CarPlay/Wireless Android Auto	INCLUDED	PERFORMANCE PACKAGE includes (L3T) ECOTEC 1.3L Turbo engine, (C2Y) 4255 lbs. GVWR, Sport mode and Snow mode
INTERIOR		CONVENIENCE PACKAGE includes (C68) automatic climate control air conditioning, (U2K) SiriusXM Radio, (ULJ) 8" diagonal color touchscreen display, (USS) one type-A and one type-C charging only USB ports, (Kic) 120-watt power outlet, (DDB) inside rearview auto-dimming mirror and (DMS) driver and front passenger illuminated vanity mirrors, covered, sliding visors
- Seats, front bucket	INCLUDED	DRIVER CONFIDENCE PACKAGE includes (UKC) Lane Change Alert with Side Blind Zone Alert, (UFG) Rear Cross Traffic Alert and (UD7) Rear Park Assist
- Seat trim, Cloth	INCLUDED	
- Seats, heated driver and front passenger	INCLUDED	
- Seat adjuster, driver 8-way power	INCLUDED	
- Seat adjuster, driver 2-way power lumbar	INCLUDED	
- Seat adjuster, front passenger 4-way manual	INCLUDED	
- Seatback, front passenger flat-folding	INCLUDED	
- Seat, rear 40/60 split-bench, folding (60 percent on passenger side)	INCLUDED	
- Head restraints, front, 2-way adjustable	INCLUDED	
- Head restraints, rear outboard, 4-way adjustable	INCLUDED	
SAFETY		
- Automatic Emergency Braking	INCLUDED	
- Front Pedestrian Braking	INCLUDED	
- Daytime Running Lamps, signature LED	INCLUDED	
- Airbags, driver and front passenger frontal and knee, seat-mounted side-impact and roof rail-mounted head-curtain for all outboard seating positions and Passenger Sensing System for front passenger (Always use seat belts and child restraints. Children are safer when properly secured in a rear seat in the appropriate child restraint. See the Owner's Manual for more information.)	INCLUDED	
- OnStar and Chevrolet connected services capable (Terms and limitations apply. See onstar.com or dealer for details.)	INCLUDED	
- Rear Vision Camera	INCLUDED	
- Lane Keep Assist with Lane Departure Warning	INCLUDED	
- Following Distance Indicator	INCLUDED	
- Forward Collision Alert	INCLUDED	
- Seat belts, 3-point, driver and front passenger, height-adjustable includes pretensioners and front passenger load limiter	INCLUDED	
EXTERIOR		
- Wheels, 17" (43.2 cm) High Gloss Black machined aluminum	INCLUDED	
- Tires, 225/60R17 all-season, blackwall	INCLUDED	
- Wheel, spare, 16" (40.6 cm) steel	INCLUDED	
- Tire, compact spare 16" (40.3 cm)	INCLUDED	
- Side rails, roof-mounted (Silver-painted)	INCLUDED	
Total Price :		\$26,300.00

EPA DOT Fuel Economy and Environment

Fuel Economy

30 MPG
combined city/hwy

29 MPG
city

33 MPG
highway

3.3 gallons per 100 miles

Large Cars range from 14 to 40 MPG. The best vehicle rates 119 MPG.

You save

\$1,450

more in fuel costs over 5 years compared to the average new vehicle.

Annual fuel cost

\$1,110

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 25 MPG and costs \$9,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$3.00 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

fueleconomy.gov

Calculate personalized estimates and compare vehicles

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 25 MPG and costs \$9,000 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$3.00 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

Smartphone QR Code =

Manufacturer's suggested retail price includes manufacturer's recommended pre-delivery service. Gasoline license and title fees state and local taxes and dealer installed options and accessories are not included in the manufacturer's suggested retail price. This label has been affixed to this vehicle by Hyundai Motor America, pursuant to the requirements of 15 U.S.C. 1231 et seq. which prohibits its removal or alteration prior to delivery to the ultimate purchaser.

293 A

Figure A3. Window Sticker (Monroney Label)

GM **MFD BY GM KOREA COMPANY** 09 / 20

GVWR 4255 LB GAWR FRT 2336 LB GAWR RR 2336 LB

THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S. FEDERAL MOTOR VEHICLE SAFETY AND THEFT PREVENTION STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE.

KL79MPSL5MB06 TYPE: MPV

MODEL : 1TU56

	TIRE SIZE	SPEED RTG	RIM	COLD TIRE PRESSURE
FRT	225/60R17	H	17x7.5J	240KPA, 35 PSI
RR	225/60R17	H	17x7.5J	240KPA, 35 PSI
SPA	T125/70R16	M	16x4.0BT	420KPA, 60 PSI

SEE OWNER'S MANUAL  FOR MORE INFORMATION.

Figure A4. Vehicle Certification Label



Figure A5. Tire Placard



Figure A6. DGPS, Inertial Measurement Unit, and MicroAutoBox Installed in Subject Vehicle



Figure A7. Sensors for Detecting Visual and Auditory Alerts



Figure A8. Computer Installed in Subject Vehicle

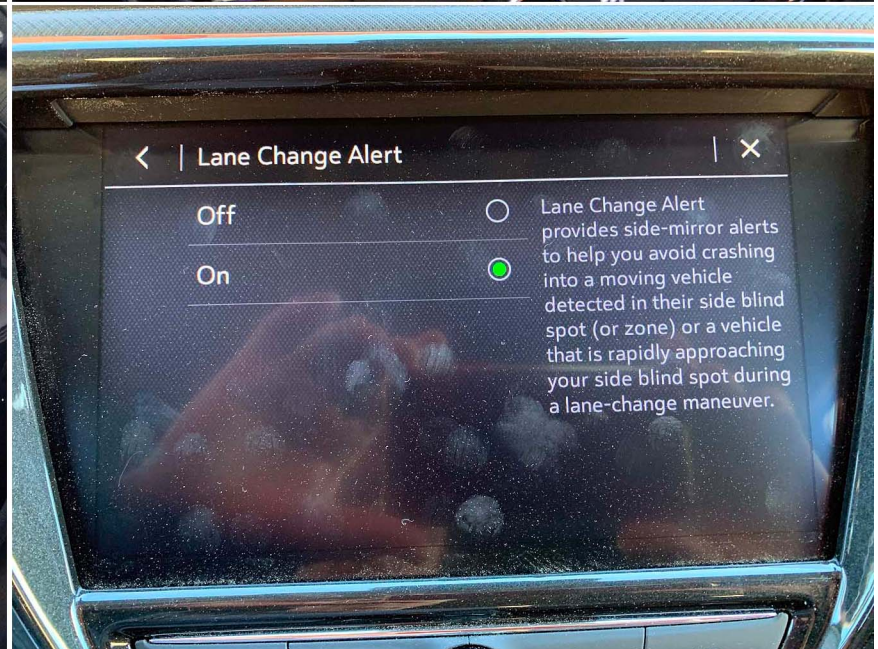


Figure A9. LDW Menus



Figure A10. Visual Alert



Figure A11. LDW on/off Switch

APPENDIX B

Excerpts from Owner's Manual

2 Introduction

Using this Manual

To quickly locate information about the vehicle, use the Index in the back of the manual. It is an alphabetical list of what is in the manual and the page number where it can be found.

About Driving the Vehicle

As with other vehicles of this type, failure to operate this vehicle correctly may result in loss of control or a crash. Be sure to read the driving guidelines in this manual in the section called "Driving and Operating" and specifically *Driver Behavior* ⇨ 181, *Driving Environment* ⇨ 181, and *Vehicle Design* ⇨ 181.

Danger, Warning, and Caution

Warning messages found on vehicle labels and in this manual describe hazards and what to do to avoid or reduce them.

Danger

Danger indicates a hazard with a high level of risk which will result in serious injury or death.

Warning

Warning indicates a hazard that could result in injury or death.

Caution


Caution indicates a hazard that could result in property or vehicle damage.




A circle with a slash through it is a safety symbol which means "Do not," "Do not do this," or "Do not let this happen."

Symbols

The vehicle has components and labels that use symbols instead of text. Symbols are shown along with the text describing the operation or information relating to a specific component, control, message, gauge, or indicator.

 : Shown when the owner's manual has additional instructions or information.


 : Shown when the service manual has additional instructions or information.

⇨ : Shown when there is more information on another page — "see page."


Vehicle Symbol Chart

Here are some additional symbols that may be found on the vehicle and what they mean. See the features in this manual for information.

 : Air Conditioning System


 : Air Conditioning Refrigerant Oil


 : Airbag Readiness Light

 : Antilock Brake System (ABS)

 : Brake System Warning Light

 : Dispose of Used Components Properly

 : Do Not Apply High Pressure Water

 : Engine Coolant Temperature




 : Flame/Fire Prohibited

 : Flammable

 : Forward Collision Alert

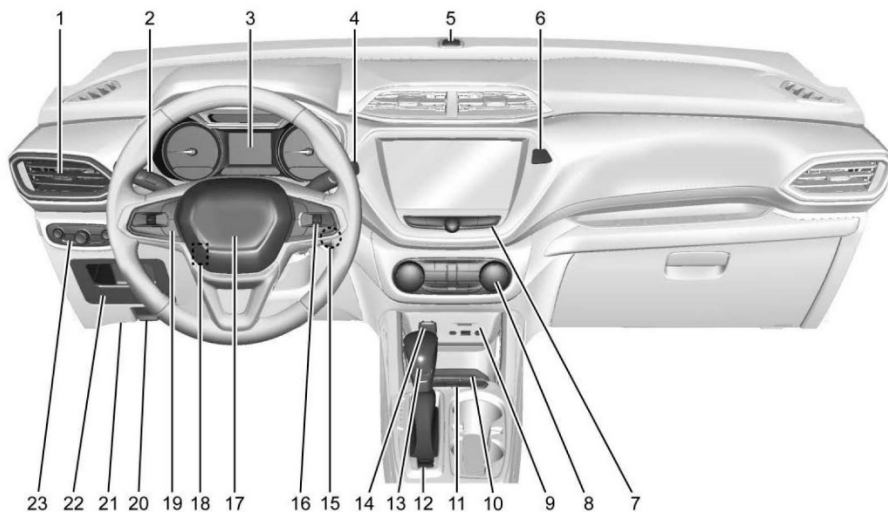
 : Fuse Block Cover Lock Location

-  : Fuses
-  : ISOFIX/LATCH System Child Restraints
-  : Keep Fuse Block Covers Properly Installed
-  : Lane Change Alert
-  : Lane Departure Warning
-  : Lane Keep Assist
-  : Malfunction Indicator Lamp
-  : Oil Pressure
-  : Park Assist
-  : Pedestrian Ahead Indicator
-  : Power
-  : Rear Cross Traffic Alert
-  : Registered Technician
-  : Remote Vehicle Start
-  : Seat Belt Reminders
-  : Side Blind Zone Alert
-  : Stop/Start
-  : Tire Pressure Monitor

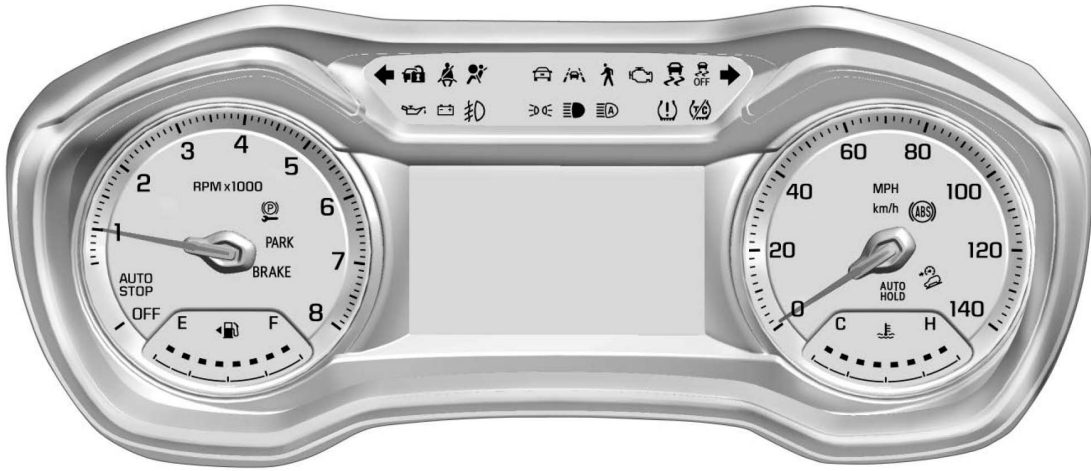
-  : Traction Control/StabiliTrak/Electronic Stability Control (ESC)
-  : Under Pressure
-  : Vehicle Ahead Indicator

4 Introduction

Instrument Panel Overview



- | | | |
|--|---|---|
| <ol style="list-style-type: none"> 1. <i>Air Vents</i> ⇨ 178. 2. <i>Turn Signal Lever</i>. See <i>Turn and Lane-Change Signals</i> ⇨ 117.
<i>IntelliBeam System Button</i> (If Equipped). See <i>Exterior Lamp Controls</i> ⇨ 114. 3. <i>Instrument Cluster</i> ⇨ 89.
<i>Driver Information Center (DIC) Display</i>. See <i>Driver Information Center (DIC) (Base Level)</i> ⇨ 104 or <i>Driver Information Center (DIC) (Uplevel)</i> ⇨ 107. 4. <i>Windshield Wiper/Washer</i> ⇨ 83.
<i>Rear Window Wiper/Washer</i> ⇨ 84. 5. <i>Light Sensor</i>. See <i>Automatic Headlamp System</i> ⇨ 116. 6. <i>Hazard Warning Flashers</i> ⇨ 117. 7. <i>Infotainment</i>. See <i>Overview</i> ⇨ 122. 8. <i>Climate Control Systems</i> ⇨ 174.
<i>Automatic Climate Control System</i> ⇨ 176.
<i>Heated Front Seats</i> ⇨ 40. (If Equipped). 9. <i>USB Port</i> ⇨ 130.
<i>Auxiliary Jack</i> ⇨ 132. 10. <i>Wireless Charging</i> ⇨ 86 (If Equipped). 11. <i>Stop/Start Disable Button</i>. See <i>Stop/Start System</i> ⇨ 195 (If Equipped). | <ol style="list-style-type: none"> <i>Lane Keep Assist (LKA)</i> ⇨ 229 (If Equipped). <i>Traction Control/Electronic Stability Control</i> ⇨ 206. <i>Sport Mode</i> (If Equipped). See <i>Driver Mode Control</i> ⇨ 208 <i>All-Wheel Drive</i> ⇨ 203 (If Equipped). 12. <i>Electric Parking Brake</i> ⇨ 205. 13. <i>Shift Lever</i>. See <i>Automatic Transmission</i> ⇨ 201. 14. <i>Power Outlets</i> ⇨ 85. 15. <i>Engine START/STOP Button</i>. See <i>Ignition Positions (Key Access)</i> ⇨ 191 or <i>Ignition Positions (Keyless Access)</i> ⇨ 192 (If Equipped). 16. <i>Steering Wheel Controls</i> ⇨ 83. 17. <i>Horn</i> ⇨ 83. 18. <i>Steering Wheel Adjustment</i> ⇨ 83 (Out of View). 19. <i>Cruise Control</i> ⇨ 209.
<i>Adaptive Cruise Control (Camera)</i> ⇨ 211 (If Equipped).
<i>Forward Collision Alert (FCA) System</i> ⇨ 223 (If Equipped). 20. <i>Hood Release</i>. See <i>Hood</i> ⇨ 245. | <ol style="list-style-type: none"> 21. <i>Data Link Connector (DLC) (Out of View)</i>. See <i>Malfunction Indicator Lamp (Check Engine Light)</i> ⇨ 96. 22. <i>Instrument Panel Storage</i> ⇨ 78.
<i>Instrument Panel Fuse Block</i> ⇨ 277. 23. <i>Exterior Lamp Controls</i> ⇨ 114. |
|--|---|---|



Uplevel English Metric Similar

Sport Mode Light



This light comes on when Sport Mode is selected. See *Driver Mode Control* ⇨ 208.

Lane Keep Assist (LKA) Light



After the vehicle is started, this light turns off and stays off if LKA has not been turned on or is unavailable.

If equipped, this light is white if LKA is turned on, but not ready to assist.

This light is green if LKA is turned on and is ready to assist.

LKA may assist by gently turning the steering wheel if the vehicle approaches a detected lane marking. The LKA light is amber when assisting.

This light flashes amber as a Lane Departure Warning (LDW) alert, to indicate that the lane marking has been crossed.

LKA will not assist or alert if the turn signal is active in the direction of lane departure, or if LKA detects that you are accelerating, braking or actively steering.

See *Lane Keep Assist (LKA)* ⇨ 229.

Vehicle Ahead Indicator



If equipped, this indicator will display green when a vehicle is detected ahead and amber when you are following a vehicle ahead much too closely.

See *Forward Collision Alert (FCA) System* ⇨ 223.

Pedestrian Ahead Indicator



If equipped, this indicator will display when a nearby pedestrian is detected directly in front of the vehicle.

See *Front Pedestrian Braking (FPB) System* ⇨ 226.

Traction Off Light



This light comes on briefly while starting the engine. If it does not, have the vehicle serviced by your dealer. If the system is working normally, the indicator light then turns off.

Auto Rear Defog

When on, this feature turns on the rear defogger at vehicle start when the interior temperature is cold and fog is likely. See "Rear Window Defogger" under *Automatic Climate Control System* ⇨ 176.

Touch Off or On.

Collision / Detection Systems

Touch and the following may display:

- Forward Collision System
- Front Pedestrian Detection
- Adaptive Cruise Go Notifier
- Lane Change Alert
- Rear Camera Park Assist Symbols
- Rear Cross Traffic Alert
- Rear Park Assist

Forward Collision System

This setting controls the vehicle response when detecting a vehicle ahead of you. The Off setting disables all FCA and AEB functions. With the Alert and Brake setting, both FCA and AEB are available. The Alert setting disables AEB. See *Automatic Emergency Braking (AEB)* ⇨ 224.

Touch Off, Alert, or Alert and Brake.

Front Pedestrian Detection

This feature may help avoid or reduce the harm caused by front-end crashes with nearby pedestrians. See *Front Pedestrian Braking (FPB) System* ⇨ 226.

Touch Off, Alert, or Alert and Brake.

Adaptive Cruise Go Notifier

This setting determines if an alert will appear when Adaptive Cruise Control brings the vehicle to a complete stop and the vehicle ahead of you starts moving again. See *Adaptive Cruise Control (Camera)* ⇨ 211.

Touch Off or On.

Lane Change Alert

This allows the feature to be turned on or off. See *Lane Change Alert (LCA)* ⇨ 228.

When Lane Change Alert is disabled, Side Blind Zone Alert is also disabled.

Touch Off or On.

Rear Camera Park Assist Symbols

This setting enables the Rear Camera Park Assist Symbols. See *Assistance Systems for Parking or Backing* ⇨ 221.

Touch Off or On.

Rear Cross Traffic Alert

This setting specifies if you see alerts when the vehicle detects approaching rear cross traffic when in R (Reverse). See *Assistance Systems for Parking or Backing* ⇨ 221.

Touch Off or On.

Rear Park Assist

This setting specifies if you have alerts when an object is detected at parking or backing when in R (Reverse). See *Assistance Systems for Parking or Backing* ⇨ 221.

Touch Off or On.

Comfort and Convenience

Touch and the following may display:

- Chime Volume
- Handsfree Liftgate/Trunk Control
- Auto Wipe in Reverse Gear
- Extended Hill Start Assist

Chime Volume

This allows the selection of the chime volume level.

Touch + or - to adjust the volume

LCA can be disabled. When you disable LCA, Side Blind Zone Alert is also disabled. See "Collision/Detection Systems" under *Vehicle Personalization* ⇨ 110. If LCA is disabled by the driver, the LCA mirror displays will not light up.

When the System Does Not Seem to Work Properly

The LCA system requires some driving for the system to calibrate to maximum performance. This calibration may occur more quickly if the vehicle is driving on a straight highway road with traffic and roadside objects (e.g., guardrails, barriers).

LCA displays may not come on when passing a vehicle quickly, for a stopped vehicle, or when towing a trailer. The LCA detection zones that extend back from the side of the vehicle do not move further back when a trailer is towed. Use caution while changing lanes when towing a trailer. LCA may alert to objects attached to the vehicle, such as a trailer, bicycle, or object extending out to either side of the vehicle. Attached objects may also interfere with the detection of vehicles. This is normal system operation; the vehicle does not need service.

LCA may not always alert the driver to vehicles in the next lane over, especially in wet conditions or when driving on sharp curves. The system does not need to be serviced. The system may light up due to guardrails, signs, trees, shrubs, and other non-moving objects. This is normal system operation; the vehicle does not need service.

LCA may not operate when the LCA sensors in the left or right corners of the rear bumper are covered with mud, dirt, snow, ice, or slush, or in heavy rainstorms. For cleaning instructions, see "Washing the Vehicle" under *Exterior Care* ⇨ 307. If the DIC still displays the system unavailable message after cleaning both sides of the vehicle toward the rear corners of the vehicle, see your dealer.

If the LCA displays do not light up when moving vehicles are in the side blind zone or are rapidly approaching this zone and the system is clean, the system may need service. Take the vehicle to your dealer.

Radio Frequency Information

See *Radio Frequency Statement* ⇨ 340.

Lane Keep Assist (LKA)

If equipped, LKA may help avoid crashes due to unintentional lane departures. This system uses a camera to detect lane markings between 60 km/h (37 mph) and 180 km/h (112 mph). It may assist by gently turning the steering wheel if the vehicle approaches a detected lane marking. It may also provide a Lane Departure Warning (LDW) alert if the vehicle crosses a detected lane marking. LKA can be overridden by turning the steering wheel. This system is not intended to keep the vehicle centered in the lane. LKA will not assist and alert if the turn signal is active in the direction of lane departure, or if it detects that you are accelerating, braking or actively steering.

Warning

The LKA system does not continuously steer the vehicle. It may not keep the vehicle in the lane or give a Lane Departure Warning (LDW) alert, even if a lane marking is detected.

The LKA and LDW systems may not:

(Continued)

Warning (Continued)

- Provide an alert or enough steering assist to avoid a lane departure or crash.
- Detect lane markings under poor weather or visibility conditions. This can occur if the windshield or headlamps are blocked by dirt, snow, or ice; if they are not in proper condition; or if the sun shines directly into the camera.
- Detect road edges.
- Detect lanes on winding or hilly roads.

If LKA only detects lane markings on one side of the road, it will only assist or provide an LDW alert when approaching the lane on the side where it has detected a lane marking. Even with LKA and LDW, you must steer the vehicle. Always keep your attention on the road and maintain proper vehicle position within the lane, or vehicle damage, injury, or death could occur. Always keep the windshield, headlamps, and camera sensors clean and in good repair. Do not

(Continued)

Warning (Continued)


use LKA in bad weather conditions or on roads with unclear lane markings, such as construction zones.





Warning

Using LKA while towing a trailer or on slippery roads could cause loss of control of the vehicle and a crash. Turn the system off.

How the System Works

LKA uses a camera sensor installed on the windshield ahead of the rearview mirror to detect lane markings. It may provide brief steering assist if it detects an unintended lane departure. It may further provide an audible alert or the driver seat may pulse indicating that a lane marking has been crossed.

To turn LKA on and off, press  on the center stack. If equipped, the indicator light on the button comes on when LKA is on and turns off when LKA is disabled.

When on,  is white, if equipped, indicating that the system is not ready to assist.  is green if LKA is ready to assist. LKA may assist by gently turning the steering wheel if the vehicle approaches a detected lane marking.  is amber when assisting. It may also provide a Lane Departure Warning (LDW) alert by flashing  amber if the vehicle crosses a detected lane marking. Additionally, there may be three beeps, on the right or left, depending on the lane departure direction.

Take Steering

The LKA system does not continuously steer the vehicle. If LKA does not detect active driver steering, an alert and chime may be provided. Steer the vehicle to dismiss. LKA may become temporarily unavailable after repeated take steering alerts.

When the System Does Not Seem to Work Properly

The system performance may be affected by:

- Close vehicles ahead.
- Sudden lighting changes, such as when driving through tunnels.
- Banked roads.

- Roads with poor lane markings, such as two-lane roads.

If the LKA system is not functioning properly when lane markings are clearly visible, cleaning the windshield may help.

A camera blocked message may display if the camera is blocked. Some driver assistance systems may have reduced performance or not work at all. An LKA or LDW unavailable message may display if the systems are temporarily unavailable. This message could be due to a blocked camera. The LKA system does not need service. Clean the outside of the windshield behind the rearview mirror.

LKA assistance and/or LDW alerts may occur due to tar marks, shadows, cracks in the road, temporary or construction lane markings, or other road imperfections. This is normal system operation; the vehicle does not need service. Turn LKA off if these conditions continue.

Fuel

Top Tier Fuel

GM recommends the use of TOP TIER Detergent Gasoline to keep the engine clean, reduce engine deposits, and maintain optimal vehicle performance. Look for the TOP TIER Logo or see www.toptiergas.com for a list of TOP TIER Detergent Gasoline marketers and applicable countries.



Recommended Fuel



Use regular unleaded gasoline meeting ASTM specification D4814 with a posted octane rating of 87 — (R+M)/2 — or higher. Do not use gasoline with a posted octane rating of less than 87, as this may cause engine knock and will lower fuel economy.

Do not use any fuel labeled E85 or FlexFuel. Do not use gasoline with ethanol levels greater than 15% by volume.

Prohibited Fuels

Caution
Do not use fuels with any of the following conditions; doing so may damage the vehicle and void its warranty:
(Continued)

APPENDIX C

Run Log

Subject Vehicle: **2021 Chevrolet Trailblazer FWD 4dr LT**

Test Date: **2/8/2021**

Driver: **A. Ricci**

Note: For Distance at Warning, positive values indicate inside the lane

Run	Lane Marking Type	Departure Direction	Valid Run?	Distance at Auditory Alert (ft)	Distance at Visual Alert (ft)	Pass/Fail	Notes
1	Botts	Left	N				Yaw rate
2			Y	-1.18	0.98	Pass	
3			Y	-1.19	0.26	Pass	
4			Y	-1.26	0.41	Pass	
5			Y	-1.36	0.16	Pass	
6			Y	-1.08	1.11	Pass	
7			Y	-1.30	0.13	Pass	
8			Y	-1.21	0.10	Pass	
9	Botts	Right	Y	NW ²	1.78	Pass	
10			Y	NW	1.76	Pass	
11			Y	NW	1.99	Pass	
12			N				Yaw rate
13			Y	NW	1.96	Pass	
14			Y	NW	2.04	Pass	
15			Y	NW	1.95	Pass	
16			Y	-2.61	1.85	Pass	

² No Warning

Run	Lane Marking Type	Departure Direction	Valid Run?	Distance at Auditory Alert (ft)	Distance at Visual Alert (ft)	Pass/Fail	Notes
17	Solid	Right	N				Yaw rate
18			Y	NW	1.50	Pass	
19			Y	NW	1.41	Pass	
20			Y	-2.64	1.94	Pass	
21			Y	NW	2.04	Pass	
22			N				Light sensor sun leak, could not detect warning
23			Y	NW	2.02	Pass	
24			Y	NW	1.76	Pass	
25			Y	NW	1.63	Pass	
26			Solid	Left	N		
27	Y	-1.00			0.17	Pass	
28	Y	NW			NW	Fail	No warning
29	Y	-0.91			0.08	Pass	
30	Y	NW			NW	Fail	No warning
31	Y	-0.94			-0.23	Pass	
32	Y	NW			NW	Fail	No warning
33	Y	-1.05			0.07	Pass	
34	Dashed	Left	Y	-0.93	0.15	Pass	
35			Y	NW	NW	Fail	No warning
36			Y	NW	0.21	Pass	
37			Y	-1.01	0.37	Pass	

Run	Lane Marking Type	Departure Direction	Valid Run?	Distance at Auditory Alert (ft)	Distance at Visual Alert (ft)	Pass/Fail	Notes
38	Dashed	Left	Y	-0.97	0.02	Pass	
39			Y	-0.94	0.10	Pass	
40			Y	-1.05	0.00	Pass	
41	Dashed	Right	Y	NW	2.08	Pass	
42			Y	NW	NW	Fail	No warning
43			Y	-1.07	-0.84	Pass	
44			Y	-2.50	2.19	Pass	
45			Y	NW	NW	Fail	No warning
46			Y	-2.99	1.93	Pass	
47			Y	NW	NW	Fail	No warning

APPENDIX D

Time History Plots

LIST OF FIGURES

	Page
Figure D1. Example Time History for Lane Departure Warning Test, Passing.....	D-8
Figure D2. Example Time History for Lane Departure Warning Test, Failing, No Warning Issued.....	D-9
Figure D3. Example Time History for Lane Departure Warning Test, Invalid Run Due to Subject Vehicle Yaw Rate	D-10
Figure D4. Time History for Run 02, Botts Dots, Left Departure, Audible Warning	D-11
Figure D5. Time History for Run 02, Botts Dots, Left Departure, Visual Warning	D-12
Figure D6. Time History for Run 03, Botts Dots, Left Departure, Audible Warning	D-13
Figure D7. Time History for Run 03, Botts Dots, Left Departure, Visual Warning	D-14
Figure D8. Time History for Run 04, Botts Dots, Left Departure, Audible Warning	D-15
Figure D9. Time History for Run 04, Botts Dots, Left Departure, Visual Warning	D-16
Figure D10. Time History for Run 05, Botts Dots, Left Departure, Audible Warning	D-17
Figure D11. Time History for Run 05, Botts Dots, Left Departure, Visual Warning	D-18
Figure D12. Time History for Run 06, Botts Dots, Left Departure, Audible Warning	D-19
Figure D13. Time History for Run 06, Botts Dots, Left Departure, Visual Warning	D-20
Figure D14. Time History for Run 07, Botts Dots, Left Departure, Audible Warning	D-21
Figure D15. Time History for Run 07, Botts Dots, Left Departure, Visual Warning	D-22
Figure D16. Time History for Run 08, Botts Dots, Left Departure, Audible Warning	D-23
Figure D17. Time History for Run 08, Botts Dots, Left Departure, Visual Warning	D-24
Figure D18. Time History for Run 09, Botts Dots, Right Departure, Audible Warning	D-25
Figure D19. Time History for Run 09, Botts Dots, Right Departure, Visual Warning	D-26
Figure D20. Time History for Run 10, Botts Dots, Right Departure, Audible Warning	D-27
Figure D21. Time History for Run 10, Botts Dots, Right Departure, Visual Warning	D-28
Figure D22. Time History for Run 11, Botts Dots, Right Departure, Audible Warning	D-29
Figure D23. Time History for Run 11, Botts Dots, Right Departure, Visual Warning	D-30
Figure D24. Time History for Run 13, Botts Dots, Right Departure, Audible Warning	D-31
Figure D25. Time History for Run 13, Botts Dots, Right Departure, Visual Warning	D-32
Figure D26. Time History for Run 14, Botts Dots, Right Departure, Audible Warning	D-33
Figure D27. Time History for Run 14, Botts Dots, Right Departure, Visual Warning	D-34
Figure D28. Time History for Run 15, Botts Dots, Right Departure, Audible Warning	D-35
Figure D29. Time History for Run 15, Botts Dots, Right Departure, Visual Warning	D-36
Figure D30. Time History for Run 16, Botts Dots, Right Departure, Audible Warning	D-37
Figure D31. Time History for Run 16, Botts Dots, Right Departure, Visual Warning	D-38
Figure D32. Time History for Run 18, Solid Line, Right Departure, Audible Warning	D-39
Figure D33. Time History for Run 18, Solid Line, Right Departure, Visual Warning	D-40
Figure D34. Time History for Run 19, Solid Line, Right Departure, Audible Warning	D-41
Figure D35. Time History for Run 19, Solid Line, Right Departure, Visual Warning	D-42
Figure D36. Time History for Run 20, Solid Line, Right Departure, Audible Warning	D-43
Figure D37. Time History for Run 20, Solid Line, Right Departure, Visual Warning	D-44
Figure D38. Time History for Run 21, Solid Line, Right Departure, Audible Warning	D-45

Figure D39.	Time History for Run 21, Solid Line, Right Departure, Visual Warning	D-46
Figure D40.	Time History for Run 23, Solid Line, Right Departure, Audible Warning.....	D-47
Figure D41.	Time History for Run 23, Solid Line, Right Departure, Visual Warning	D-48
Figure D42.	Time History for Run 24, Solid Line, Right Departure, Audible Warning.....	D-49
Figure D43.	Time History for Run 24, Solid Line, Right Departure, Visual Warning	D-50
Figure D44.	Time History for Run 25, Solid Line, Right Departure, Audible Warning.....	D-51
Figure D45.	Time History for Run 25, Solid Line, Right Departure, Visual Warning	D-52
Figure D46.	Time History for Run 27, Solid Line, Left Departure, Audible Warning	D-53
Figure D47.	Time History for Run 27, Solid Line, Left Departure, Visual Warning	D-54
Figure D48.	Time History for Run 28, Solid Line, Left Departure, Audible Warning	D-55
Figure D49.	Time History for Run 28, Solid Line, Left Departure, Visual Warning	D-56
Figure D50.	Time History for Run 29, Solid Line, Left Departure, Audible Warning	D-57
Figure D51.	Time History for Run 29, Solid Line, Left Departure, Visual Warning	D-58
Figure D52.	Time History for Run 30, Solid Line, Left Departure, Audible Warning	D-59
Figure D53.	Time History for Run 30, Solid Line, Left Departure, Visual Warning	D-60
Figure D54.	Time History for Run 31, Solid Line, Left Departure, Audible Warning	D-61
Figure D55.	Time History for Run 31, Solid Line, Left Departure, Visual Warning	D-62
Figure D56.	Time History for Run 32, Solid Line, Left Departure, Audible Warning	D-63
Figure D57.	Time History for Run 32, Solid Line, Left Departure, Visual Warning	D-64
Figure D58.	Time History for Run 33, Solid Line, Left Departure, Audible Warning	D-65
Figure D59.	Time History for Run 33, Solid Line, Left Departure, Visual Warning	D-66
Figure D60.	Time History for Run 34, Dashed Line, Left Departure, Audible Warning.....	D-67
Figure D61.	Time History for Run 34, Dashed Line, Left Departure, Visual Warning.....	D-68
Figure D62.	Time History for Run 35, Dashed Line, Left Departure, Audible Warning.....	D-69
Figure D63.	Time History for Run 35, Dashed Line, Left Departure, Visual Warning.....	D-70
Figure D64.	Time History for Run 36, Dashed Line, Left Departure, Audible Warning.....	D-71
Figure D65.	Time History for Run 36, Dashed Line, Left Departure, Visual Warning.....	D-72
Figure D66.	Time History for Run 37, Dashed Line, Left Departure, Audible Warning.....	D-73
Figure D67.	Time History for Run 37, Dashed Line, Left Departure, Visual Warning.....	D-74
Figure D68.	Time History for Run 38, Dashed Line, Left Departure, Audible Warning.....	D-75
Figure D69.	Time History for Run 38, Dashed Line, Left Departure, Visual Warning.....	D-76
Figure D70.	Time History for Run 39, Dashed Line, Left Departure, Audible Warning.....	D-77
Figure D71.	Time History for Run 39, Dashed Line, Left Departure, Visual Warning.....	D-78
Figure D72.	Time History for Run 40, Dashed Line, Left Departure, Audible Warning.....	D-79
Figure D73.	Time History for Run 40, Dashed Line, Left Departure, Visual Warning.....	D-80
Figure D74.	Time History for Run 41, Dashed Line, Right Departure, Audible Warning	D-81
Figure D75.	Time History for Run 41, Dashed Line, Right Departure, Visual Warning.....	D-82
Figure D76.	Time History for Run 42, Dashed Line, Right Departure, Audible Warning	D-83
Figure D77.	Time History for Run 42, Dashed Line, Right Departure, Visual Warning.....	D-84
Figure D78.	Time History for Run 43, Dashed Line, Right Departure, Audible Warning	D-85
Figure D79.	Time History for Run 43, Dashed Line, Right Departure, Visual Warning.....	D-86
Figure D80.	Time History for Run 44, Dashed Line, Right Departure, Audible Warning	D-87
Figure D81.	Time History for Run 44, Dashed Line, Right Departure, Visual Warning.....	D-88

Figure D82. Time History for Run 45, Dashed Line, Right Departure, Audible Warning	D-89
Figure D83. Time History for Run 45, Dashed Line, Right Departure, Visual Warning.....	D-90
Figure D84. Time History for Run 46, Dashed Line, Right Departure, Audible Warning	D-91
Figure D85. Time History for Run 46, Dashed Line, Right Departure, Visual Warning.....	D-92
Figure D86. Time History for Run 47, Dashed Line, Right Departure, Audible Warning	D-93
Figure D87. Time History for Run 47, Dashed Line, Right Departure, Visual Warning.....	D-94

Description of Time History Plots

A set of time history plots is provided for each valid run in the test series. Each set of plots comprises time varying data from the Subject Vehicle, as well as pass/fail envelopes and thresholds. The following is a description of data types shown in the time history plots, as well as a description of the color code for data envelopes.

Time History Plot Description

Time history figures include the following sub-plots:

- Warning – Indicates timing of warning issued by LDW system. Depending on the type of LDW alert or instrumentation used to measure the alert, this can be any of the following:
 - Filtered and rectified sound signal
 - Filtered and rectified acceleration (e.g., steering wheel vibration)
 - Light sensor signal
 - Discrete on/off value
- Speed (mph) – Speed of the Subject Vehicle
- Yaw Rate (deg/sec) – Yaw rate of the Subject Vehicle
- Distance to Lane Edge (ft) – Lateral distance (in lane coordinates) from the outer front tire bulge to the inside edge of the lane marking of interest for a given test (a positive value indicates the vehicle is completely within the lane while a negative value indicates that the outer front tire bulge has crossed over the inner lane marking edge). The distance to the lane edge at the moment the LDW alert is issued, is displayed to the right of subplot.
- Lateral Lane Velocity (ft/sec) – Lateral velocity (in lane coordinates) of the outer front tire bulge
- Bird's Eye View – Indicates the position of the Subject Vehicle with respect to the lane marking of interest for a given test. Green rectangles represent the Subject Vehicle's position at approximately 2 second intervals, while the yellow rectangle indicates the position of the Subject Vehicle at the time of LDW warning issuance.

Envelopes and Thresholds

Each of the time history plot figures can contain either green or yellow envelopes and/or black threshold lines. These envelopes and thresholds are used to programmatically and visually determine the validity of a given test run. Envelope and threshold exceedances are indicated with either red shading or red asterisks, and red text is placed to the right side of the plot indicating the type of exceedance.

Green envelopes indicate that the time-varying data should not exceed the envelope boundaries at any time within the envelope. Exceedances of a green envelope are indicated by red shading in the area between the measured time-varying data and the envelope boundaries.

Yellow envelopes indicate that the time-varying data should not exceed the envelope only at the right end. Exceedances at the right extent of a yellow envelope are indicated by red asterisks. Data within the boundaries at the right extent of a yellow envelope are indicated by green circles.

For the warning plot, a dashed black threshold line indicates the threshold used to determine the onset of the LDW alert. The alert is considered on the first time the alert signal crosses this threshold line.

Color Codes

Color codes have been adopted to easily identify the types of data, envelopes, and thresholds used in the plots.

Color codes can be broken into three categories:

1. Validation envelopes and thresholds
 1. Validation envelopes and thresholds
 2. Instantaneous samplings
 3. Text
1. Validation envelope and threshold color codes:
 - Green envelope = time varying data must be within the envelope at all times in order to be valid
 - Yellow envelope = time varying data must be within limits at right end
 - Black threshold (Solid) = time varying data must not exceed this threshold in order to be valid
 - Black threshold (Dashed) = for reference only – this can include warning level thresholds which are used to determine the timing of the alert
2. Instantaneous sampling color codes:
 - Green circle = passing or valid value at a given moment in time
 - Red asterisk = failing or invalid value at a given moment in time

3. Text color codes:

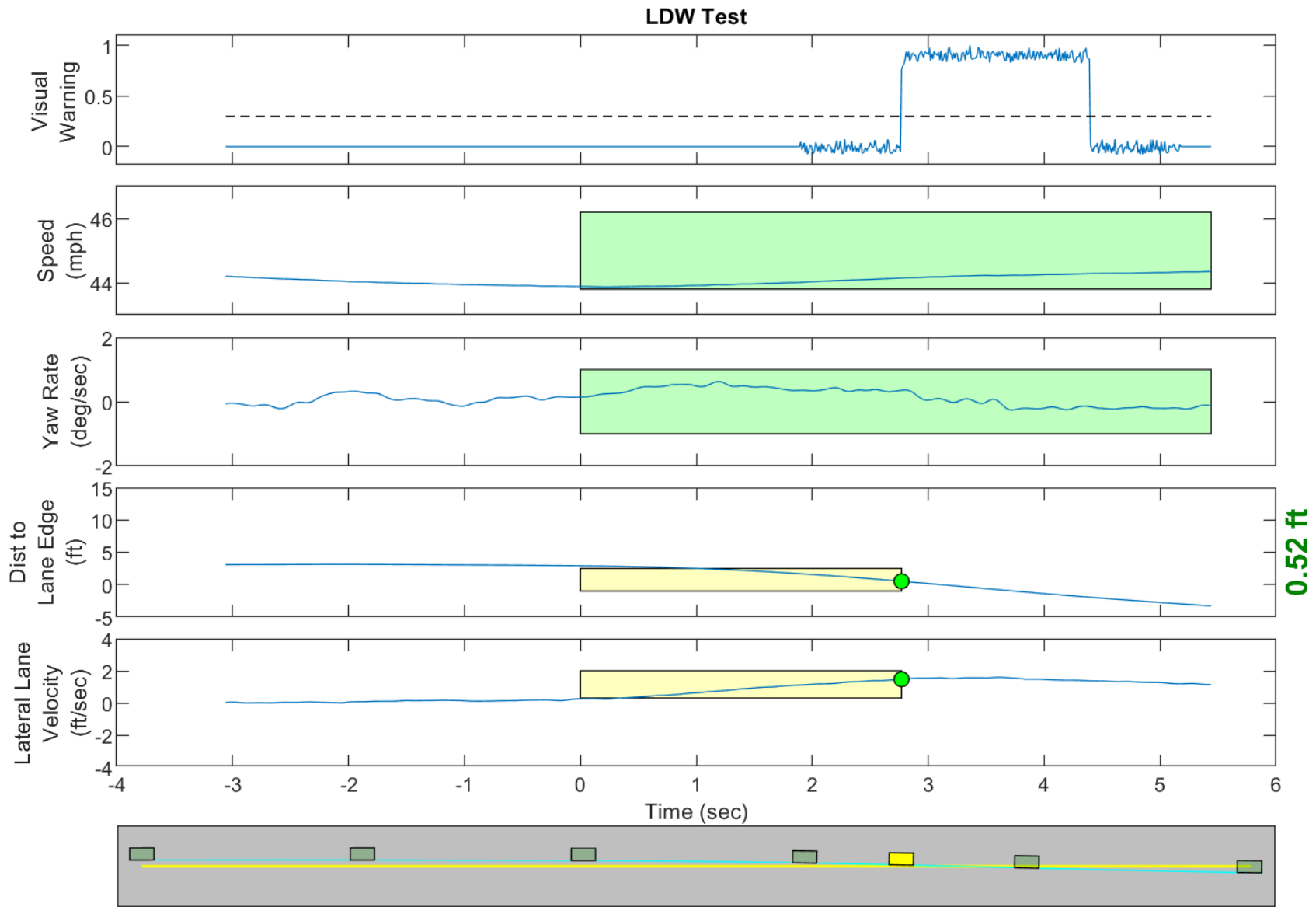
- Green = passing or valid value
- Red = failing or invalid value

Other Notations

- NG – Indicates that the value for that variable was outside of bounds and therefore “No Good”.
- No Wng – No warning was detected.

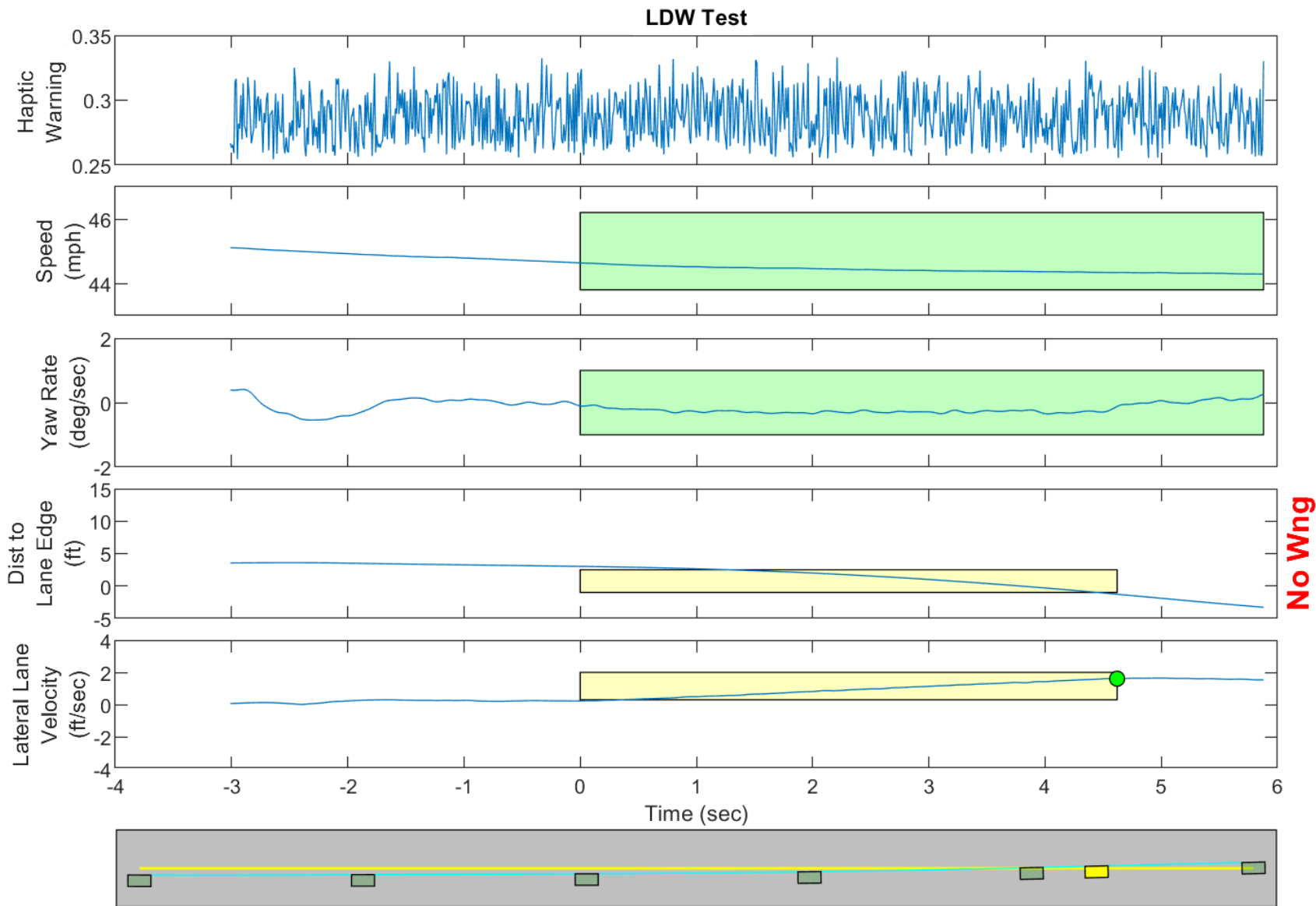
The minimum (worst) GPS fix type is displayed in the lower right corner of each page. The only valid fix type is RTK fixed (displayed in green). If the fix type during any portion of the test was anything other than RTK fixed, then “RTK Fixed OR LESS!!” is displayed in red.

Examples of time history plots (including passing, failing and invalid runs) are shown in Figure D1 through Figure D3. Actual time history data plots for the vehicle under consideration are provided subsequently.



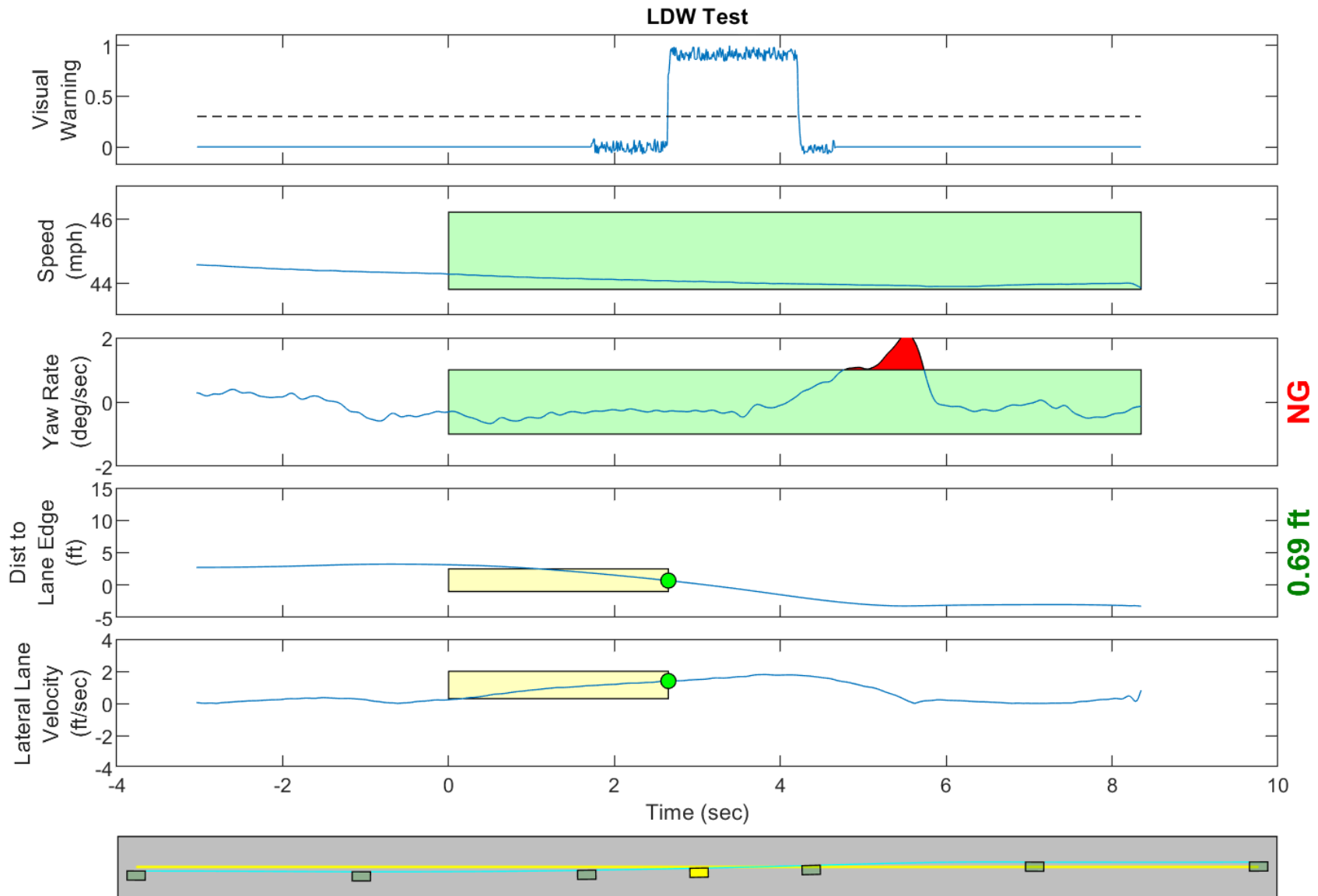
GPS Fix Type: RTK Fixed

Figure D1. Example Time History for Lane Departure Warning Test, Passing



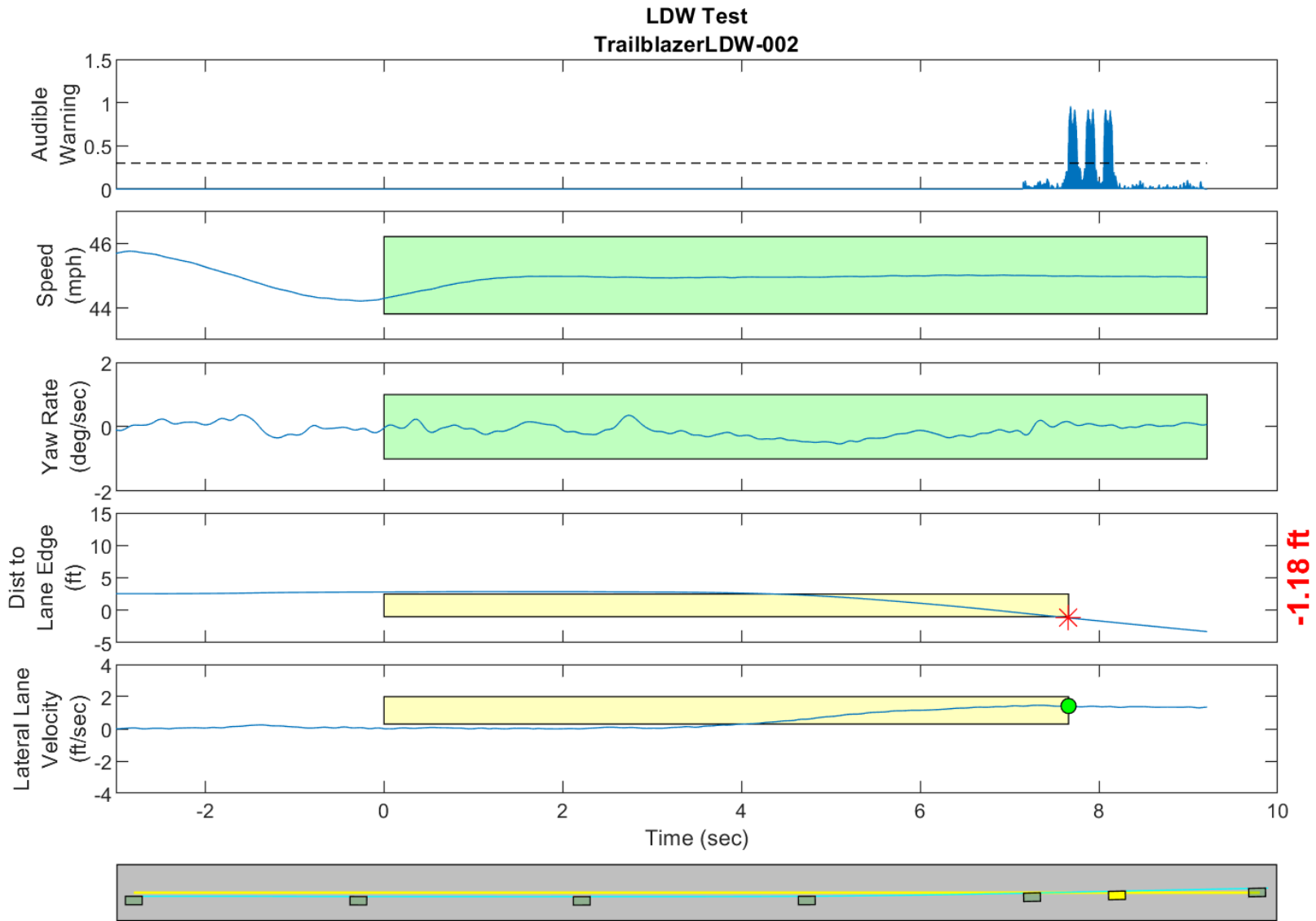
GPS Fix Type: RTK Fixed

Figure D2. Example Time History for Lane Departure Warning Test, Failing, No Warning Issued



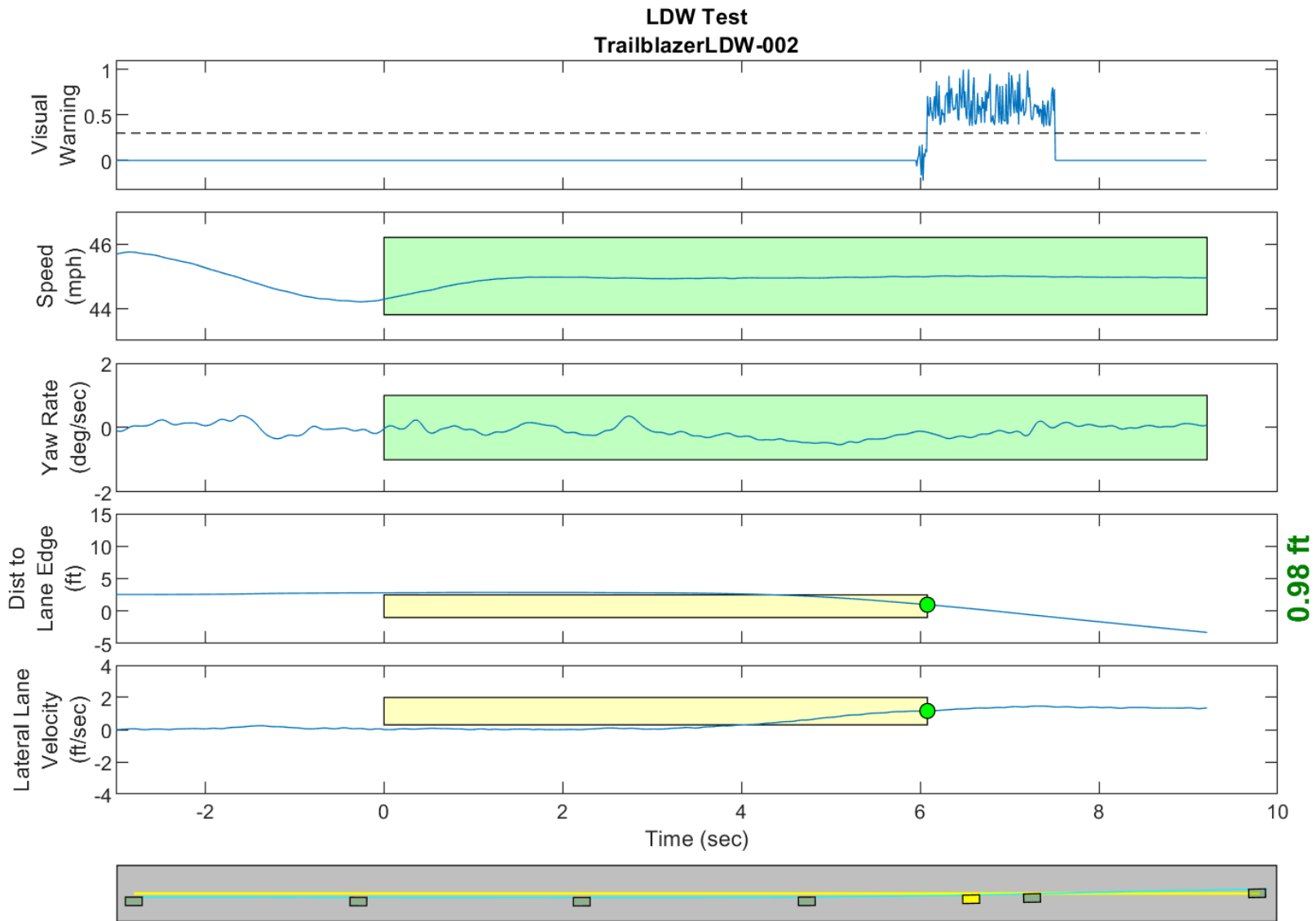
GPS Fix Type: RTK Fixed

Figure D3. Example Time History for Lane Departure Warning Test, Invalid Run Due to Subject Vehicle Yaw Rate



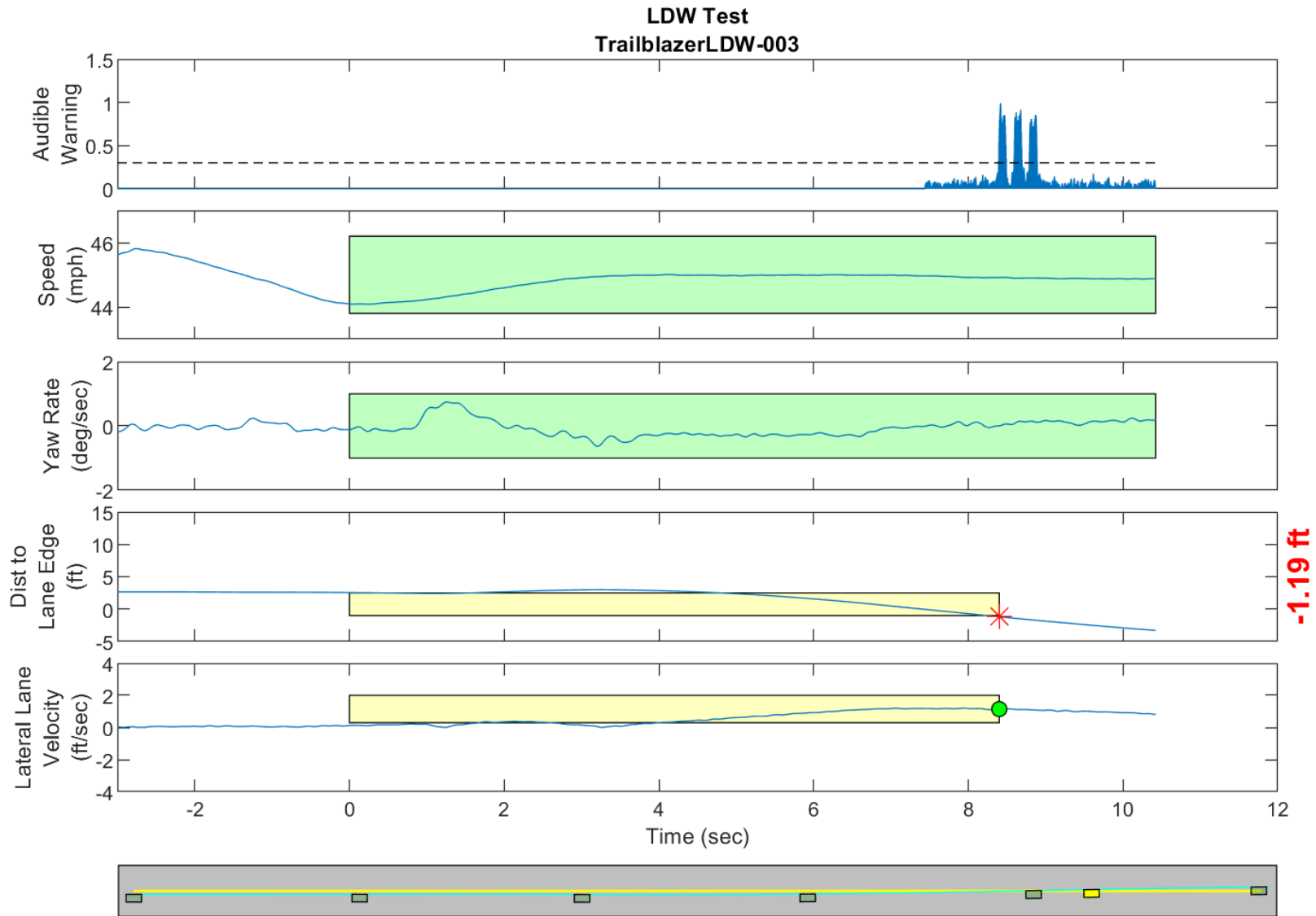
GPS Fix Type: RTK Fixed

Figure D4. Time History for Run 02, Botts Dots, Left Departure, Audible Warning



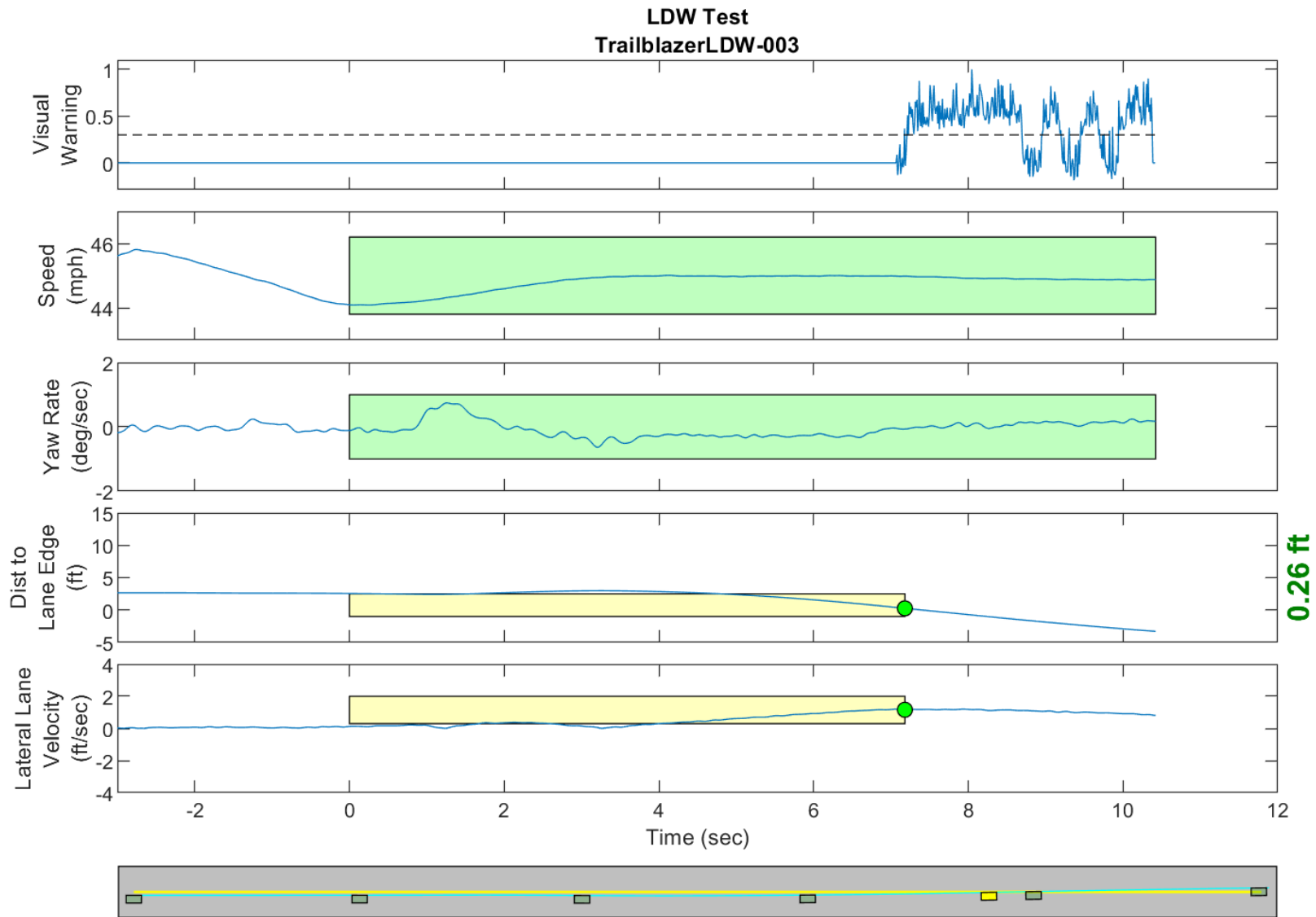
GPS Fix Type: RTK Fixed

Figure D5. Time History for Run 02, Botts Dots, Left Departure, Visual Warning



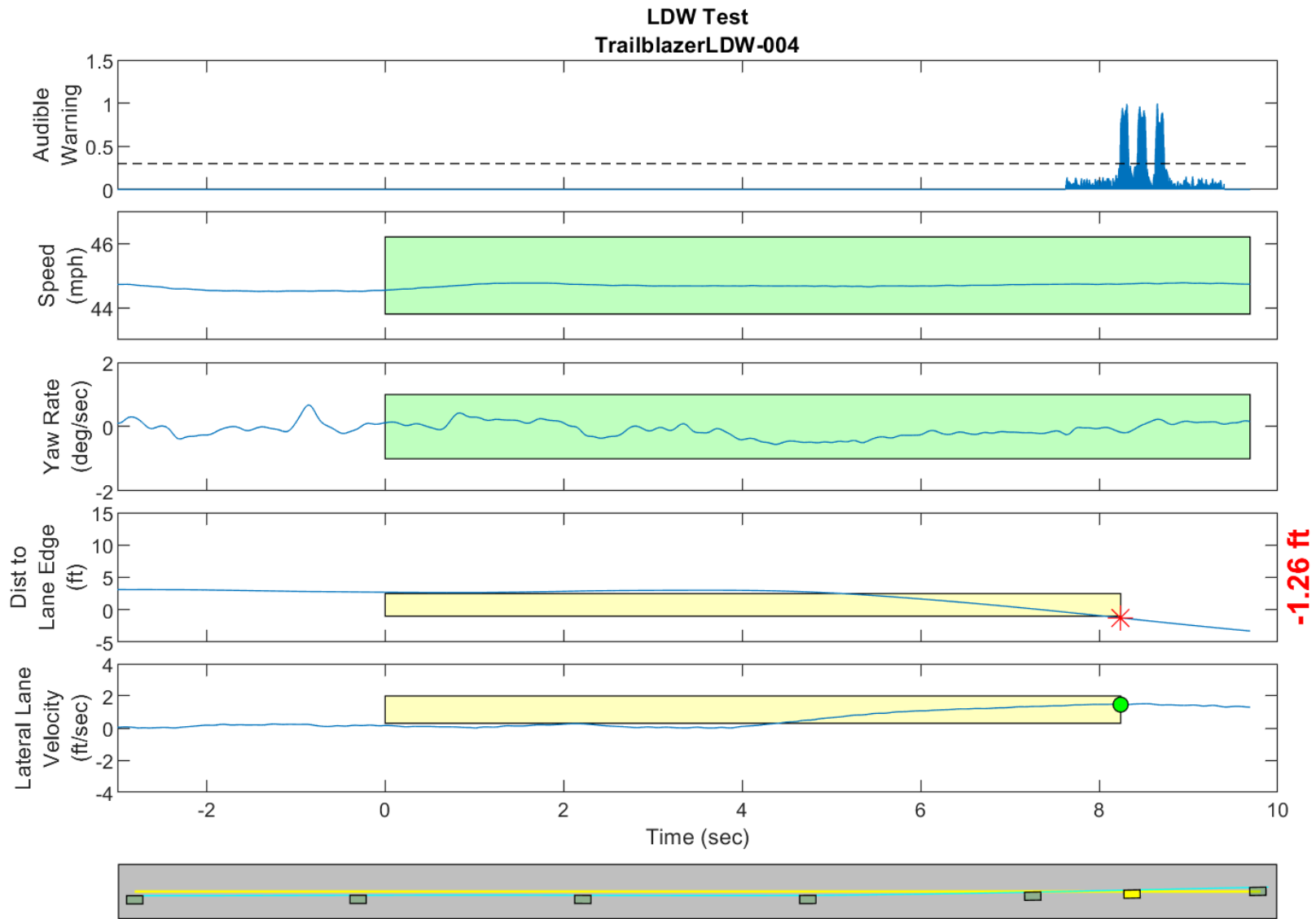
GPS Fix Type: RTK Fixed

Figure D6. Time History for Run 03, Botts Dots, Left Departure, Audible Warning



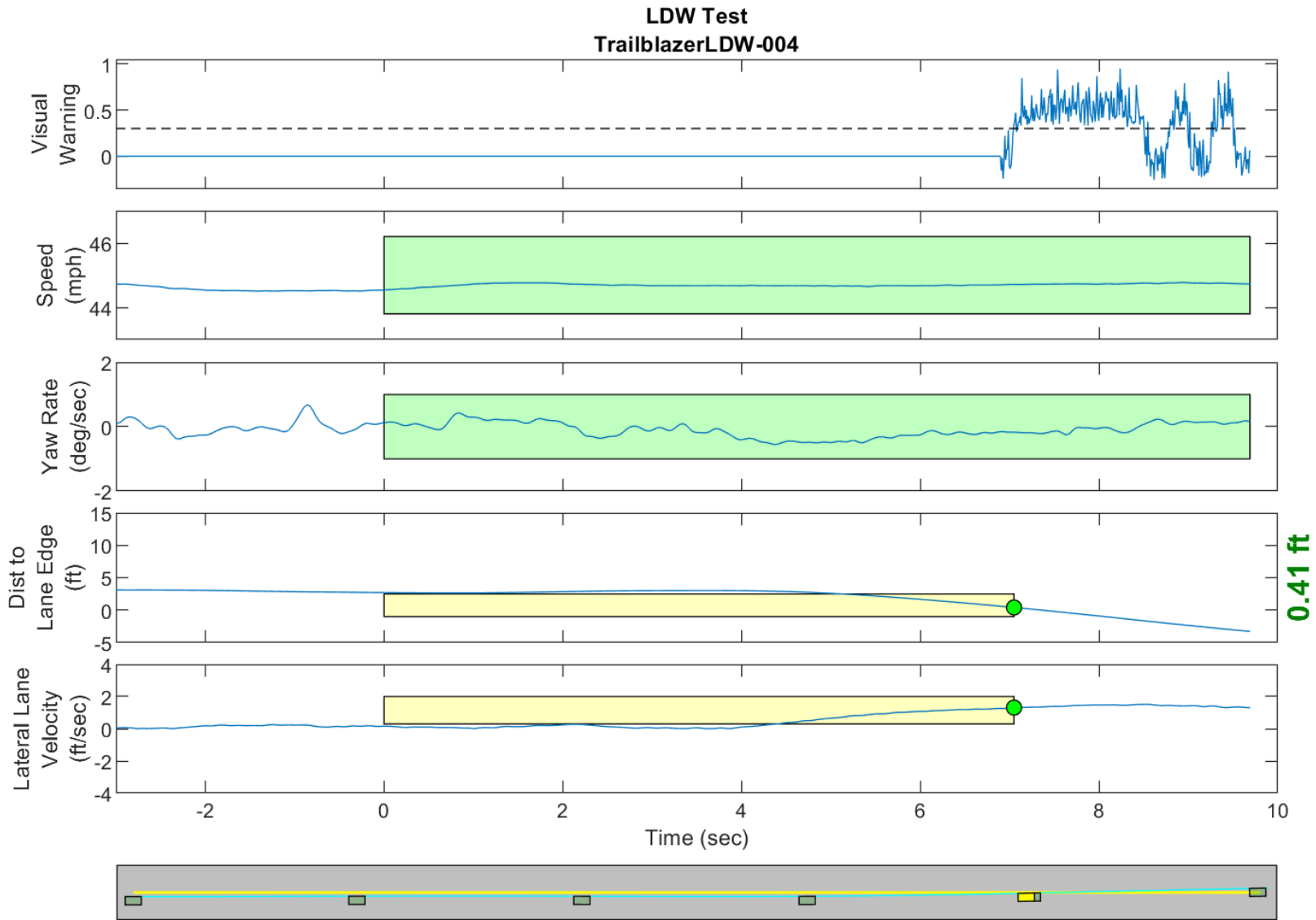
GPS Fix Type: RTK Fixed

Figure D7. Time History for Run 03, Botts Dots, Left Departure, Visual Warning



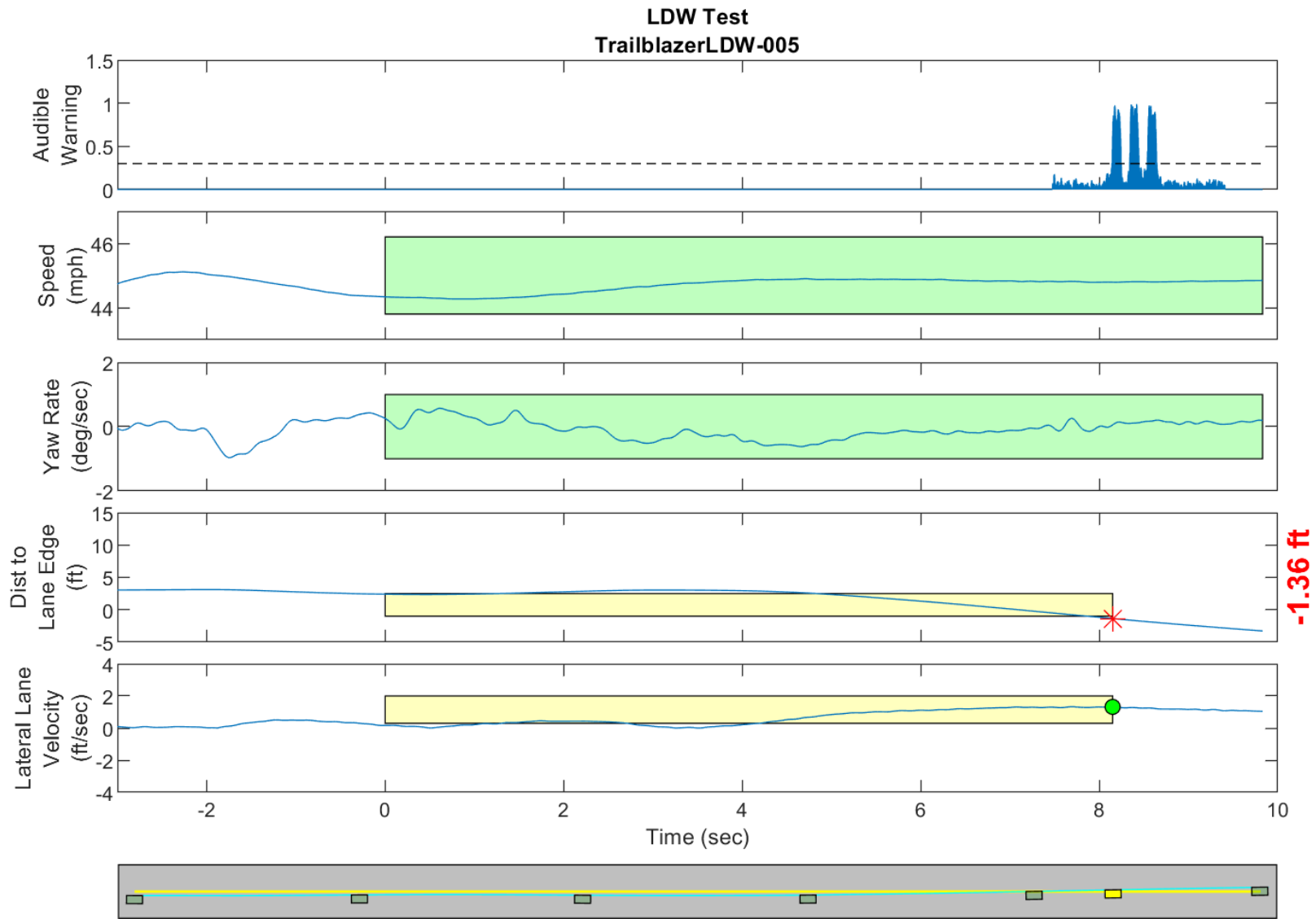
GPS Fix Type: RTK Fixed

Figure D8. Time History for Run 04, Botts Dots, Left Departure, Audible Warning



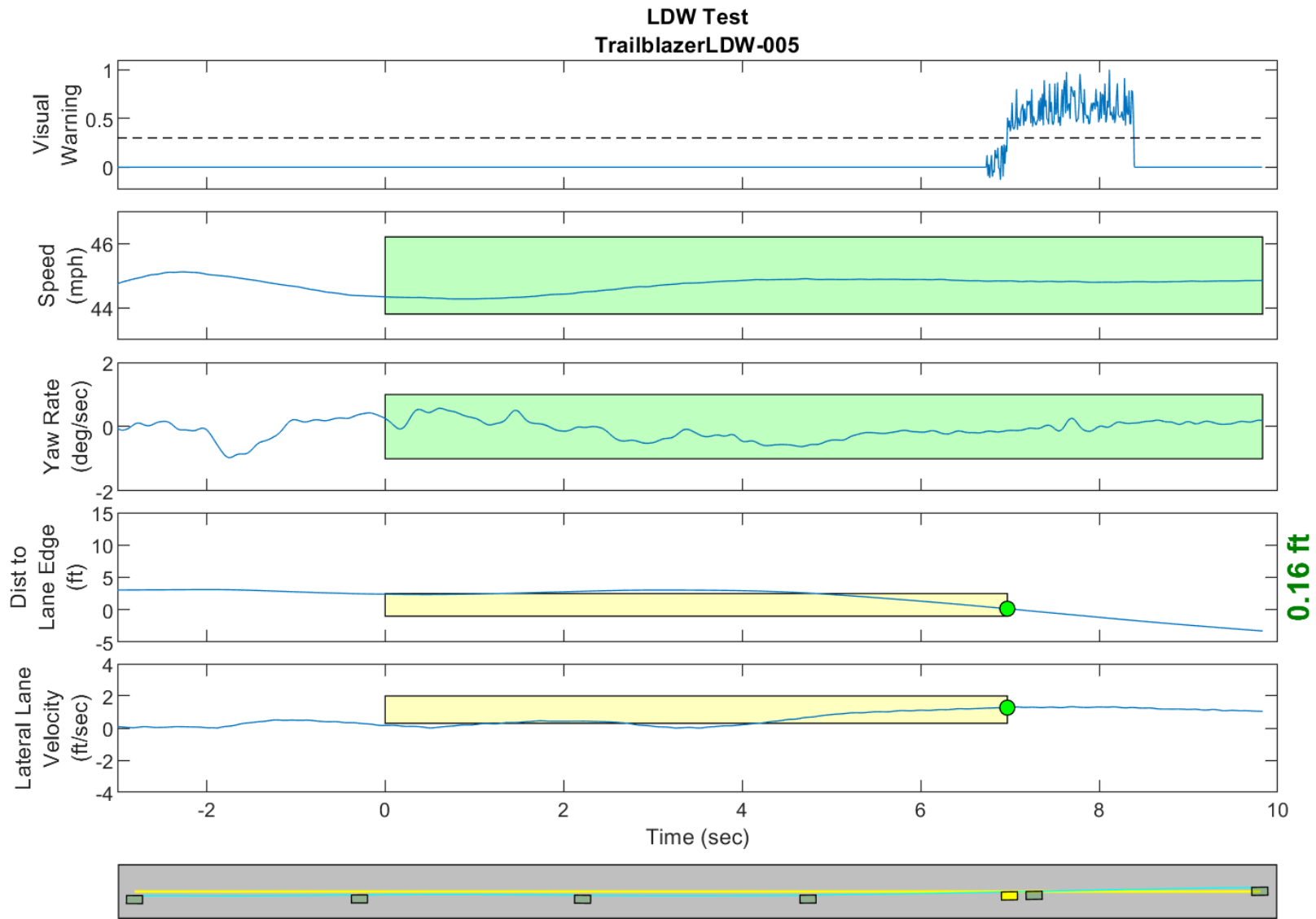
GPS Fix Type: RTK Fixed

Figure D9. Time History for Run 04, Botts Dots, Left Departure, Visual Warning



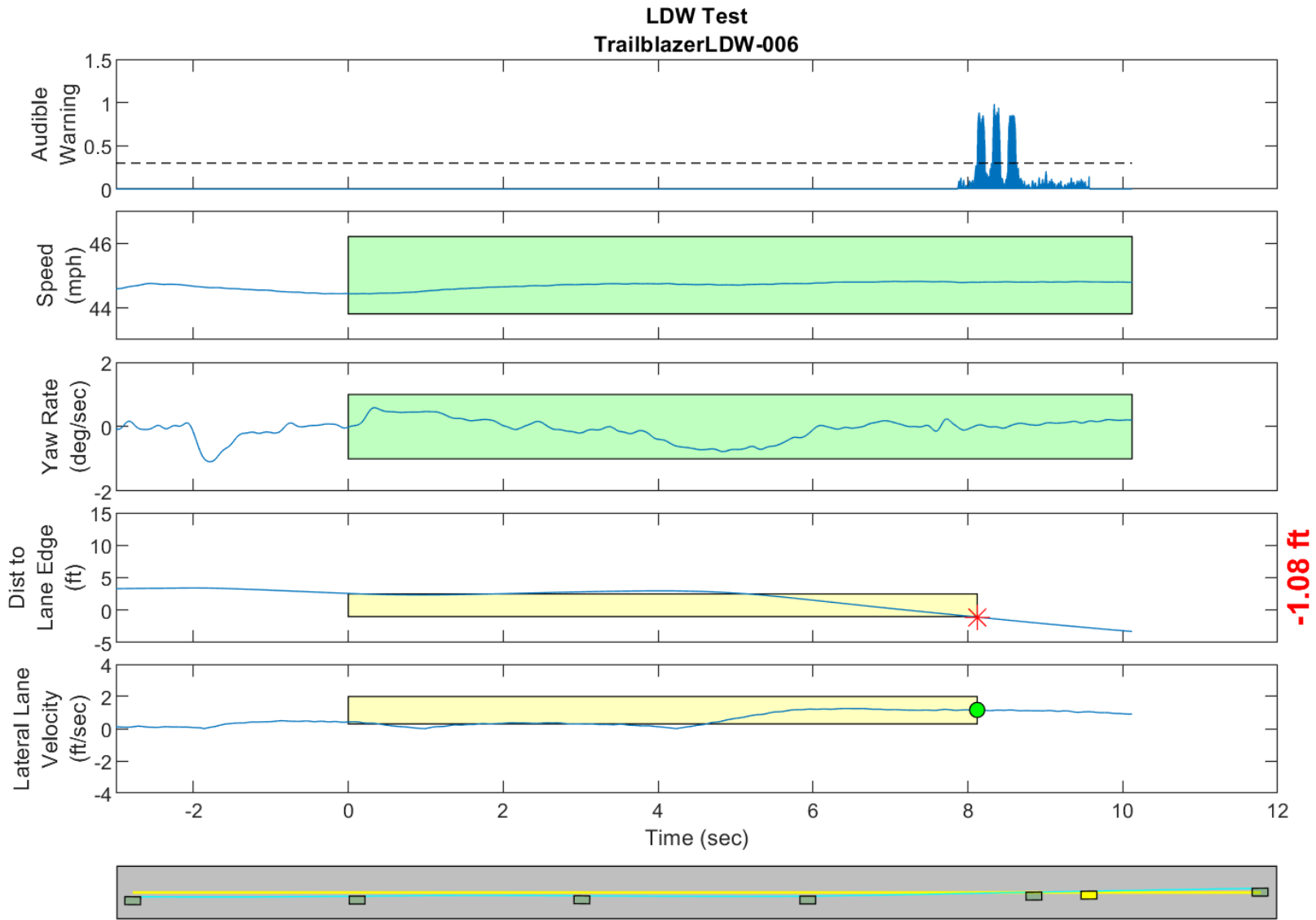
GPS Fix Type: RTK Fixed

Figure D10. Time History for Run 05, Botts Dots, Left Departure, Audible Warning



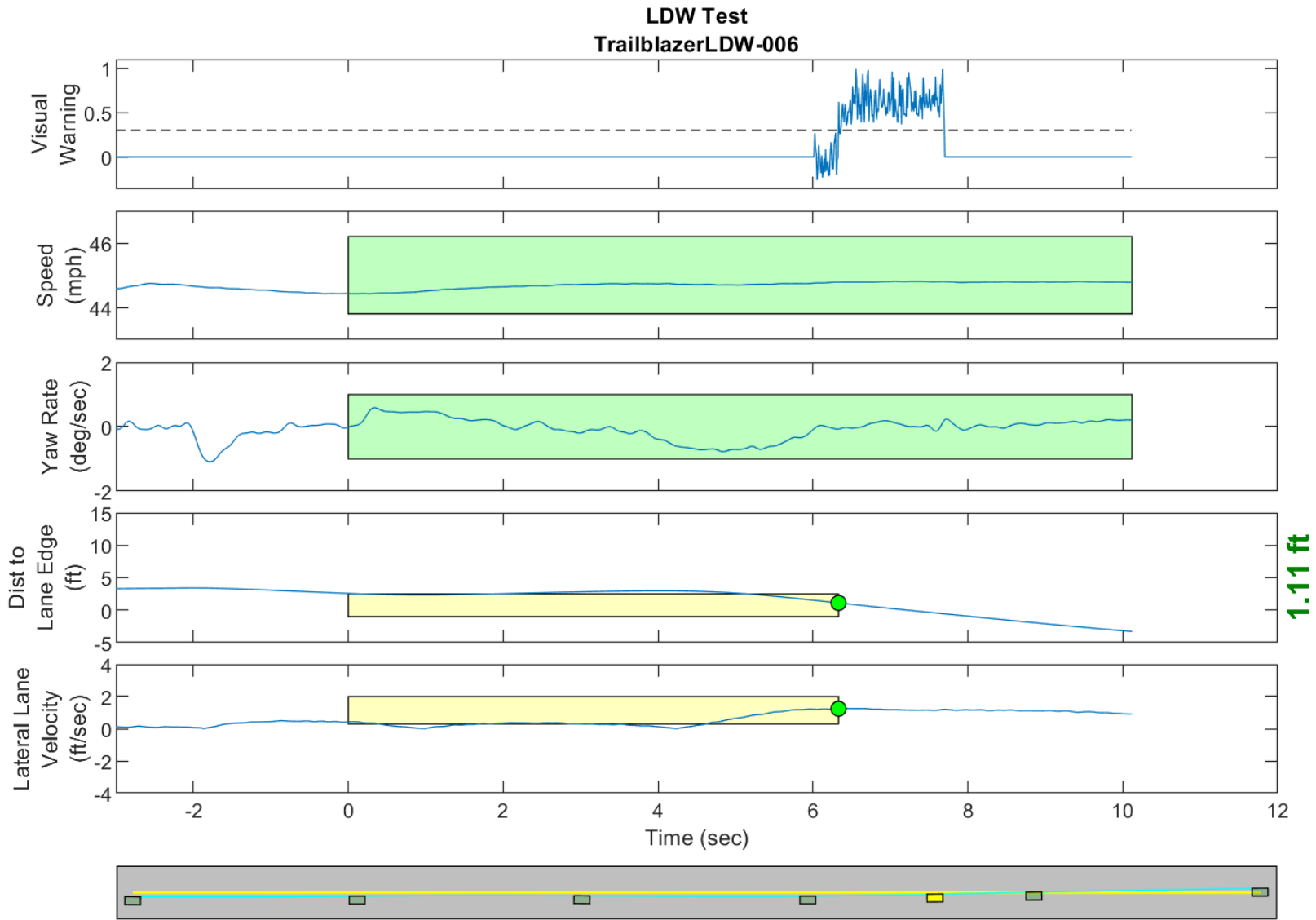
GPS Fix Type: RTK Fixed

Figure D11. Time History for Run 05, Botts Dots, Left Departure, Visual Warning



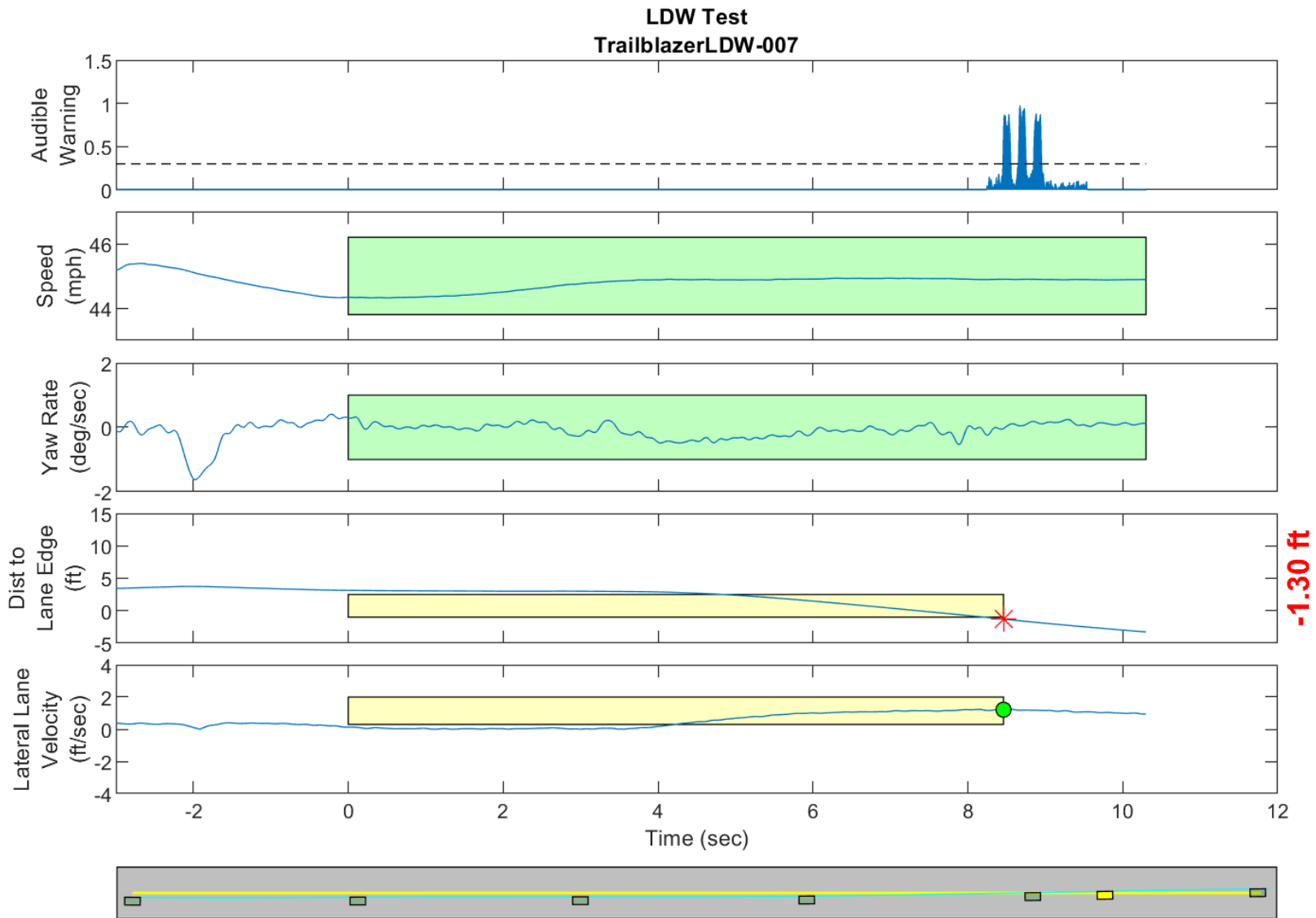
GPS Fix Type: RTK Fixed

Figure D12. Time History for Run 06, Botts Dots, Left Departure, Audible Warning



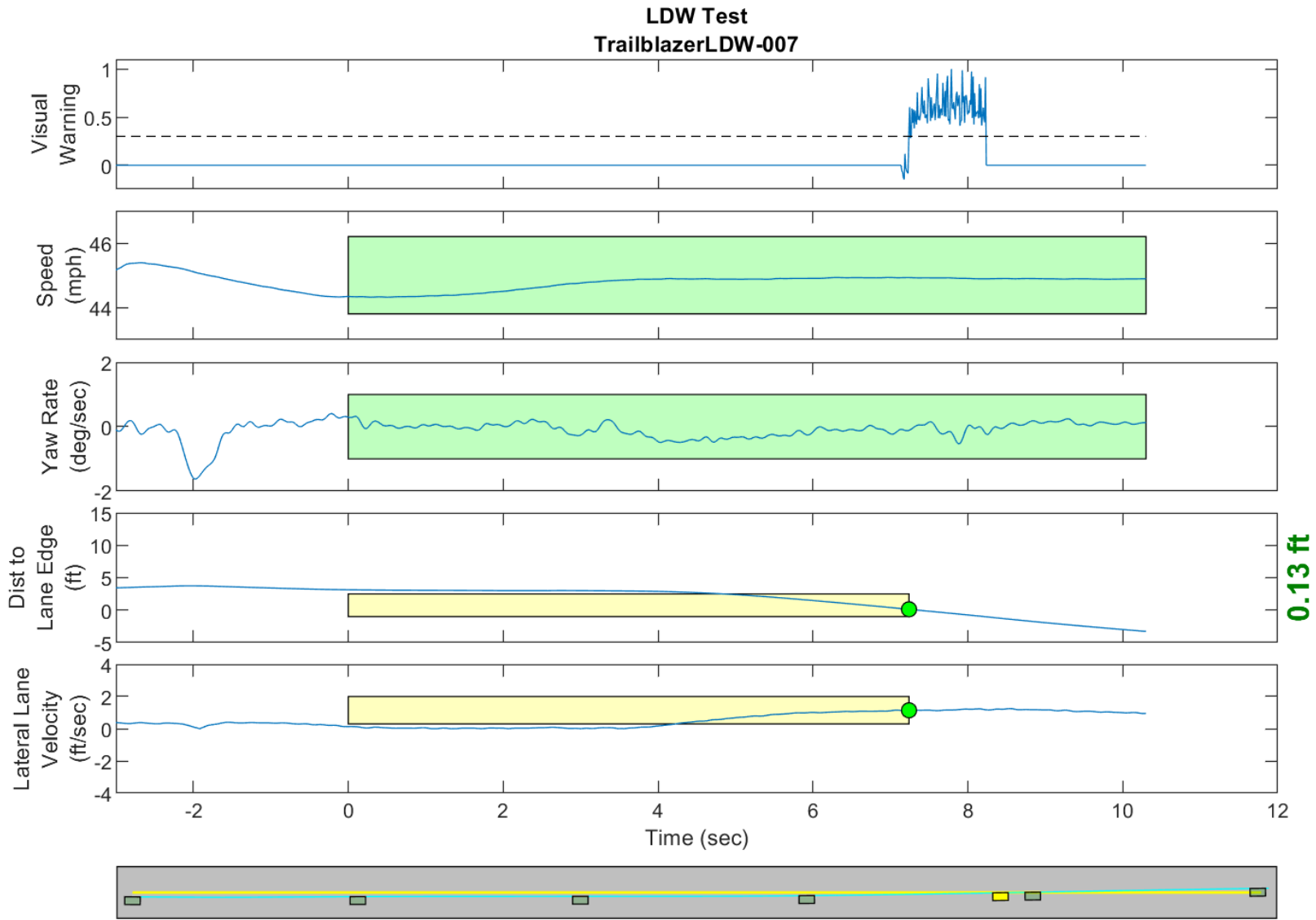
GPS Fix Type: RTK Fixed

Figure D13. Time History for Run 06, Botts Dots, Left Departure, Visual Warning



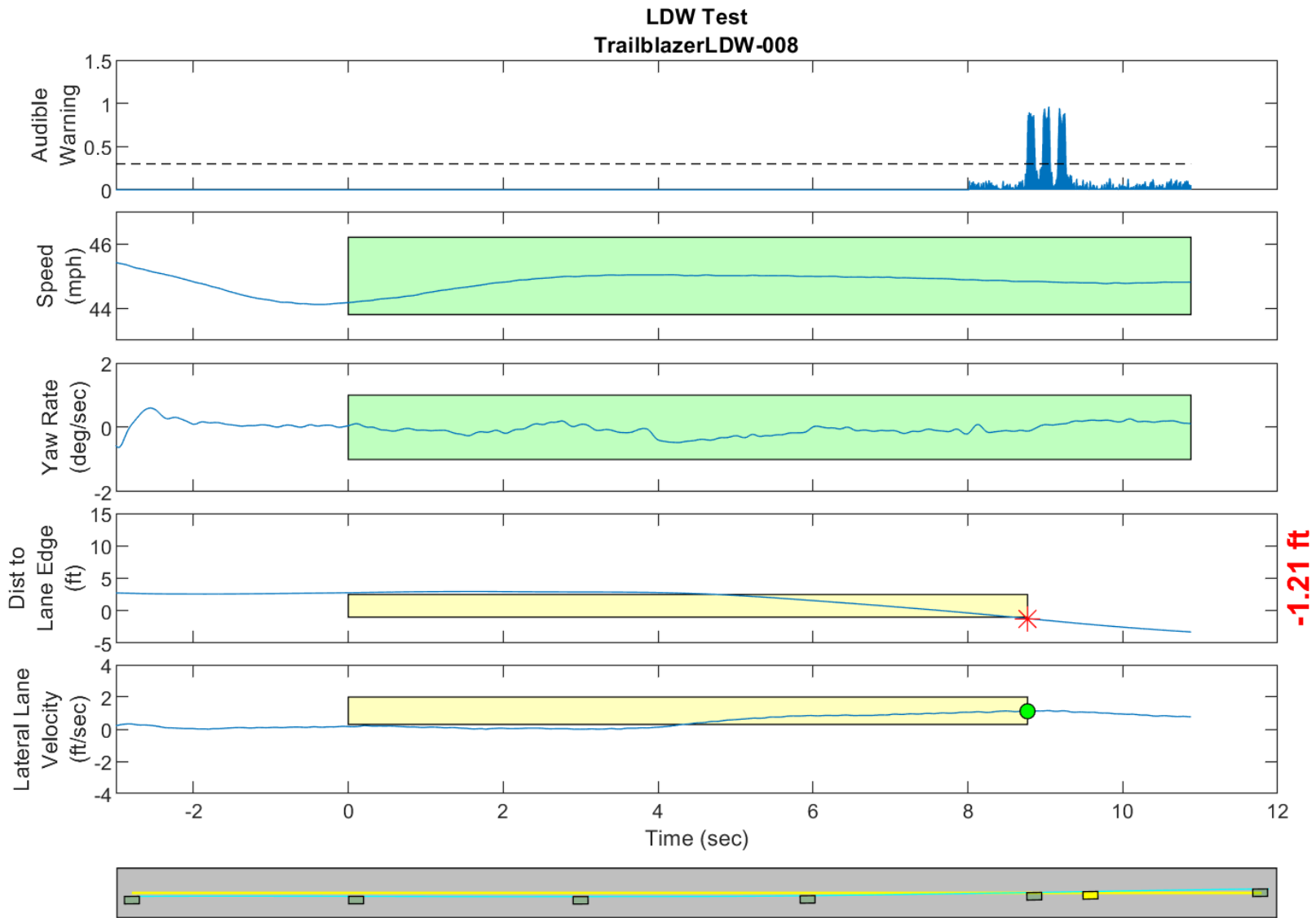
GPS Fix Type: RTK Fixed

Figure D14. Time History for Run 07, Botts Dots, Left Departure, Audible Warning



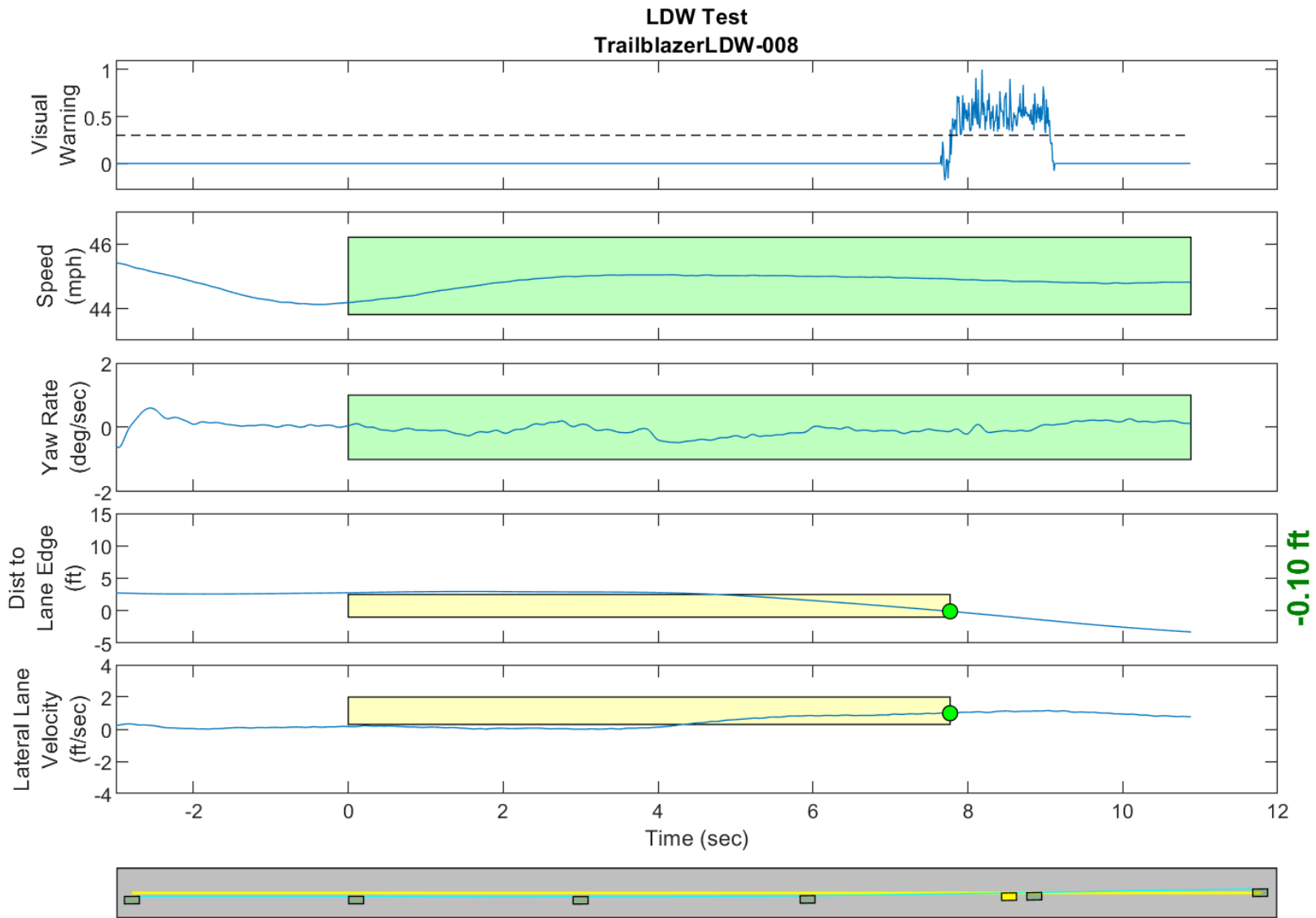
GPS Fix Type: RTK Fixed

Figure D15. Time History for Run 07, Botts Dots, Left Departure, Visual Warning



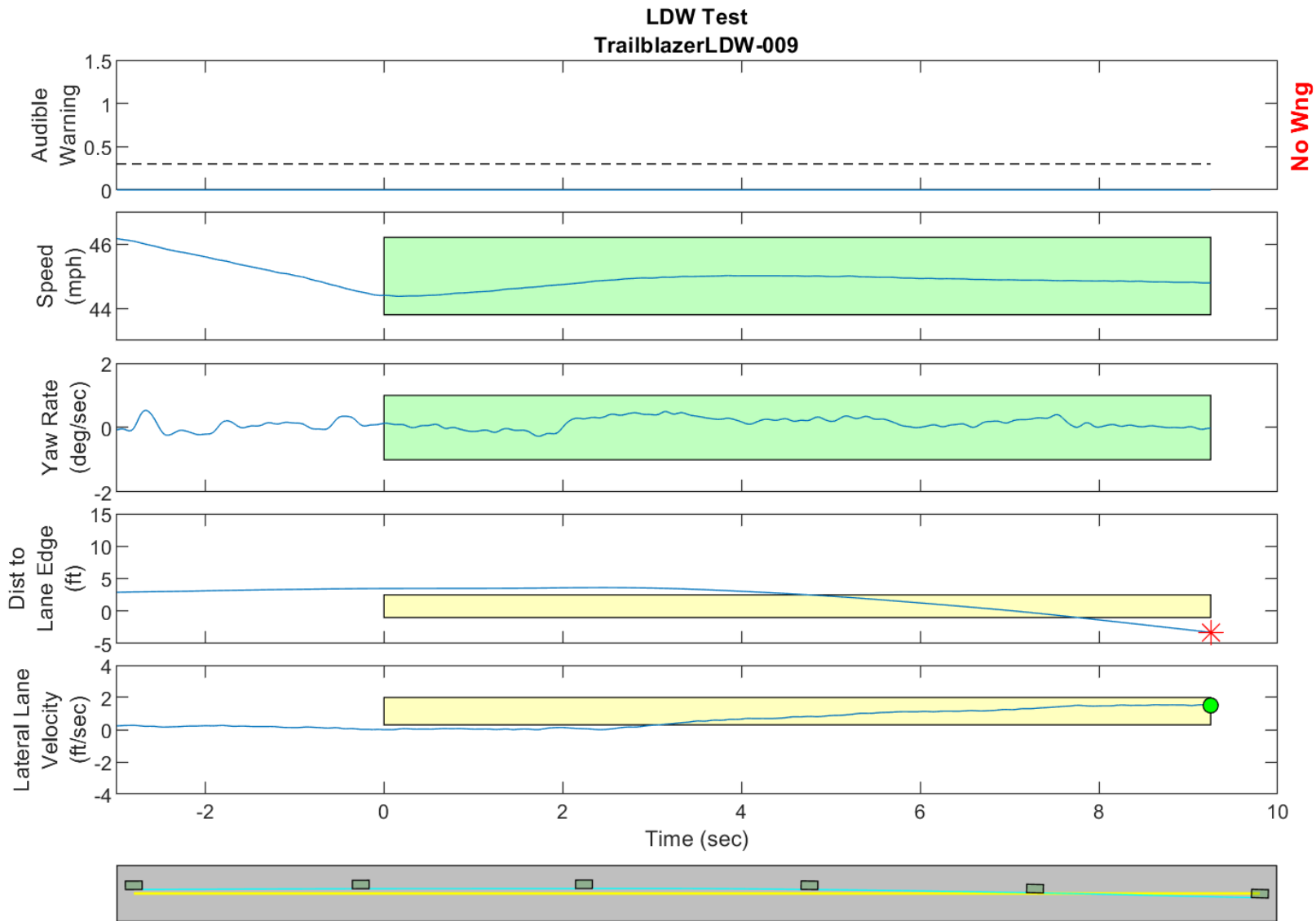
GPS Fix Type: RTK Fixed

Figure D16. Time History for Run 08, Botts Dots, Left Departure, Audible Warning



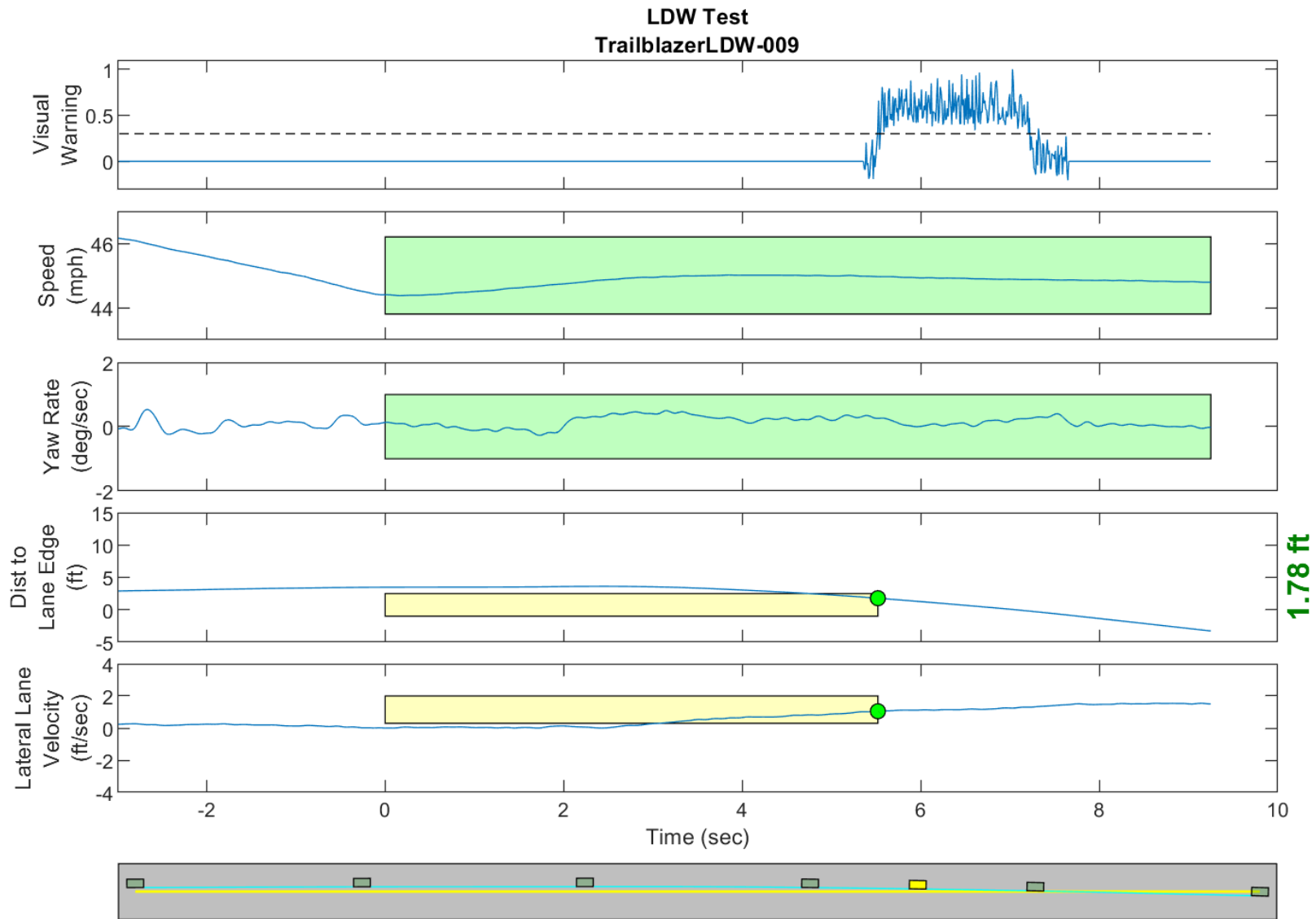
GPS Fix Type: RTK Fixed

Figure D17. Time History for Run 08, Botts Dots, Left Departure, Visual Warning



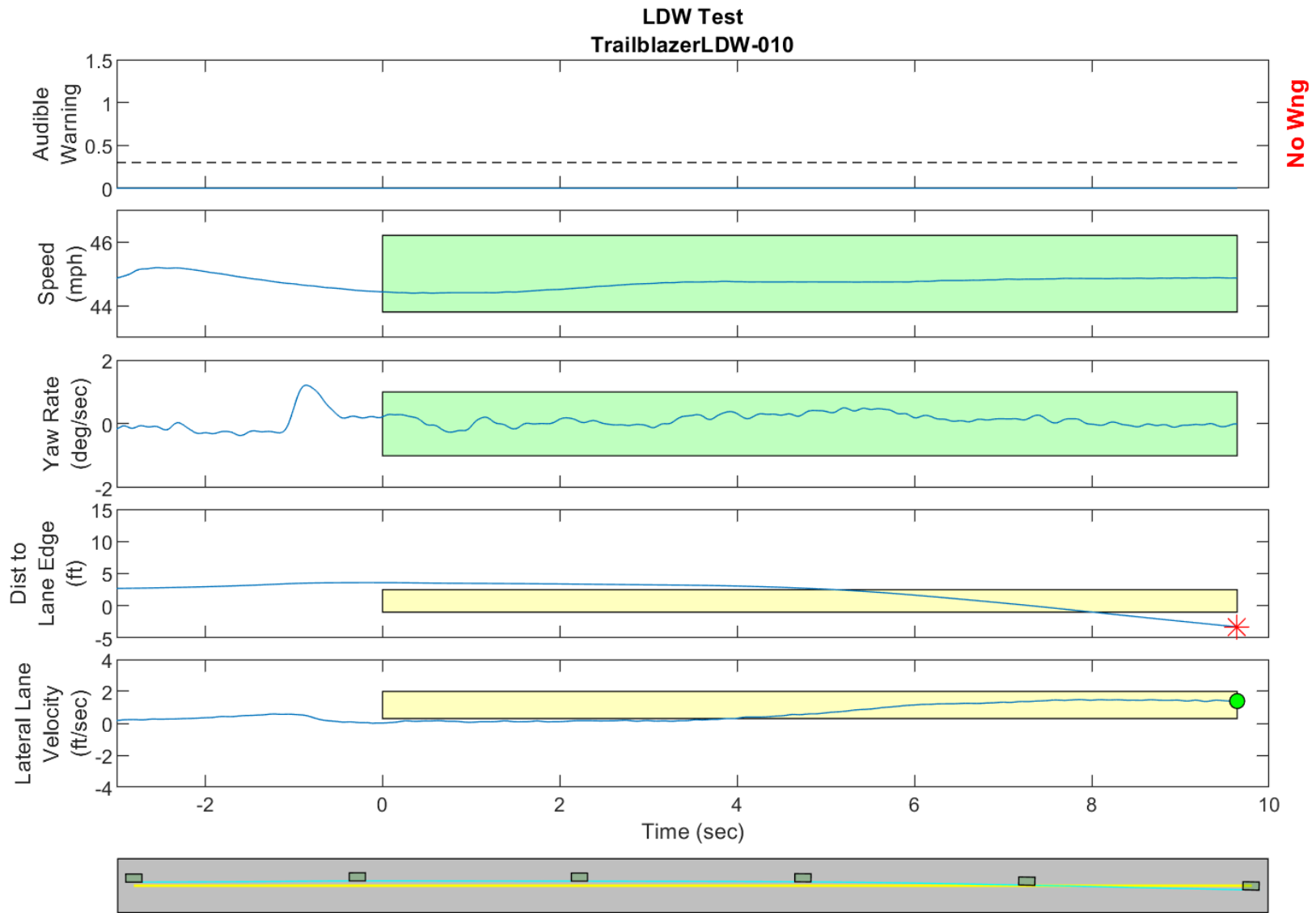
GPS Fix Type: RTK Fixed

Figure D18. Time History for Run 09, Botts Dots, Right Departure, Audible Warning



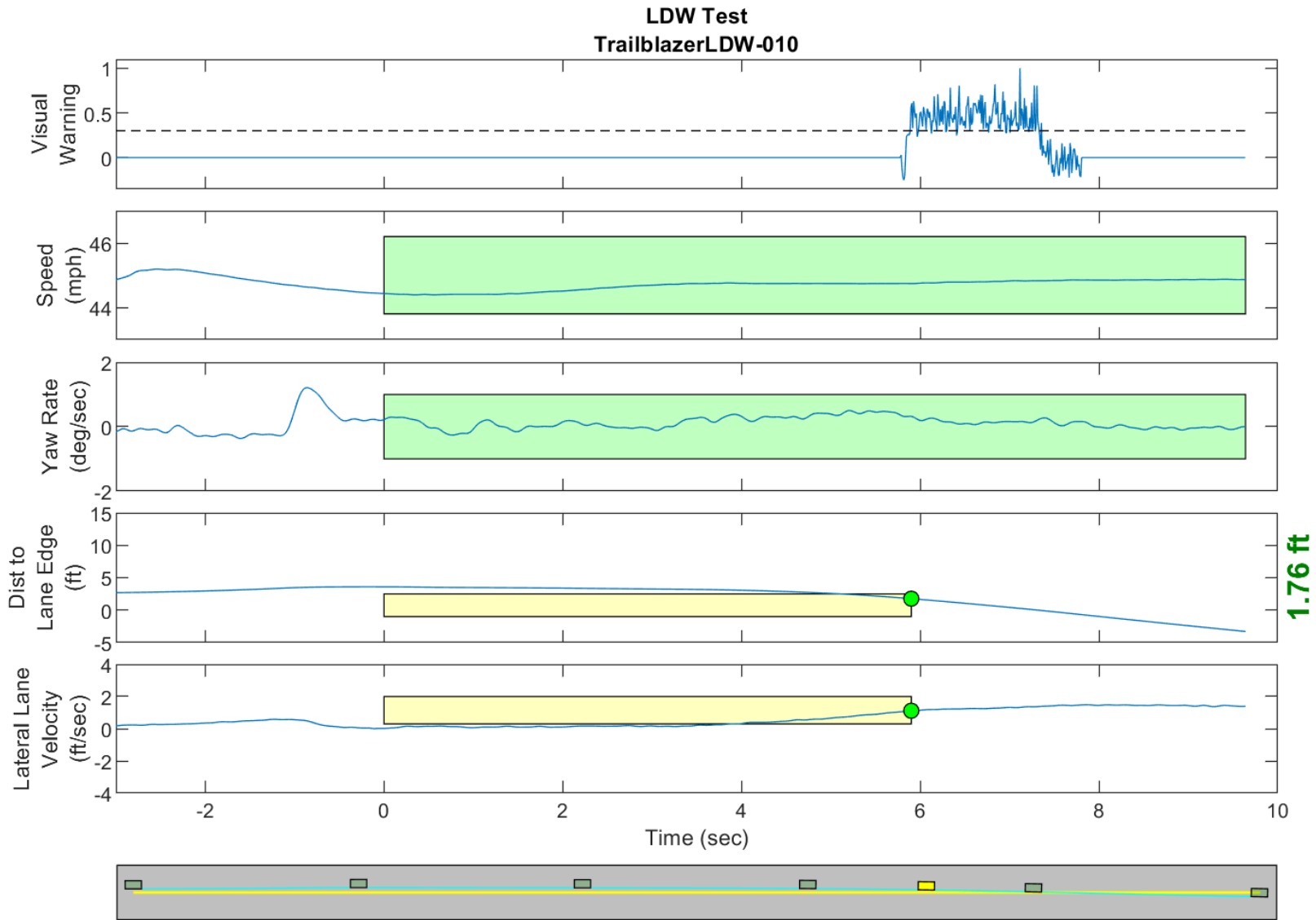
GPS Fix Type: RTK Fixed

Figure D19. Time History for Run 09, Botts Dots, Right Departure, Visual Warning



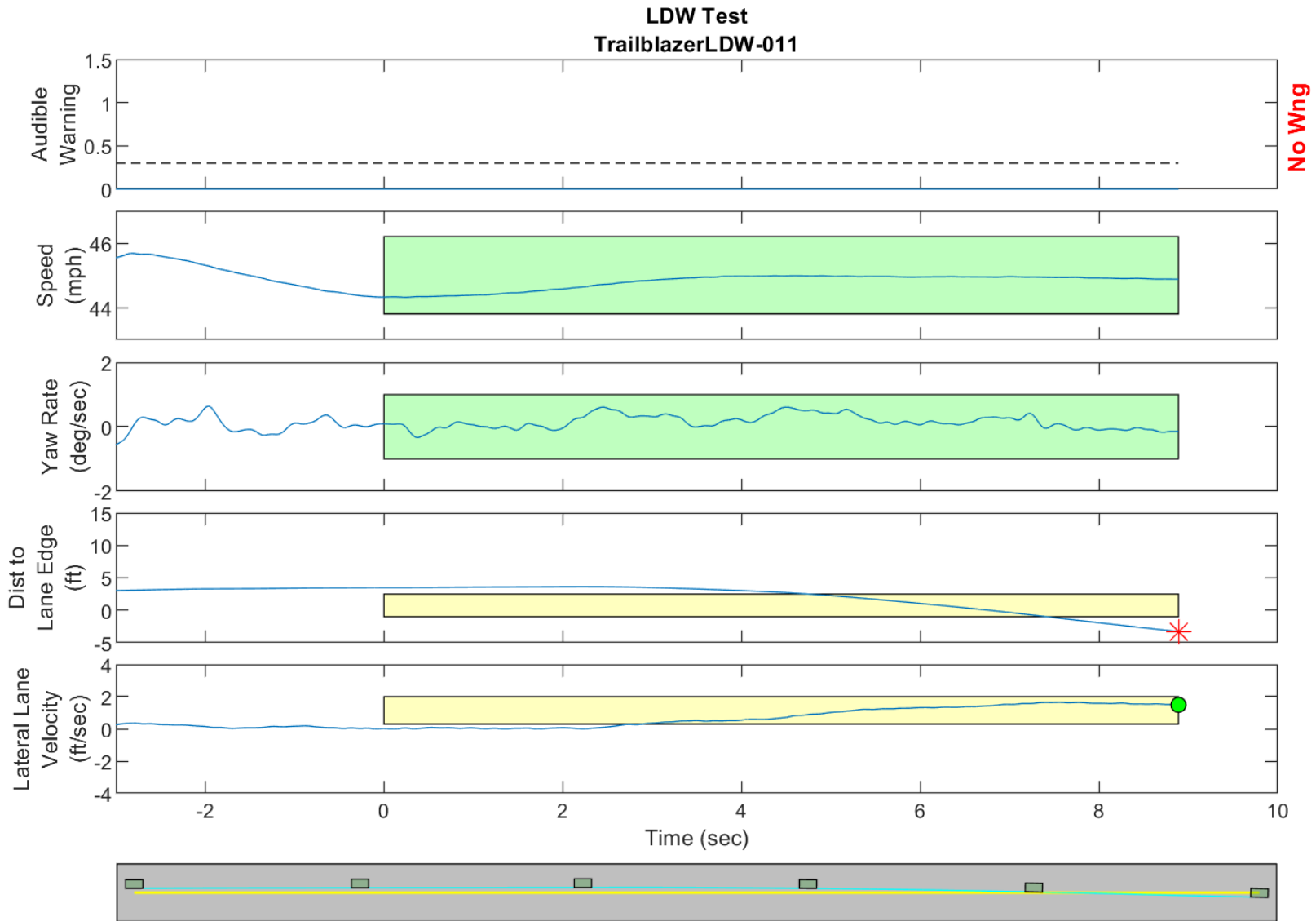
GPS Fix Type: RTK Fixed

Figure D20. Time History for Run 10, Botts Dots, Right Departure, Audible Warning



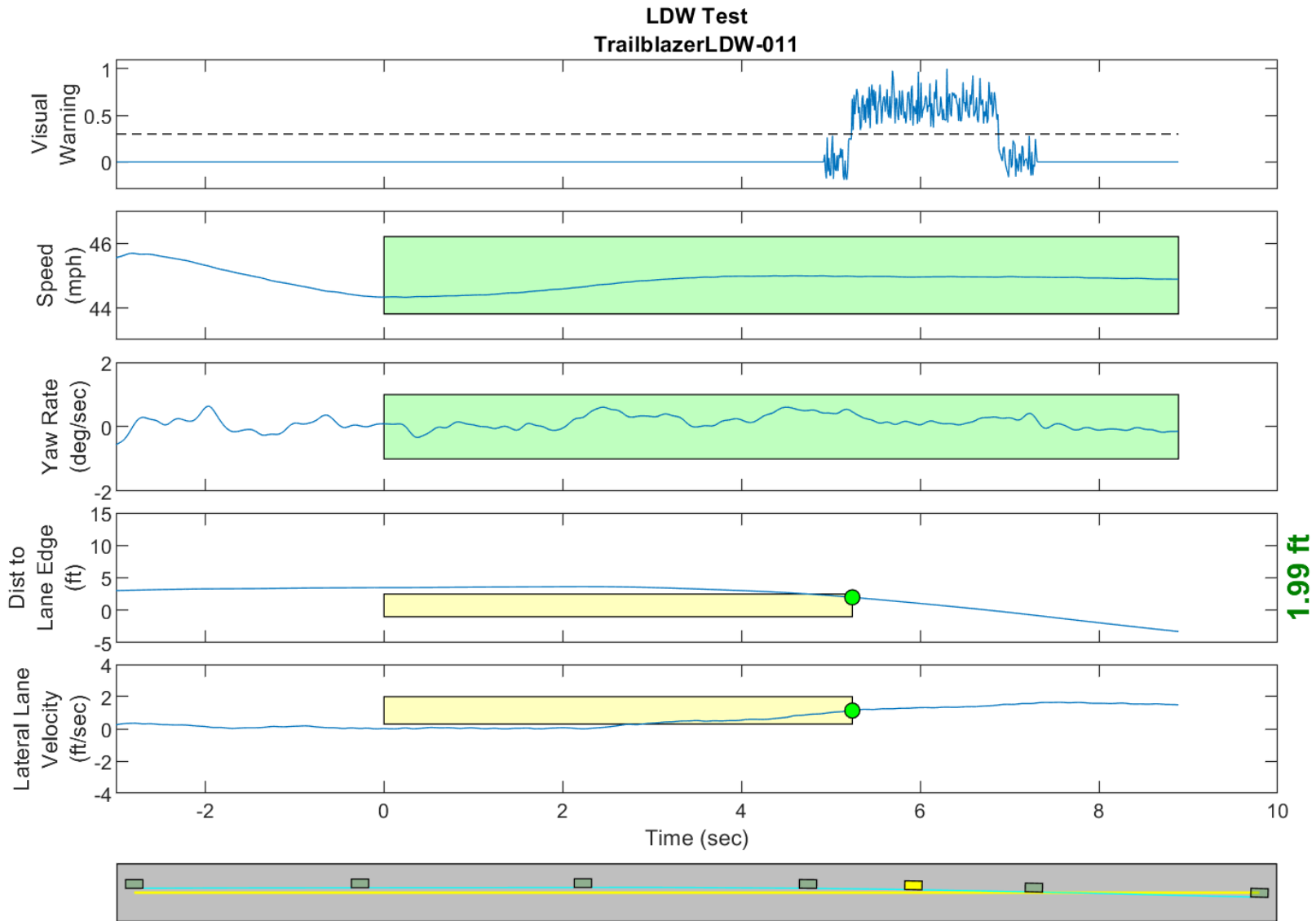
GPS Fix Type: RTK Fixed

Figure D21. Time History for Run 10, Botts Dots, Right Departure, Visual Warning



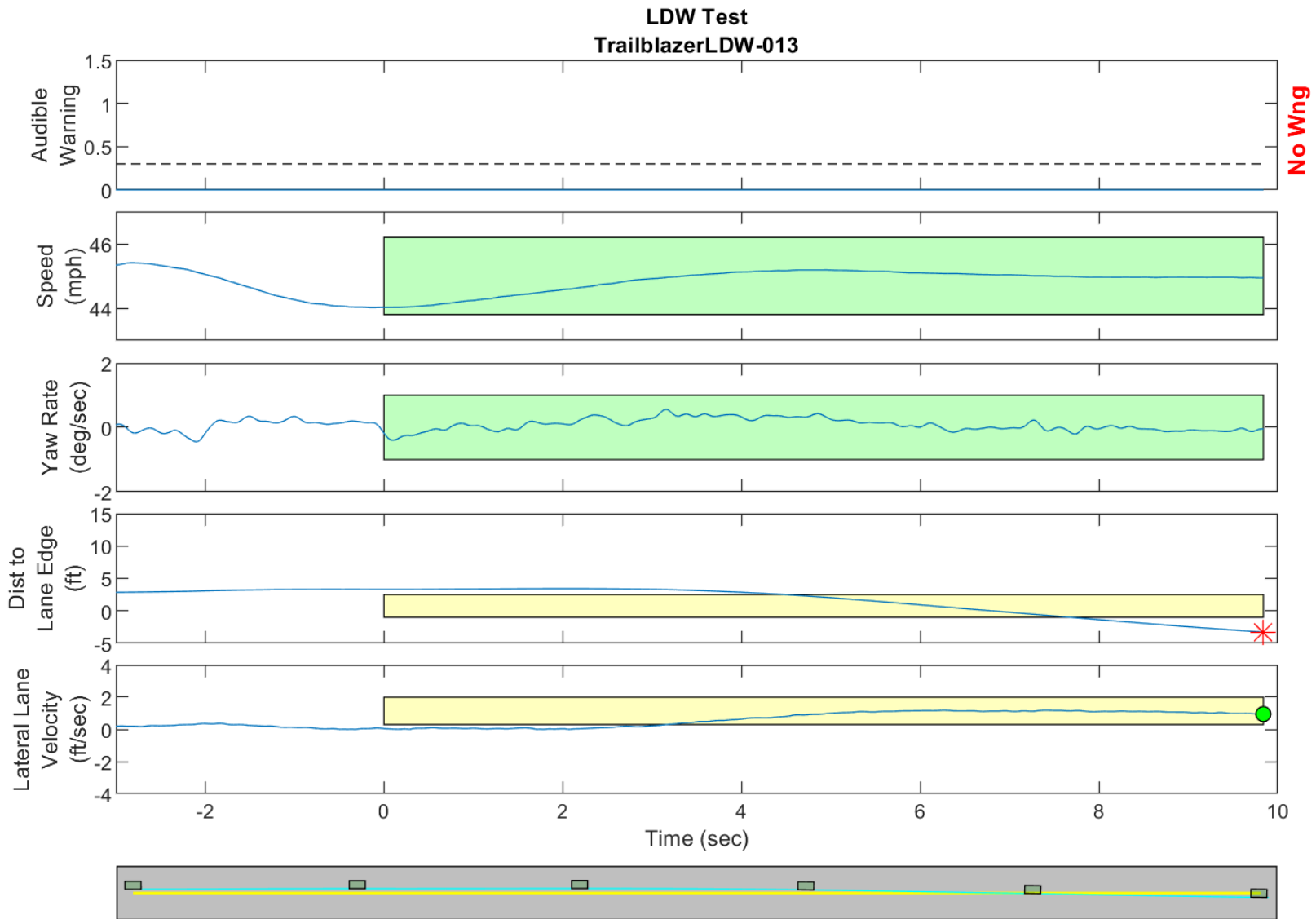
GPS Fix Type: RTK Fixed

Figure D22. Time History for Run 11, Botts Dots, Right Departure, Audible Warning



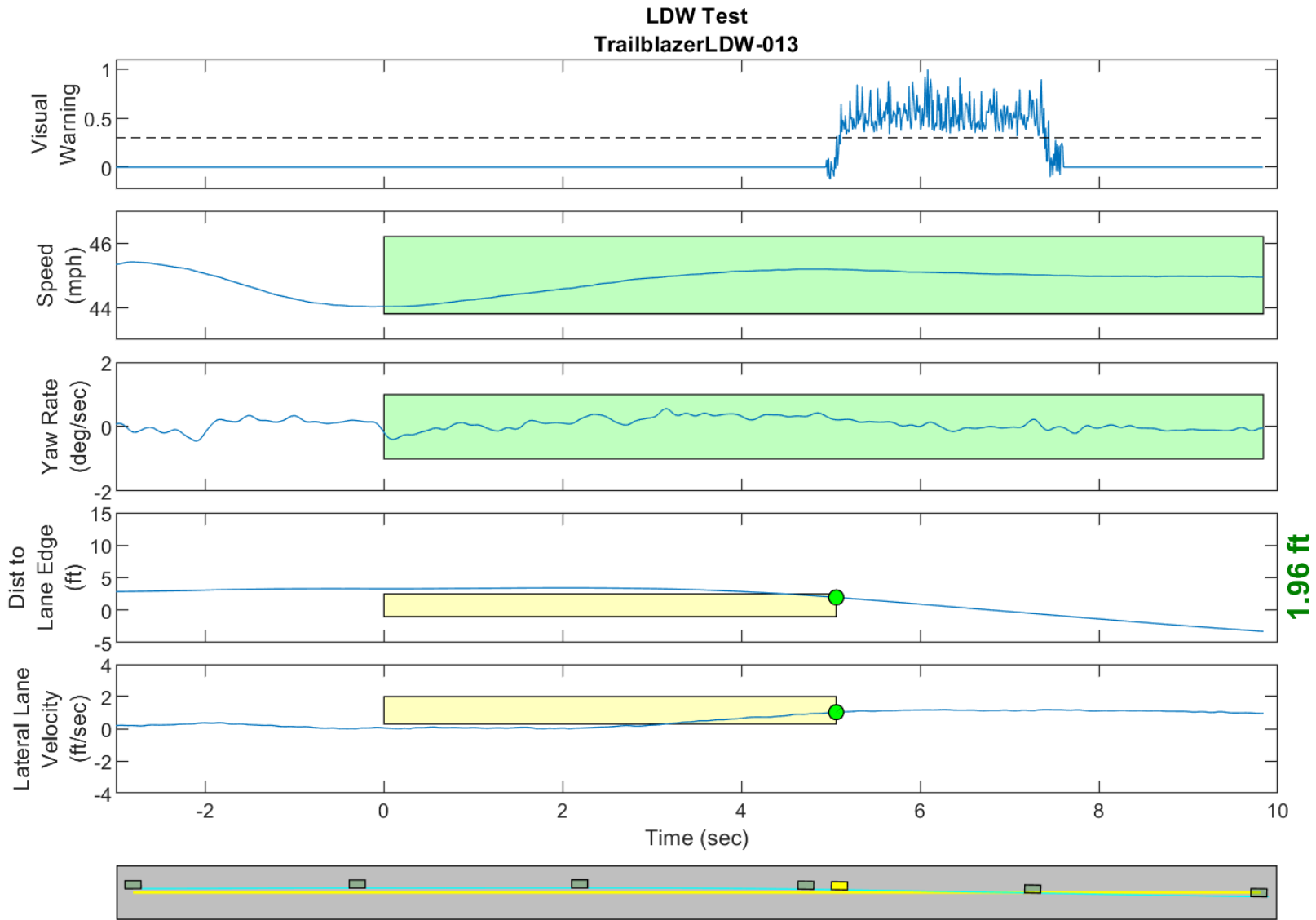
GPS Fix Type: RTK Fixed

Figure D23. Time History for Run 11, Botts Dots, Right Departure, Visual Warning



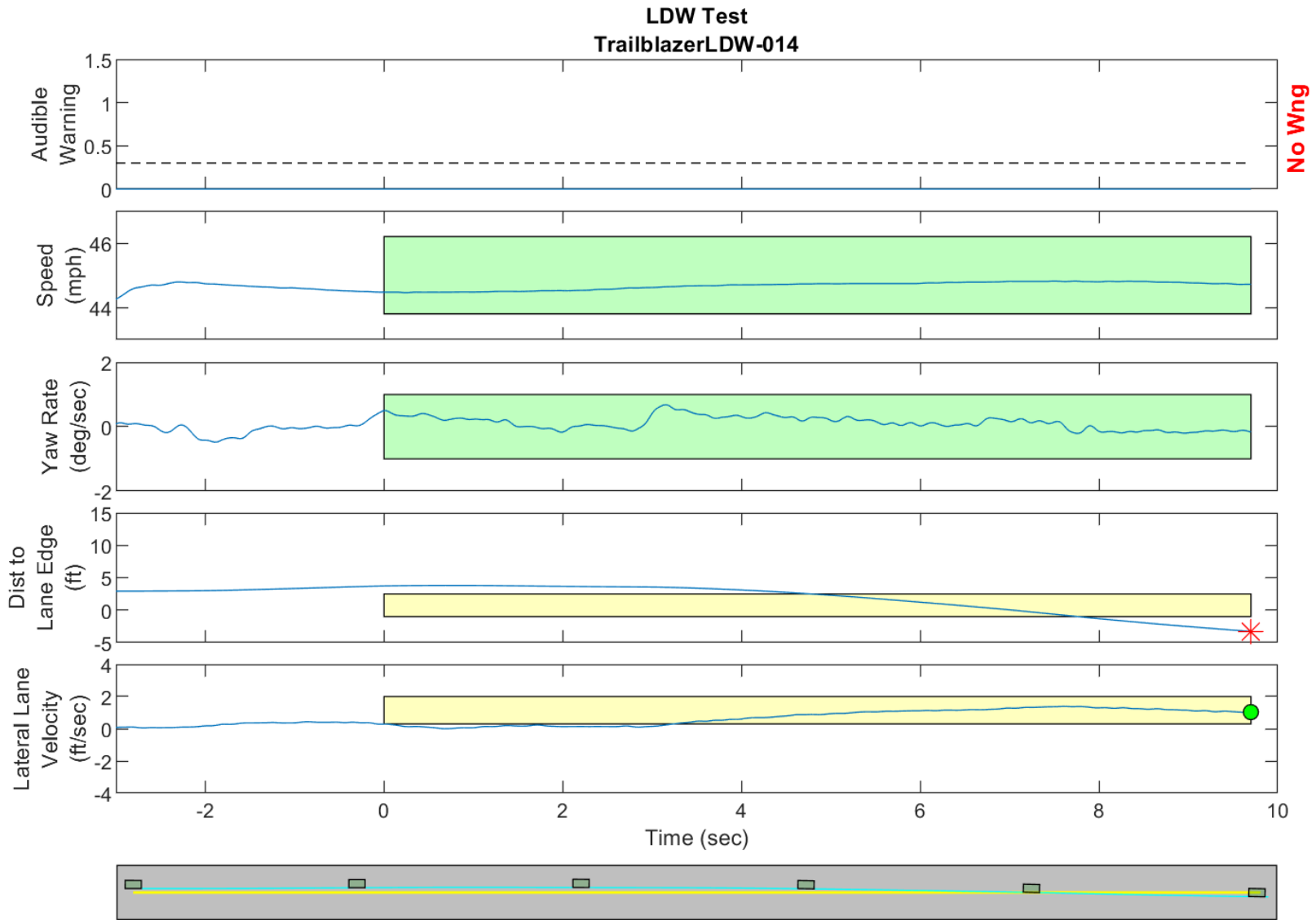
GPS Fix Type: RTK Fixed

Figure D24. Time History for Run 13, Botts Dots, Right Departure, Audible Warning



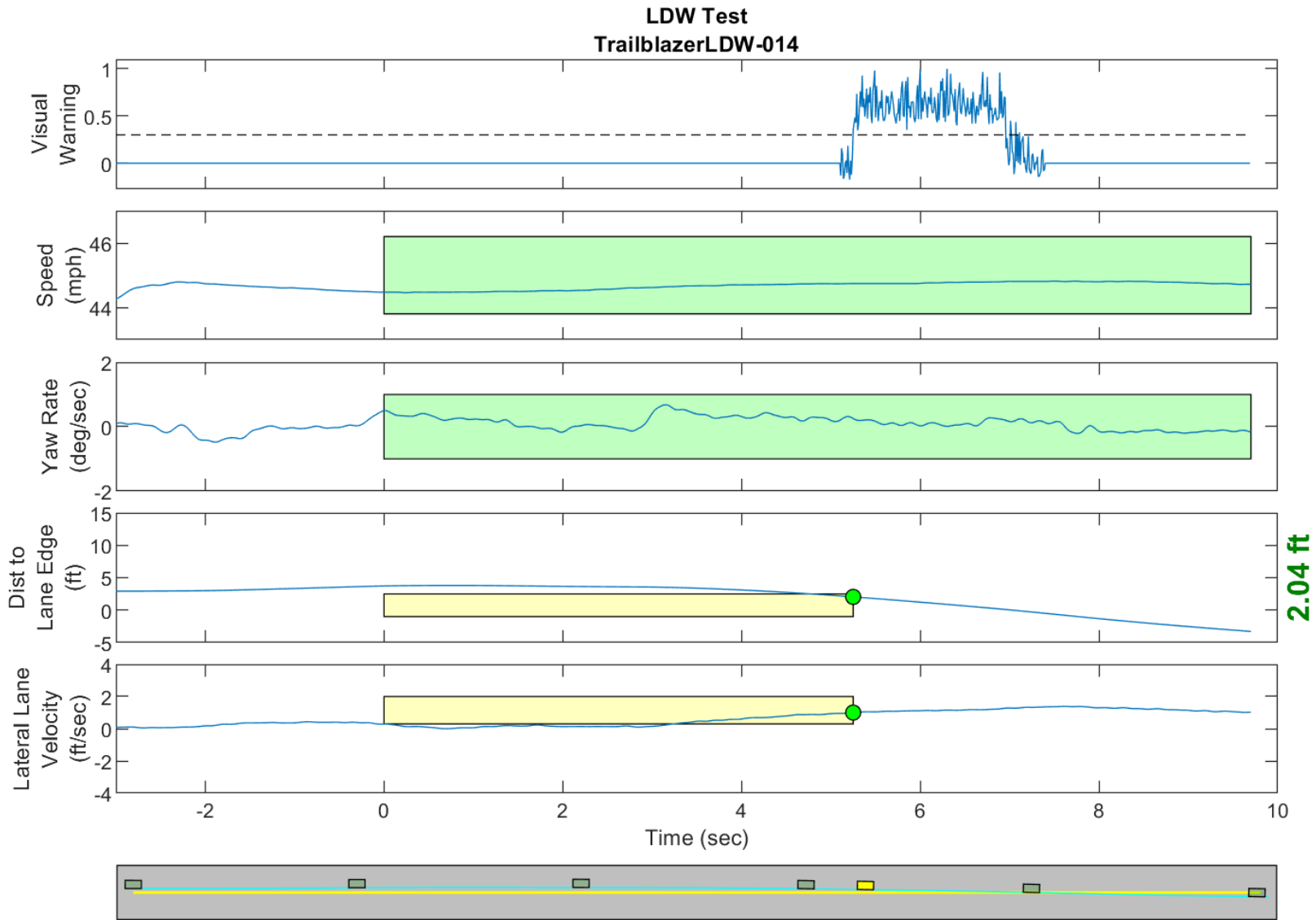
GPS Fix Type: RTK Fixed

Figure D25. Time History for Run 13, Botts Dots, Right Departure, Visual Warning



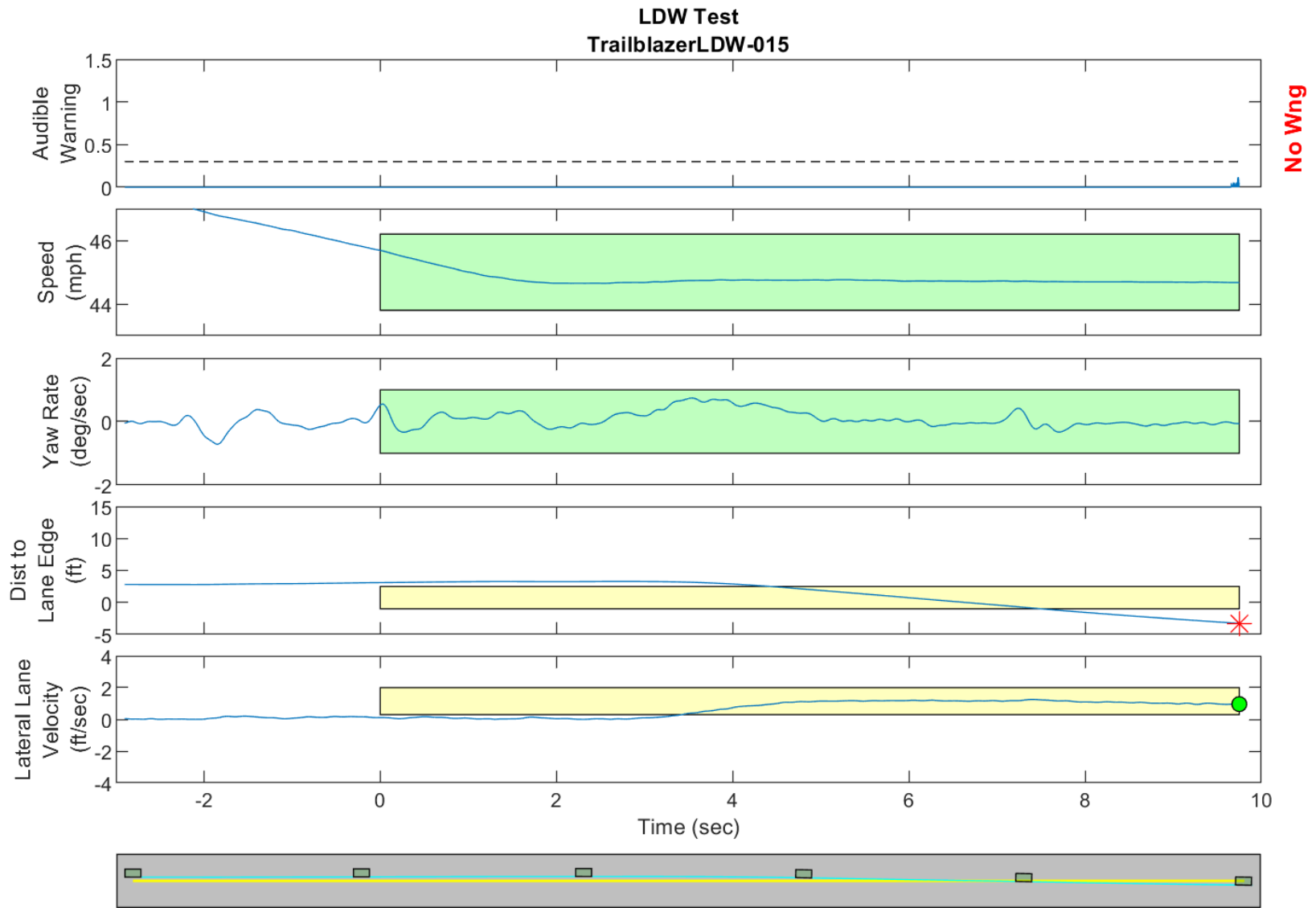
GPS Fix Type: RTK Fixed

Figure D26. Time History for Run 14, Botts Dots, Right Departure, Audible Warning



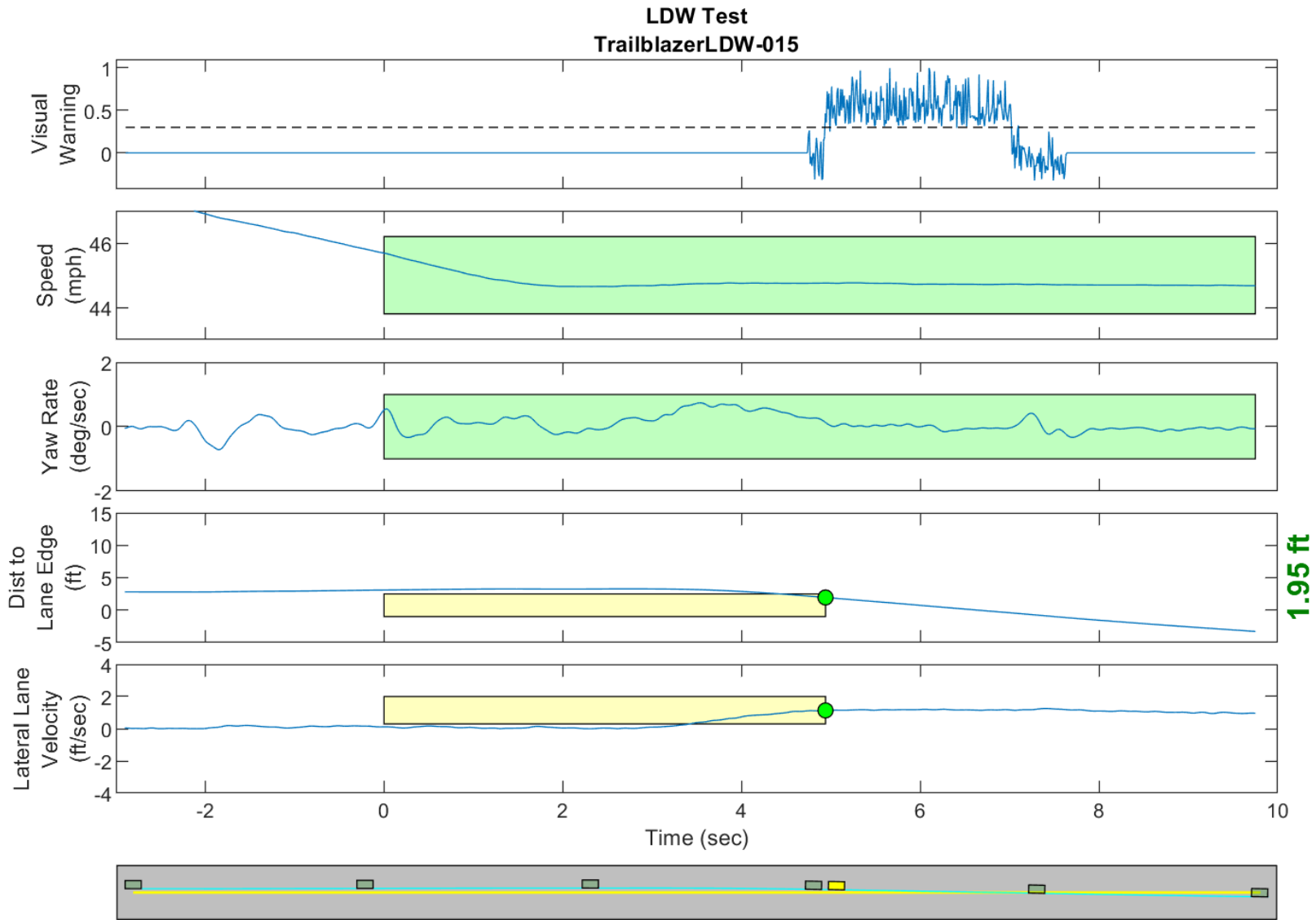
GPS Fix Type: RTK Fixed

Figure D27. Time History for Run 14, Botts Dots, Right Departure, Visual Warning



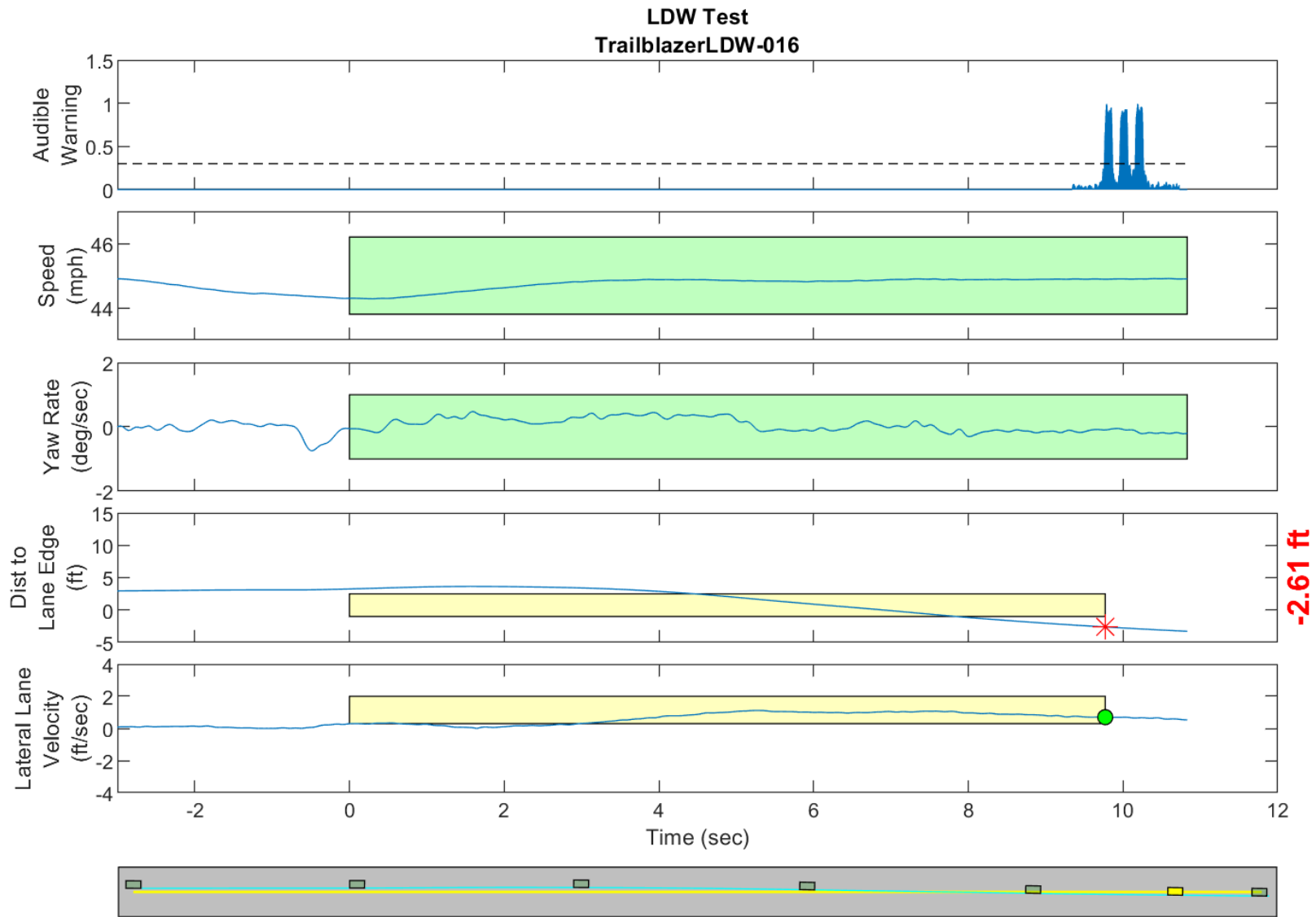
GPS Fix Type: RTK Fixed

Figure D28. Time History for Run 15, Botts Dots, Right Departure, Audible Warning



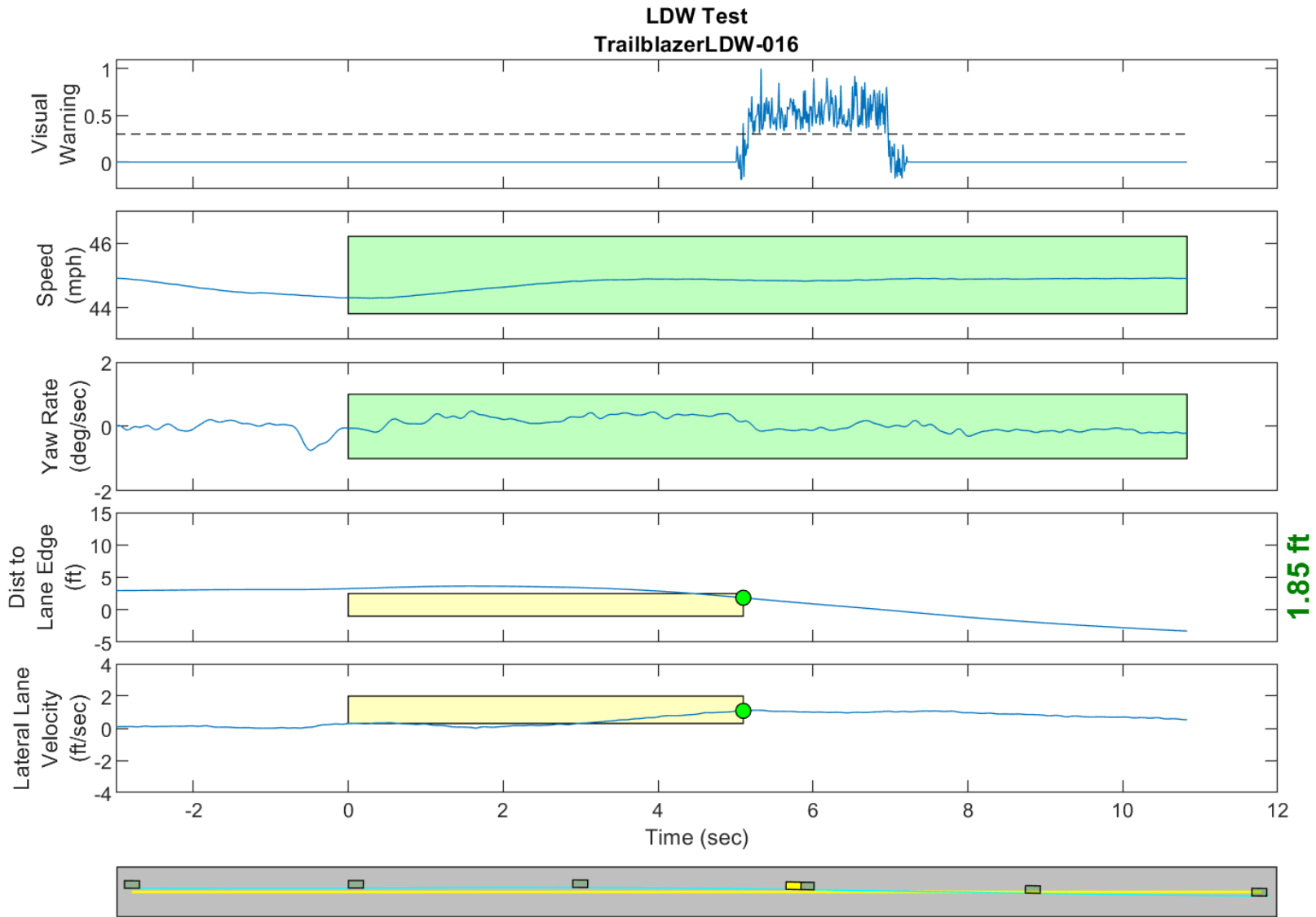
GPS Fix Type: RTK Fixed

Figure D29. Time History for Run 15, Botts Dots, Right Departure, Visual Warning



GPS Fix Type: RTK Fixed

Figure D30. Time History for Run 16, Botts Dots, Right Departure, Audible Warning



GPS Fix Type: RTK Fixed

Figure D31. Time History for Run 16, Botts Dots, Right Departure, Visual Warning

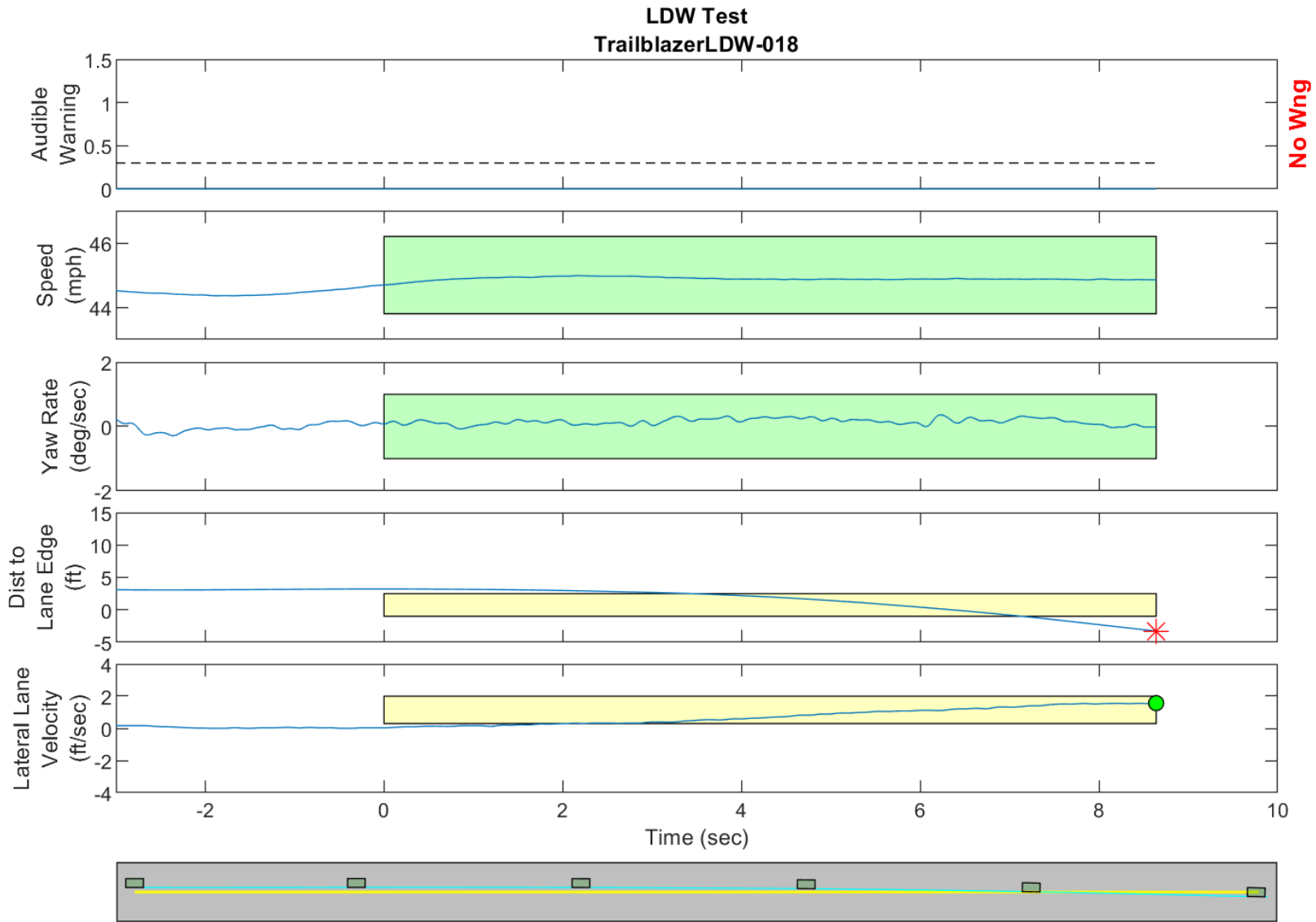
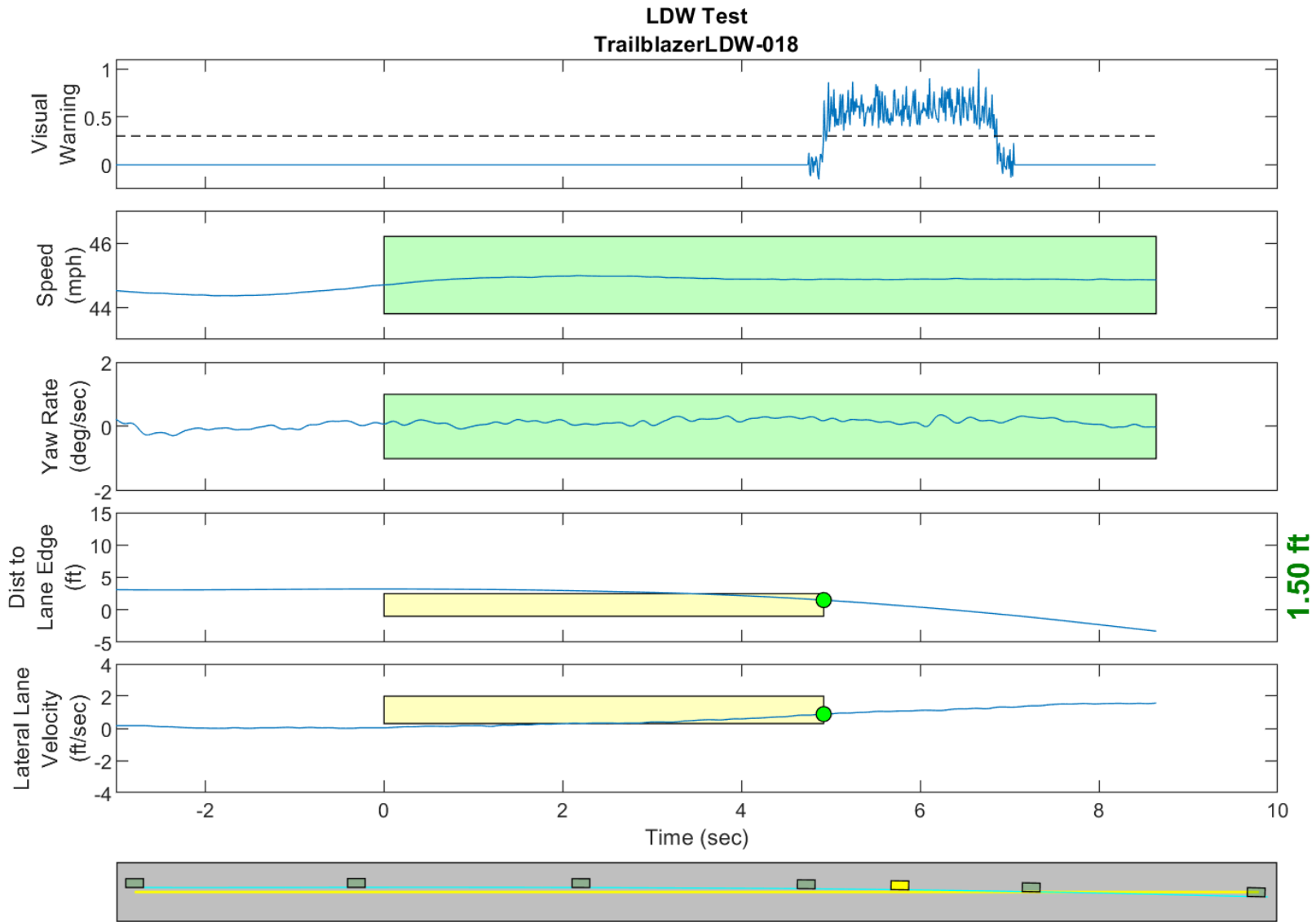
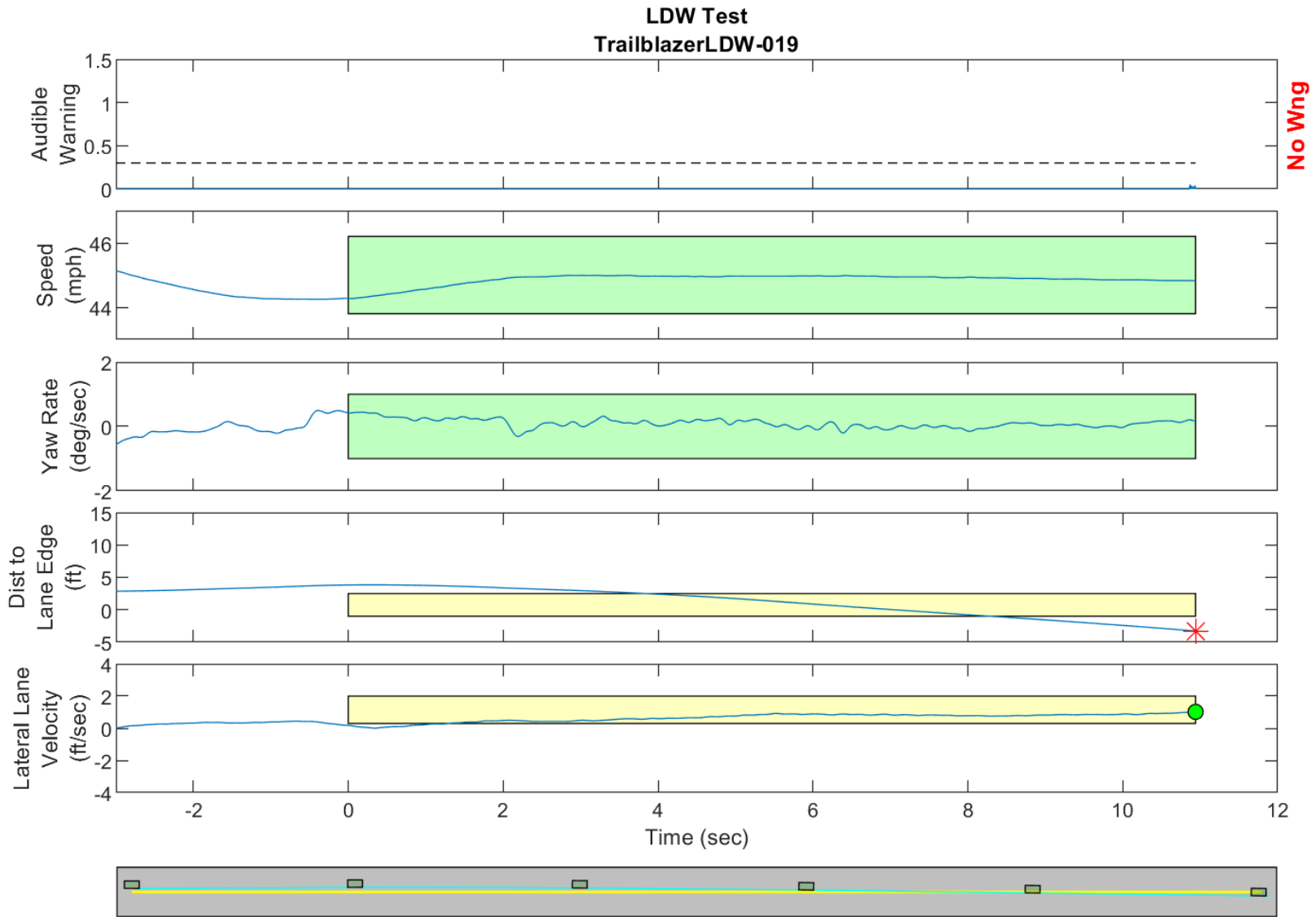


Figure D32. Time History for Run 18, Solid Line, Right Departure, Audible Warning



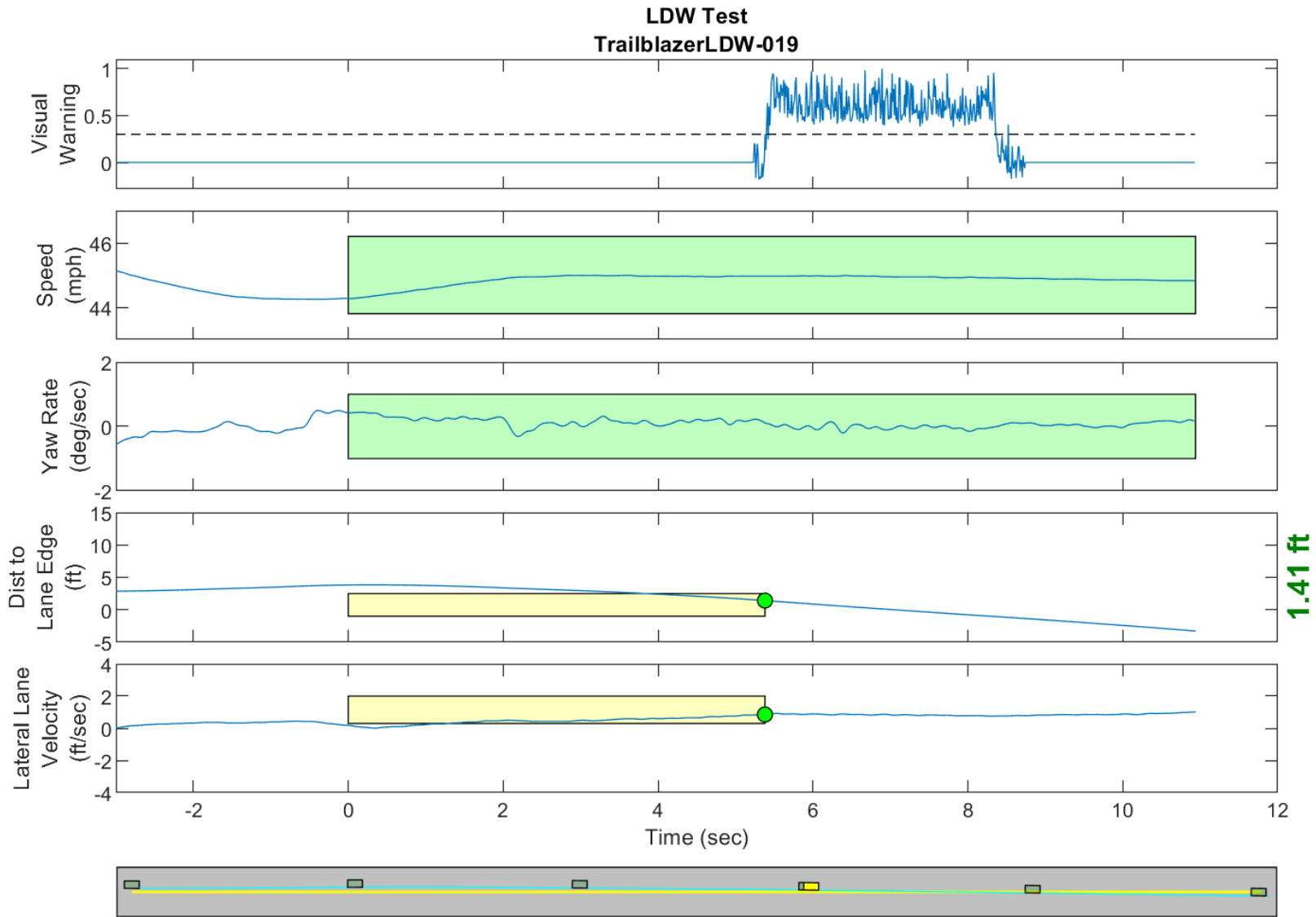
GPS Fix Type: RTK Fixed

Figure D33. Time History for Run 18, Solid Line, Right Departure, Visual Warning



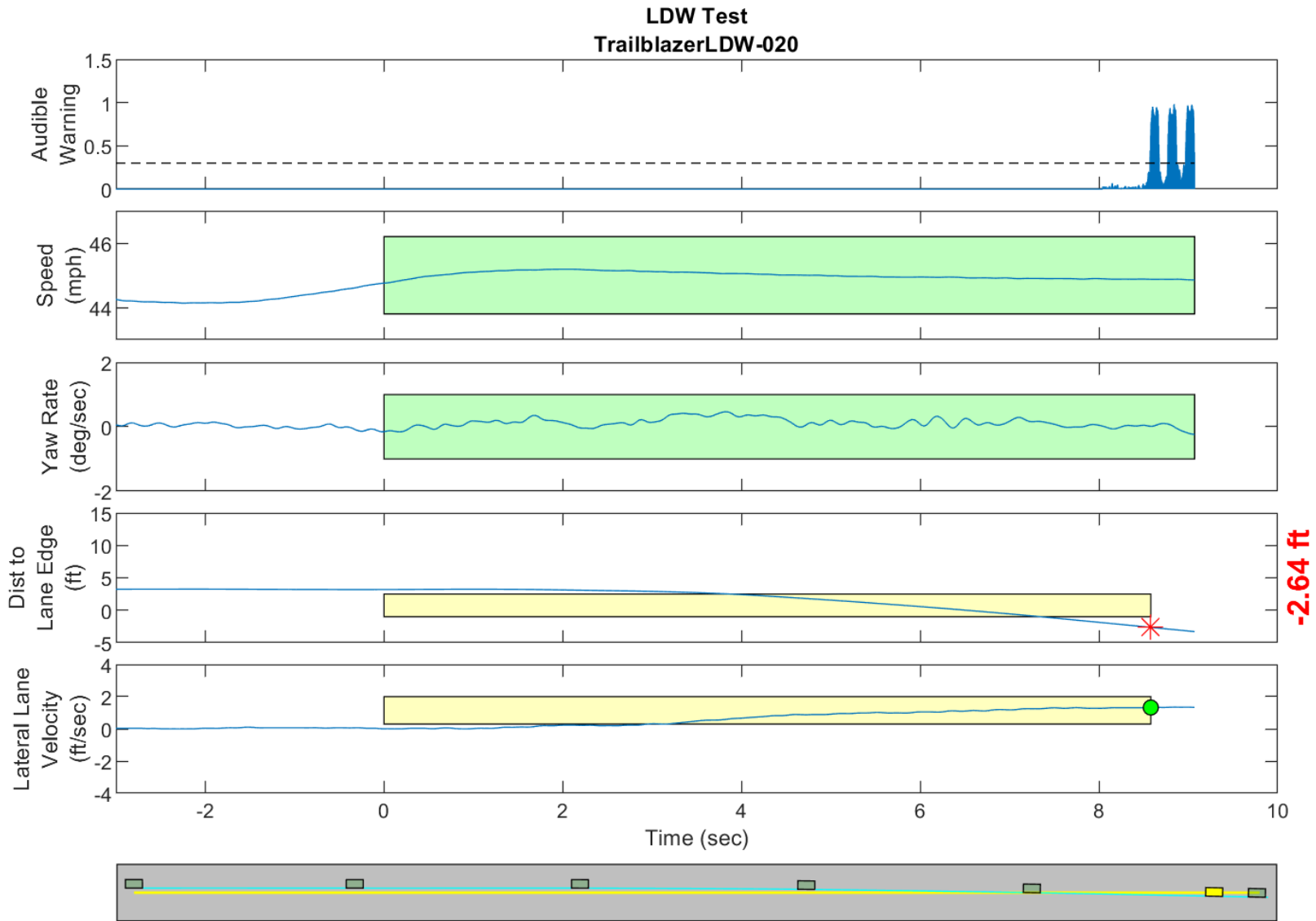
GPS Fix Type: RTK Fixed

Figure D34. Time History for Run 19, Solid Line, Right Departure, Audible Warning



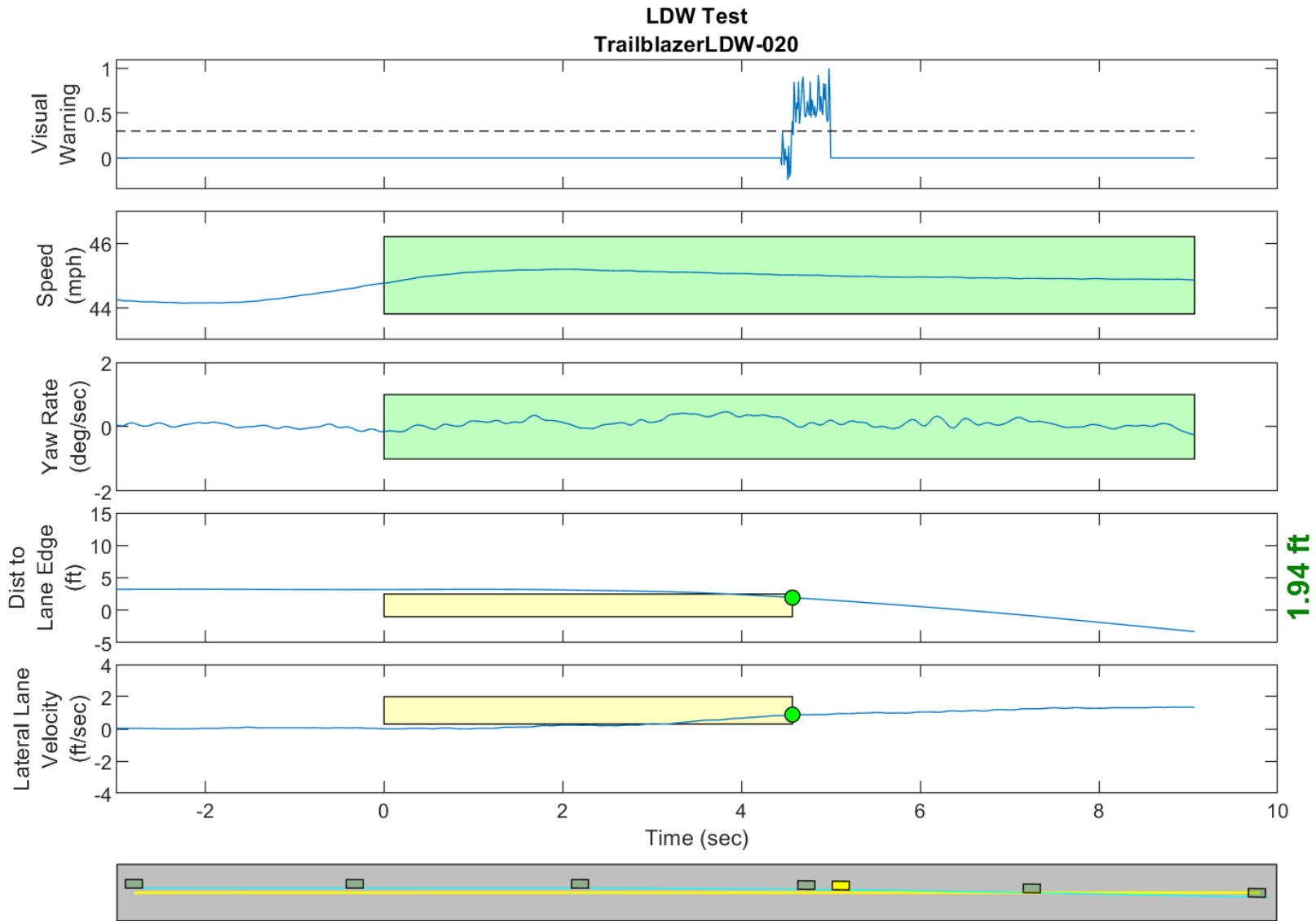
GPS Fix Type: RTK Fixed

Figure D35. Time History for Run 19, Solid Line, Right Departure, Visual Warning



GPS Fix Type: RTK Fixed

Figure D36. Time History for Run 20, Solid Line, Right Departure, Audible Warning



GPS Fix Type: RTK Fixed

Figure D37. Time History for Run 20, Solid Line, Right Departure, Visual Warning

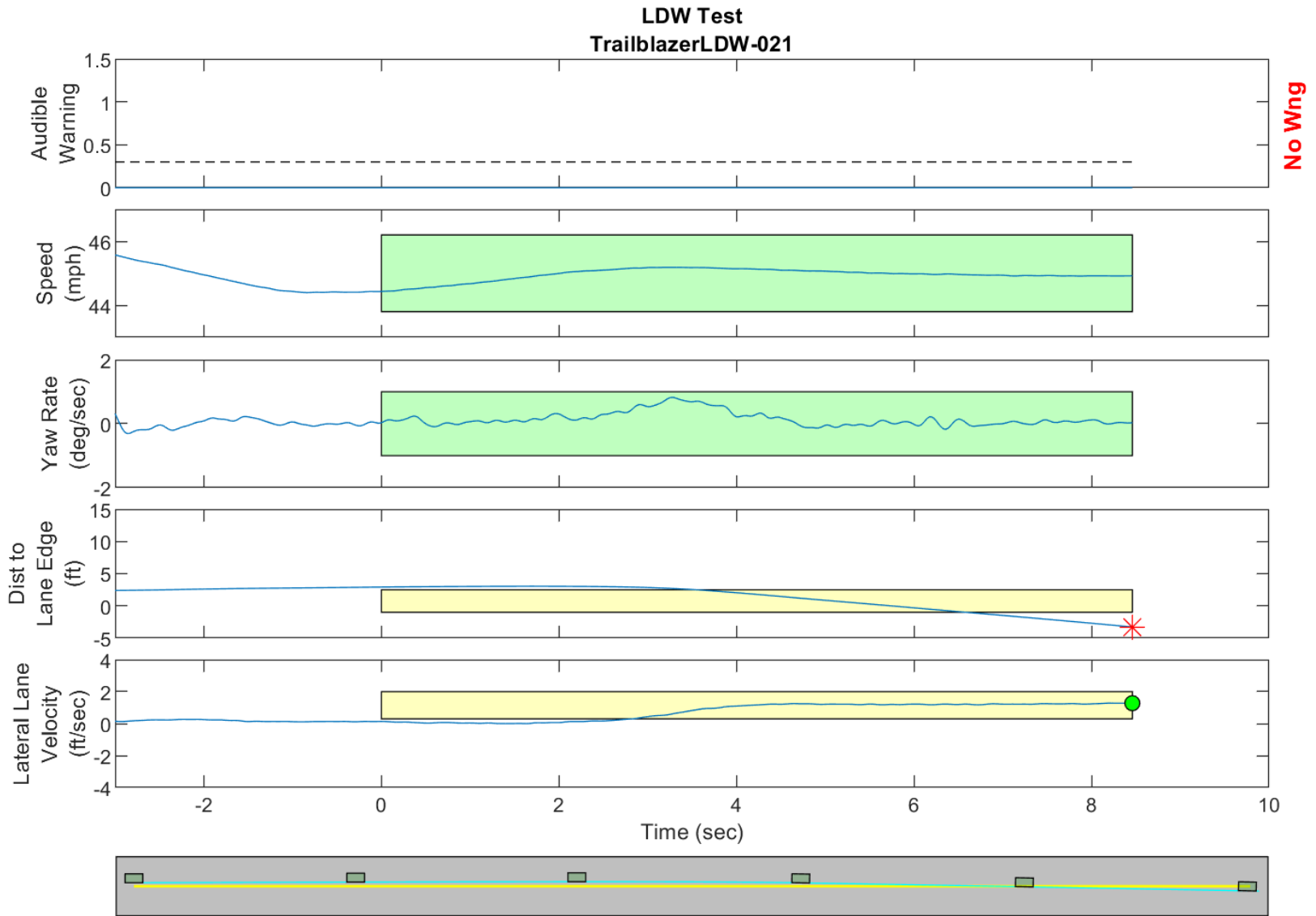
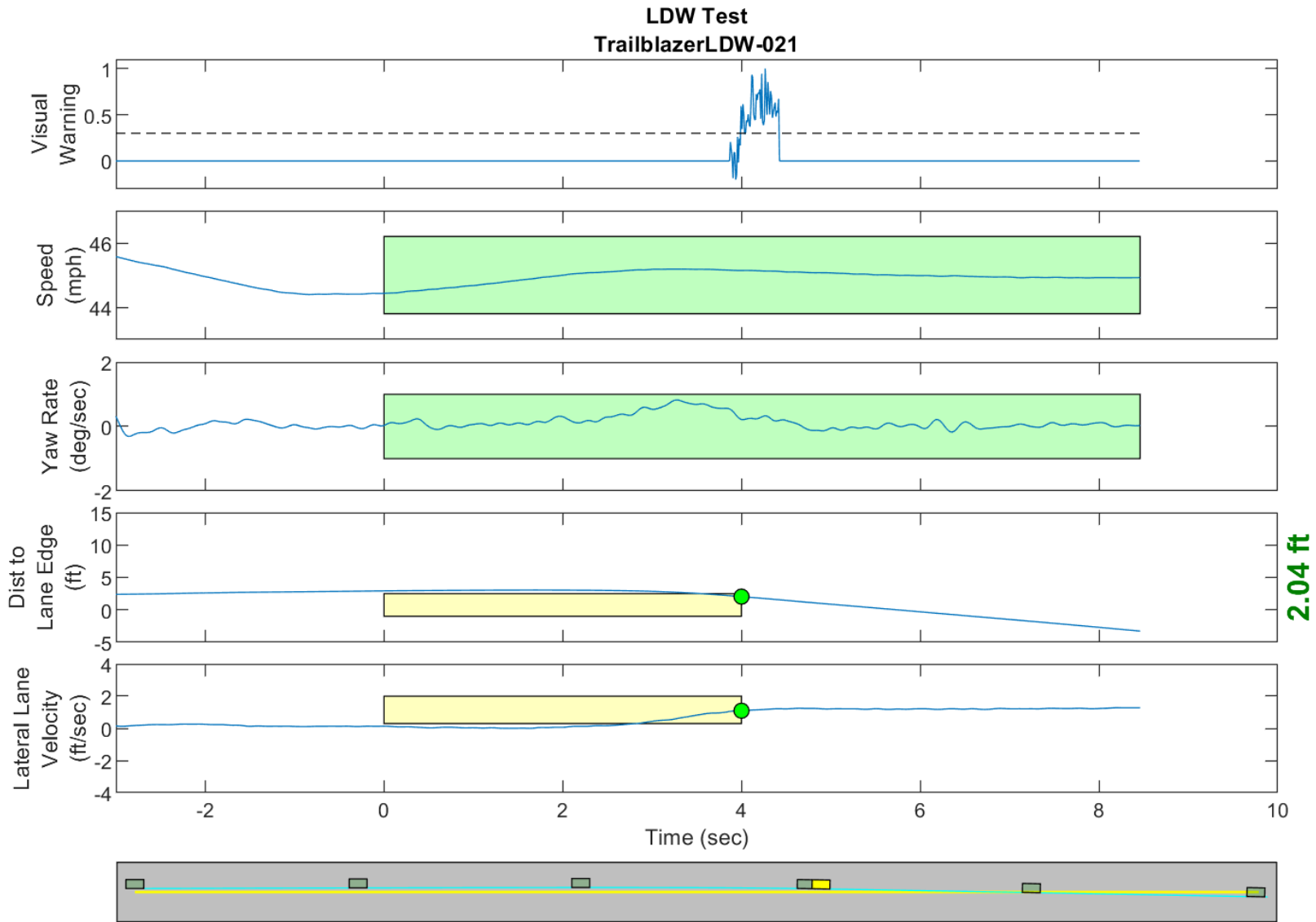
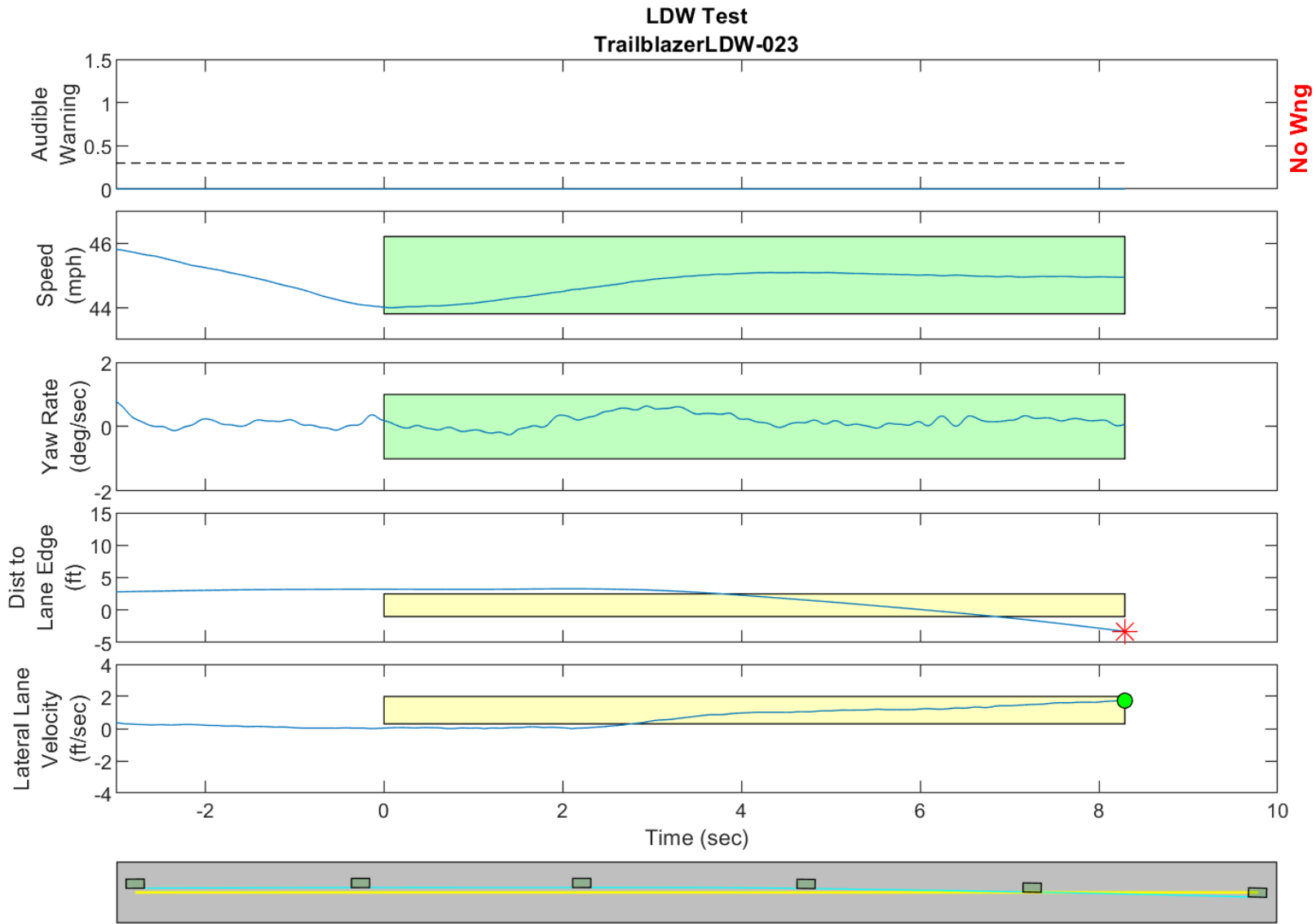


Figure D38. Time History for Run 21, Solid Line, Right Departure, Audible Warning



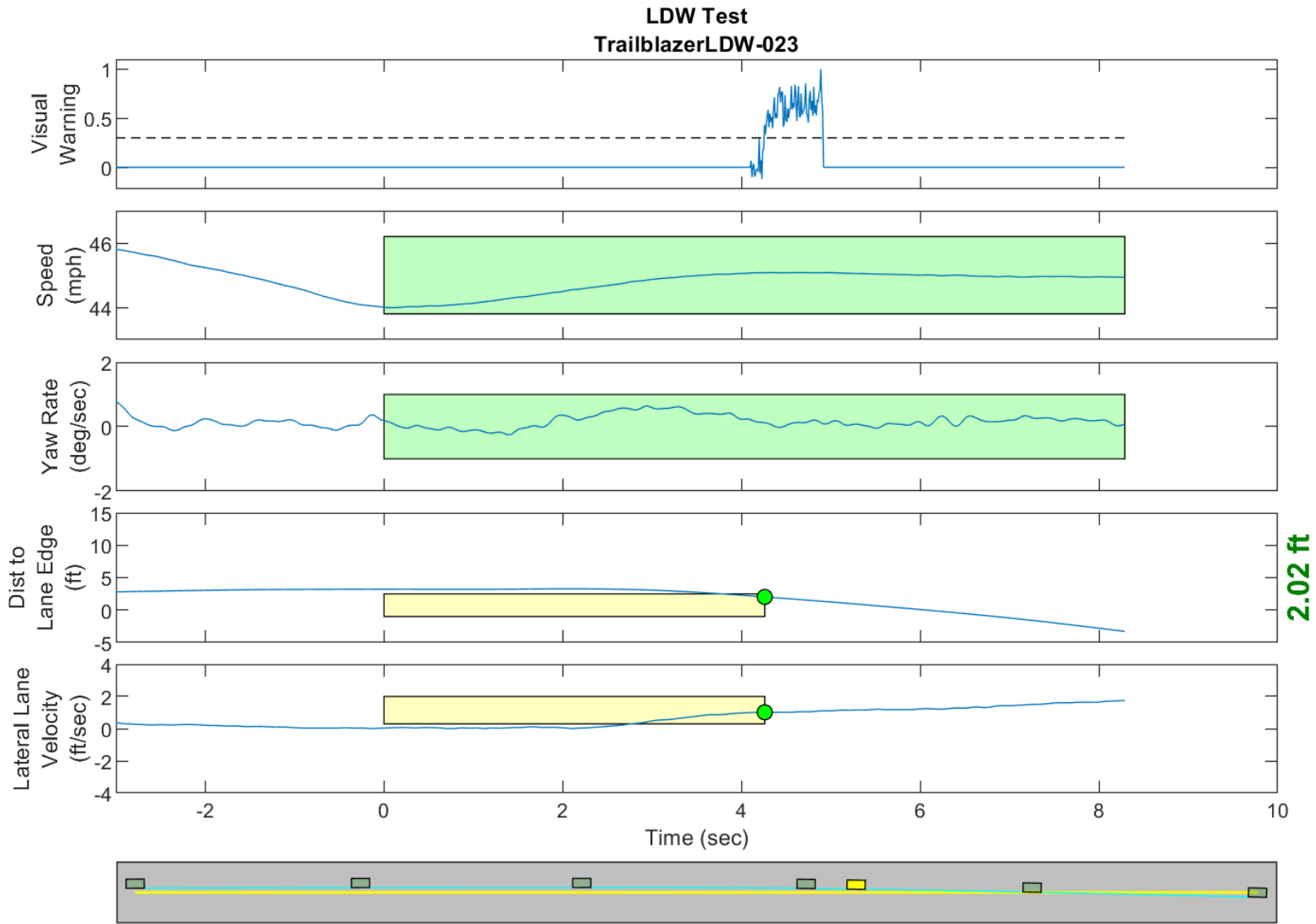
GPS Fix Type: RTK Fixed

Figure D39. Time History for Run 21, Solid Line, Right Departure, Visual Warning



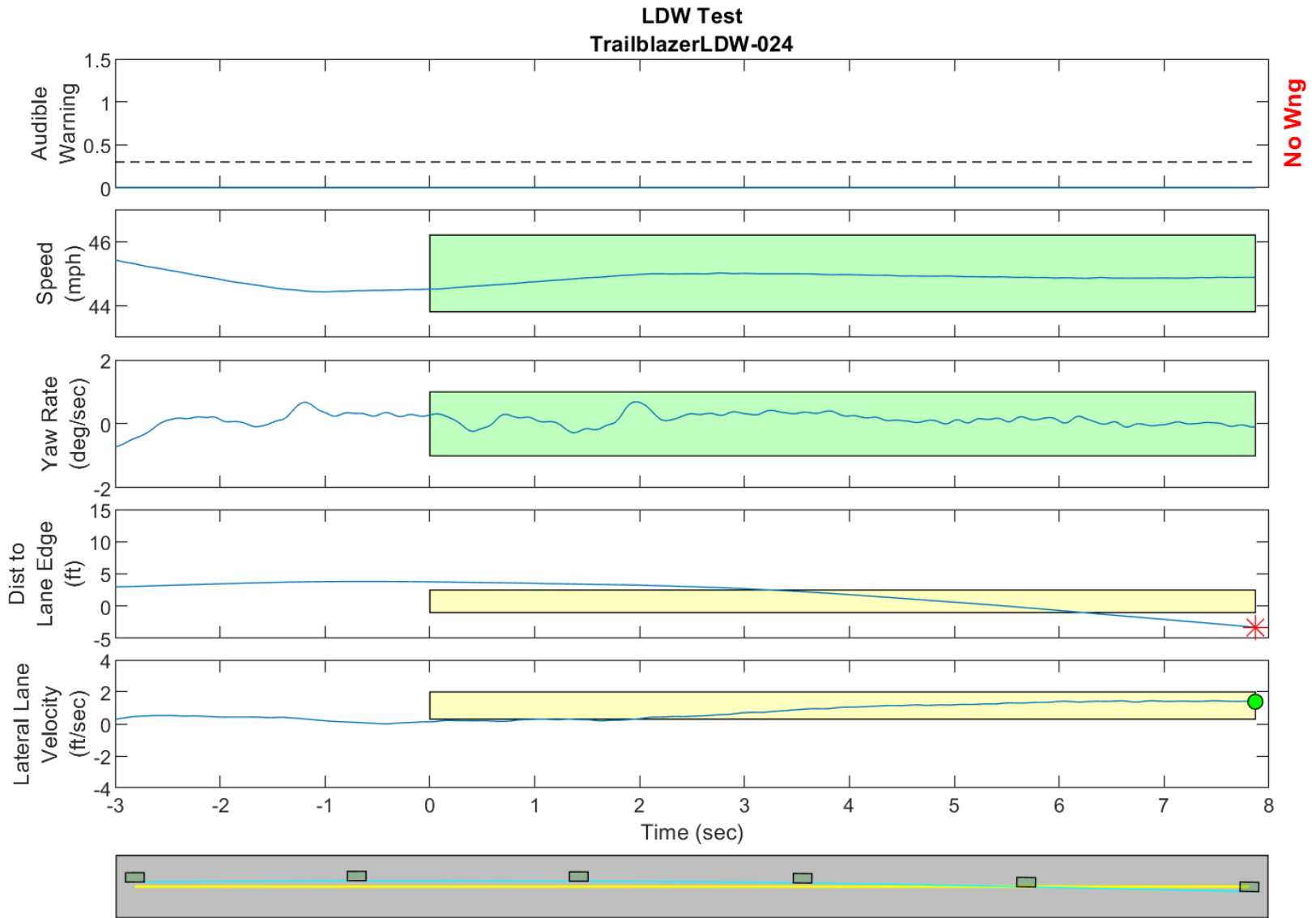
GPS Fix Type: RTK Fixed

Figure D40. Time History for Run 23, Solid Line, Right Departure, Audible Warning



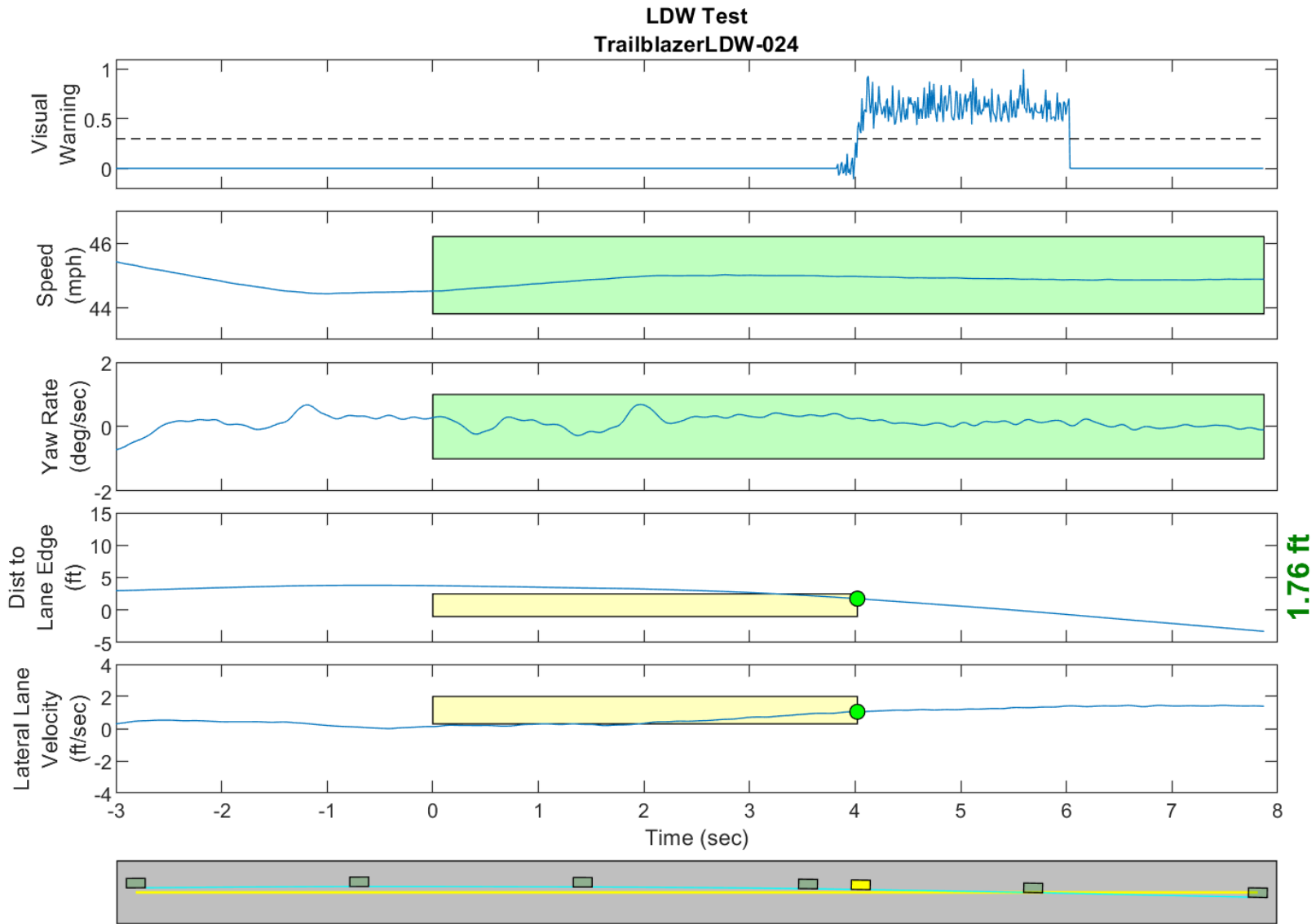
GPS Fix Type: RTK Fixed

Figure D41. Time History for Run 23, Solid Line, Right Departure, Visual Warning



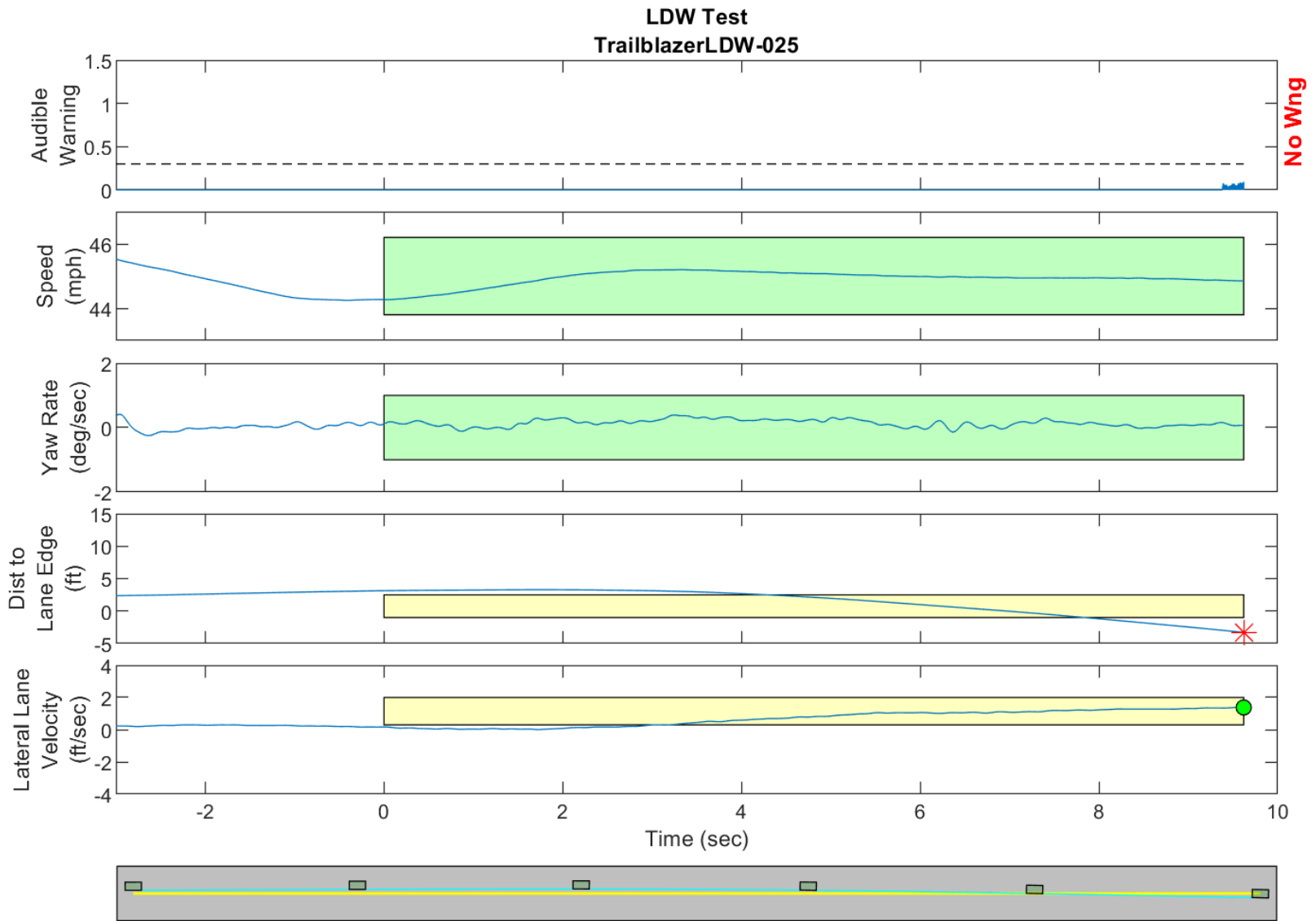
GPS Fix Type: RTK Fixed

Figure D42. Time History for Run 24, Solid Line, Right Departure, Audible Warning



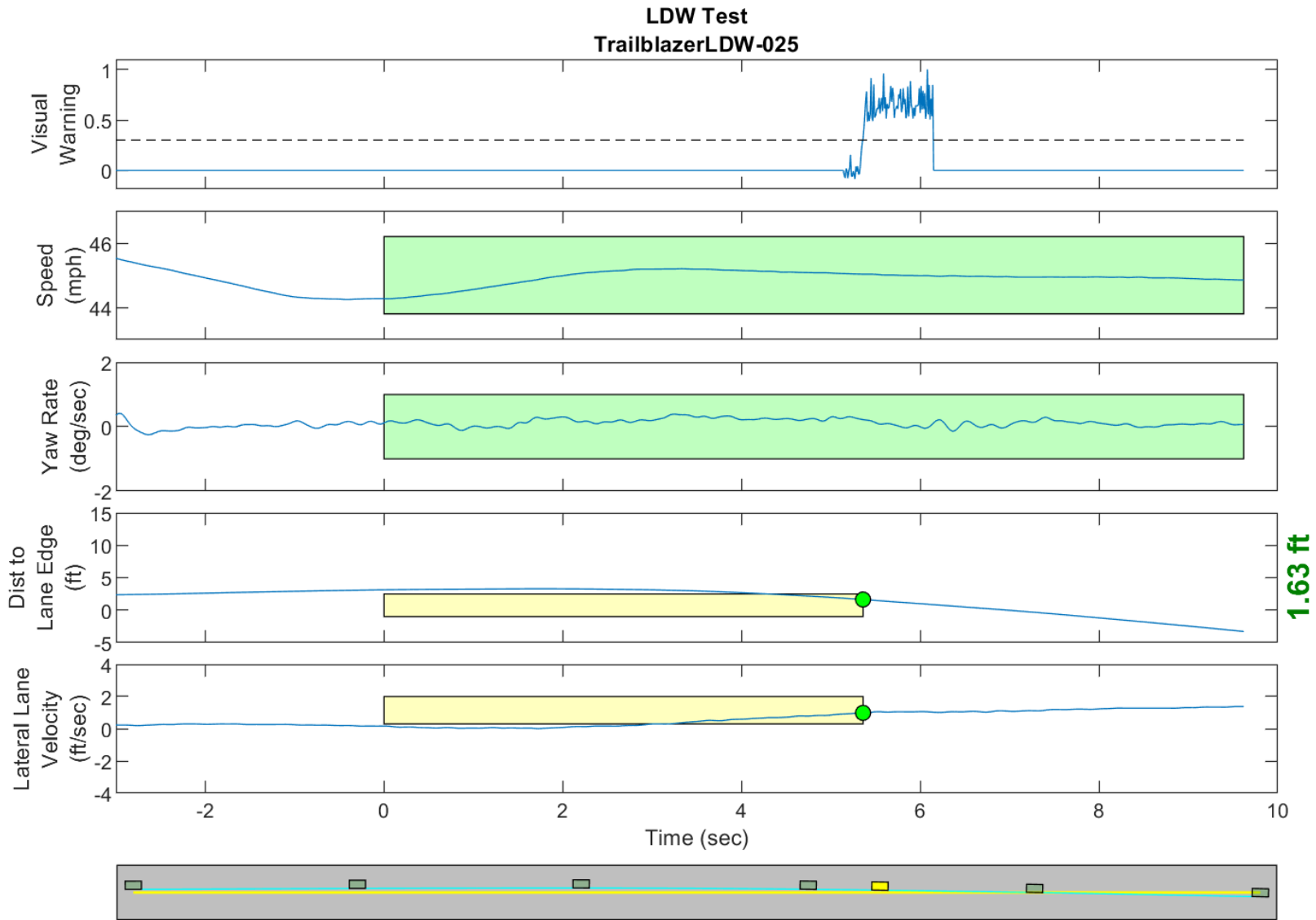
GPS Fix Type: RTK Fixed

Figure D43. Time History for Run 24, Solid Line, Right Departure, Visual Warning



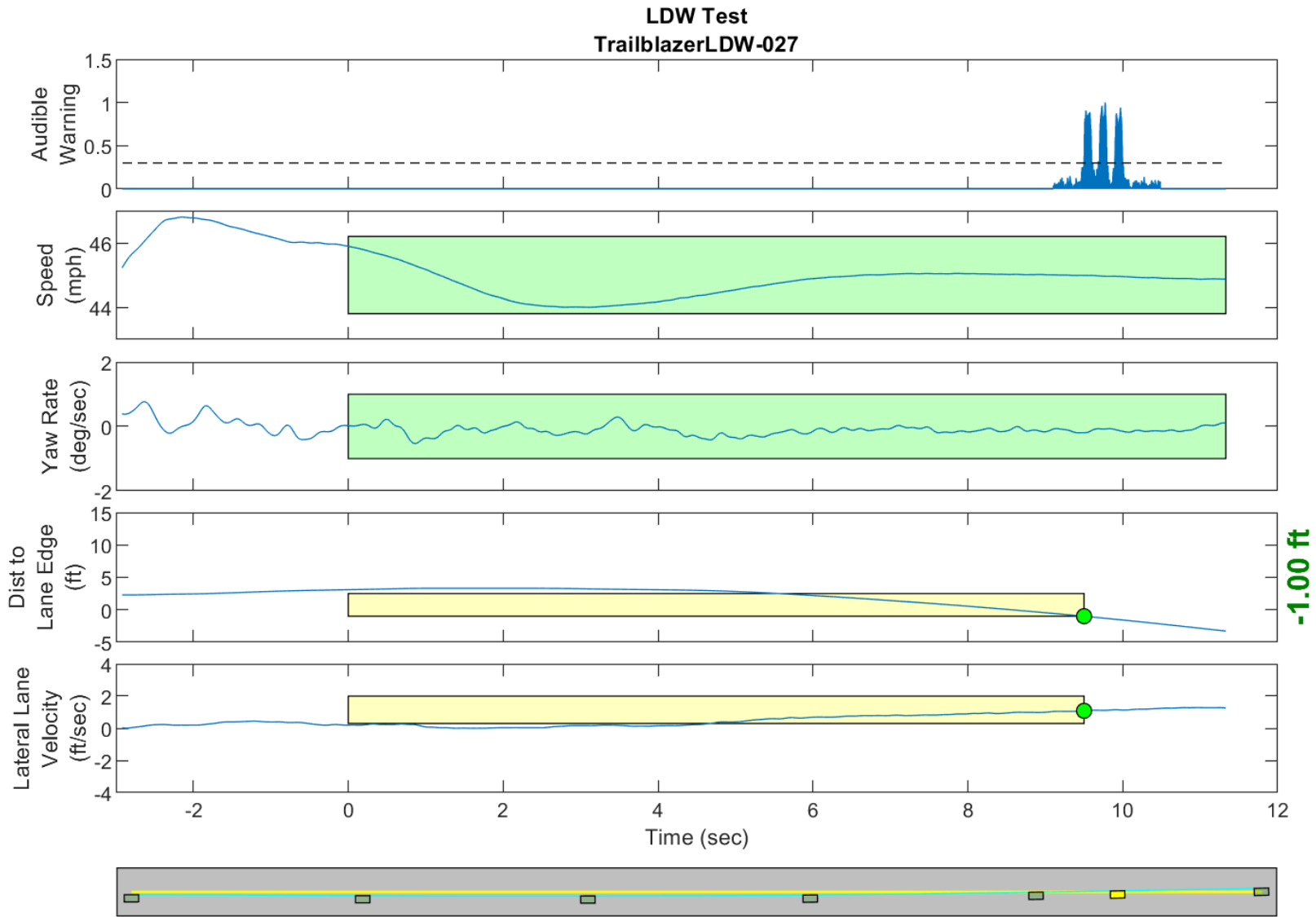
GPS Fix Type: RTK Fixed

Figure D44. Time History for Run 25, Solid Line, Right Departure, Audible Warning



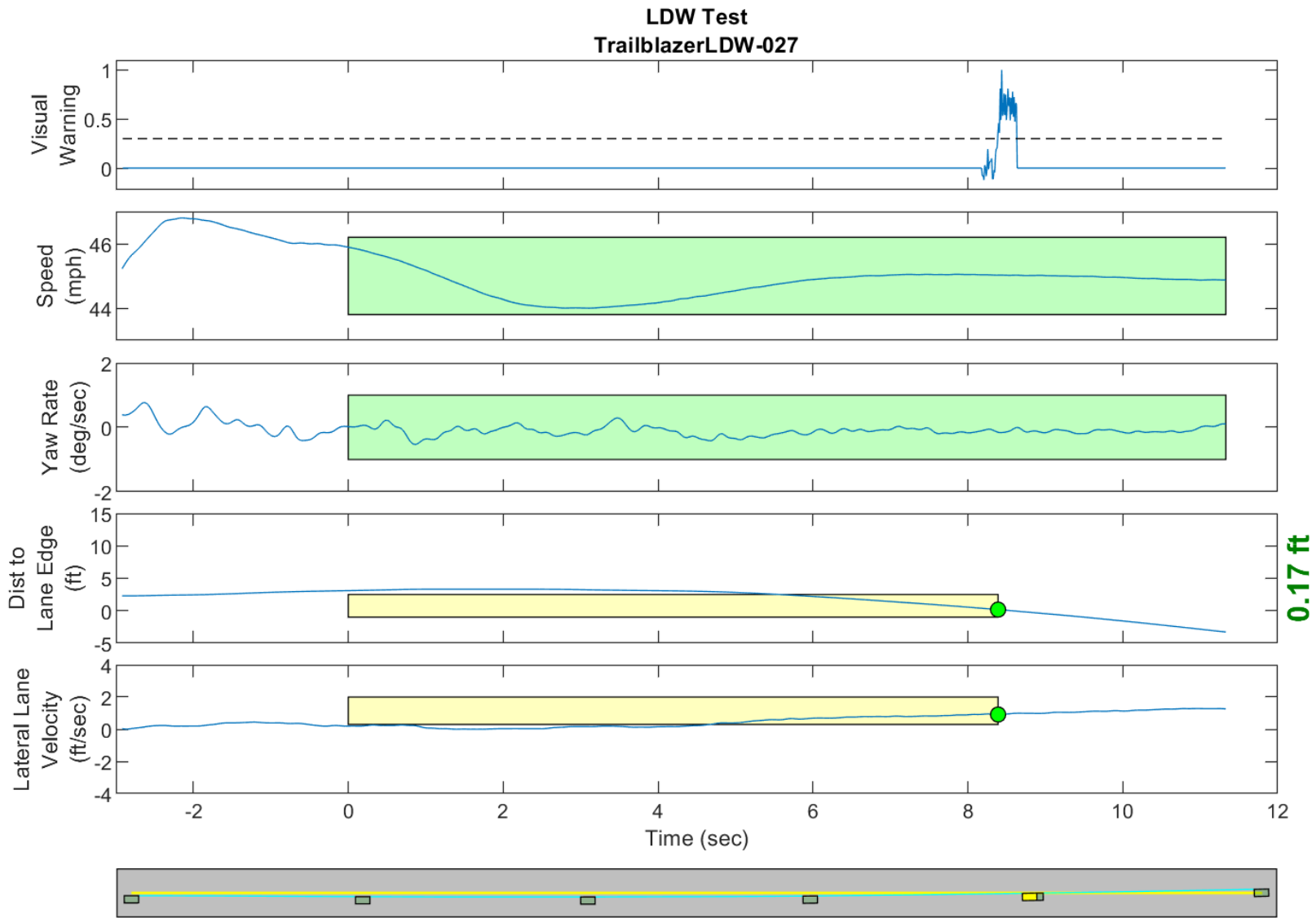
GPS Fix Type: RTK Fixed

Figure D45. Time History for Run 25, Solid Line, Right Departure, Visual Warning



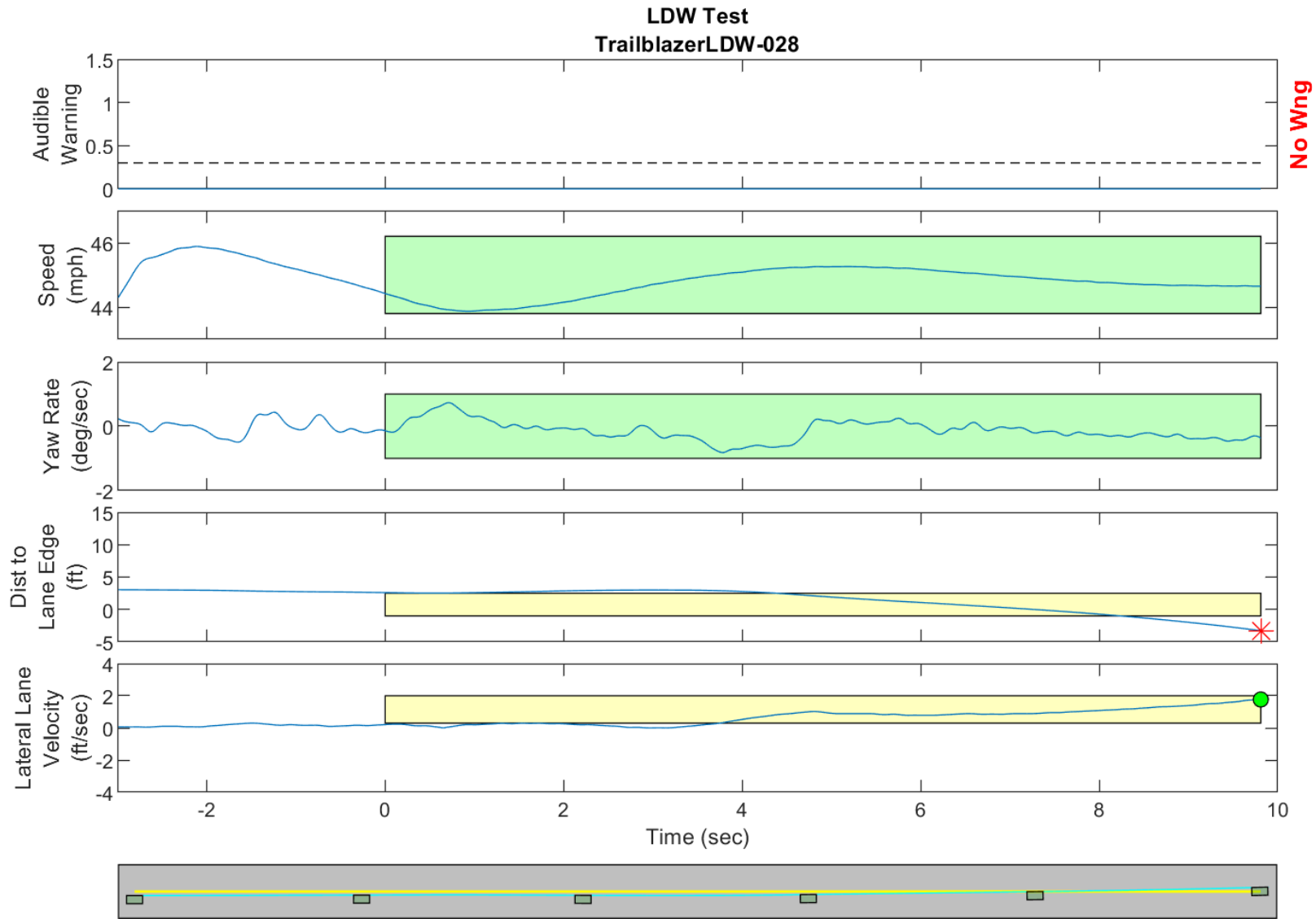
GPS Fix Type: RTK Fixed

Figure D46. Time History for Run 27, Solid Line, Left Departure, Audible Warning



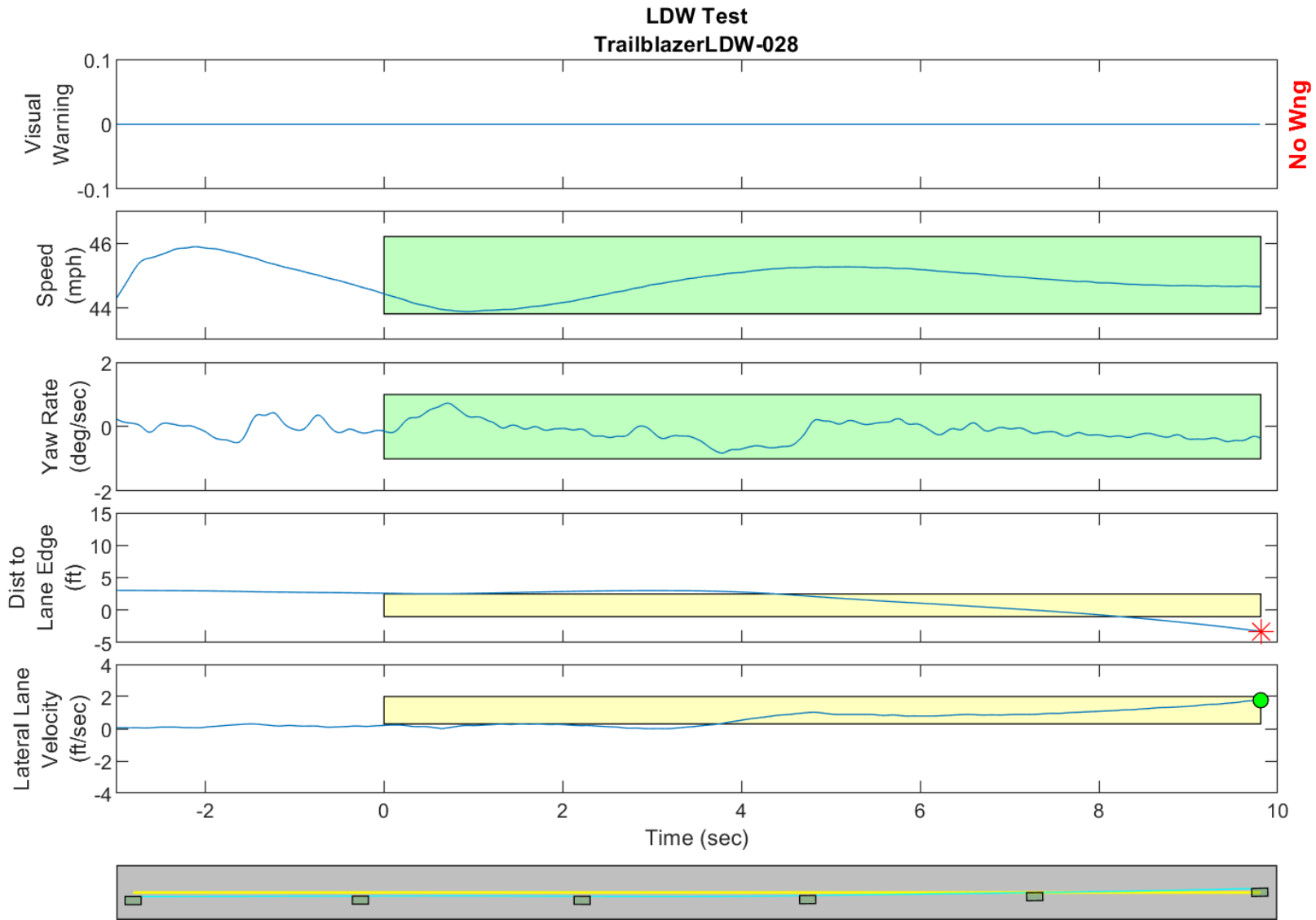
GPS Fix Type: RTK Fixed

Figure D47. Time History for Run 27, Solid Line, Left Departure, Visual Warning



GPS Fix Type: RTK Fixed

Figure D48. Time History for Run 28, Solid Line, Left Departure, Audible Warning



GPS Fix Type: RTK Fixed

Figure D49. Time History for Run 28, Solid Line, Left Departure, Visual Warning

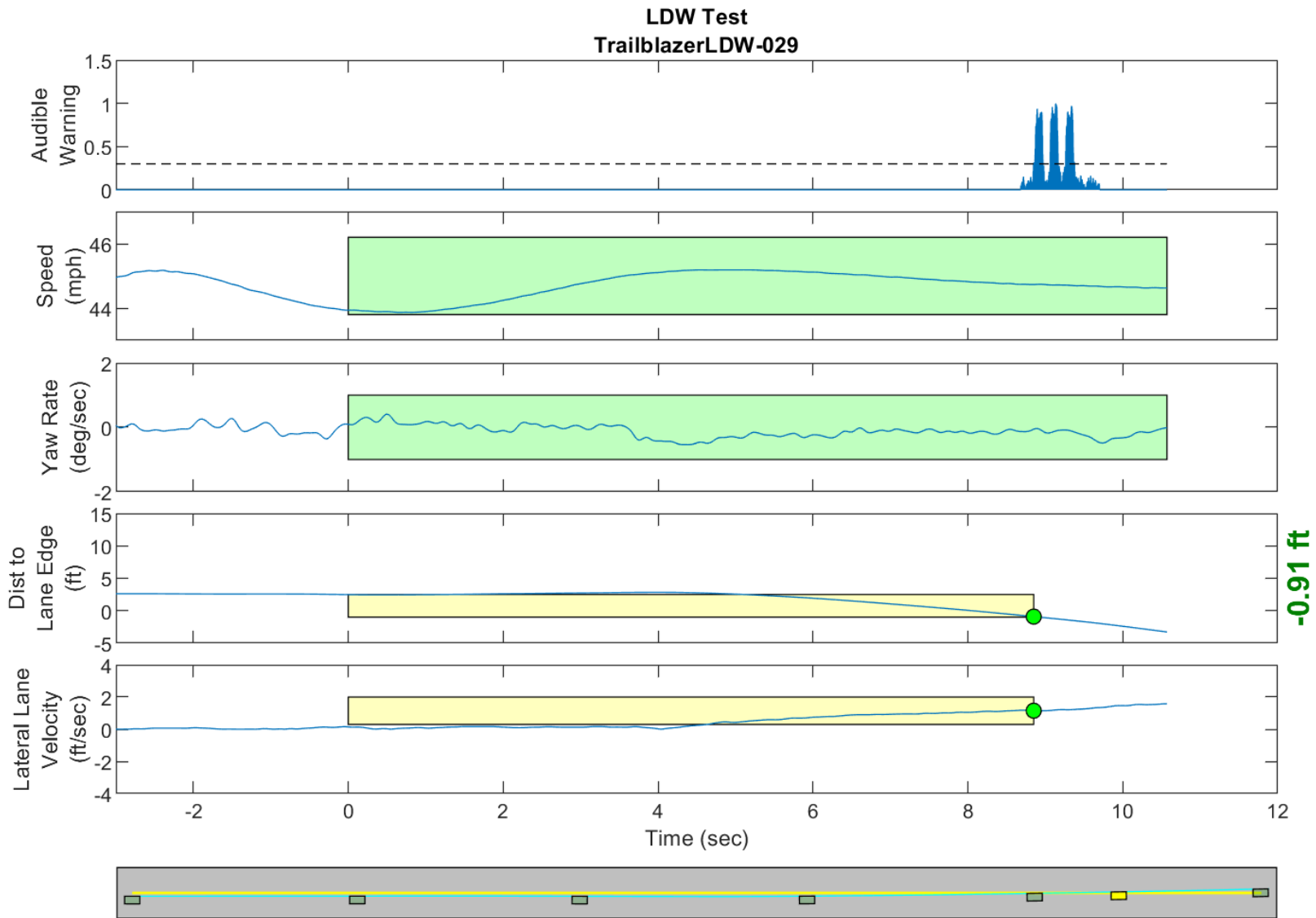
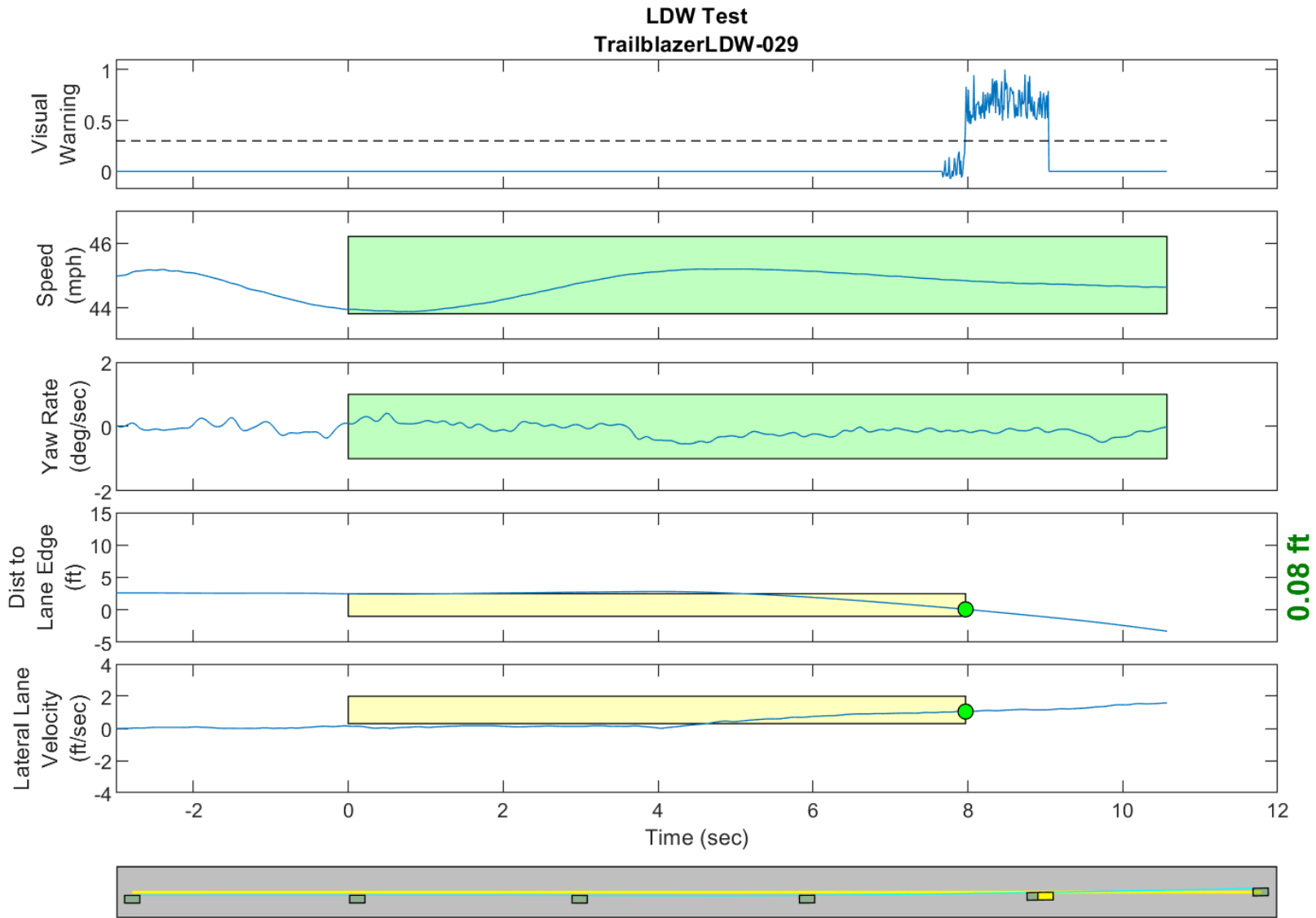
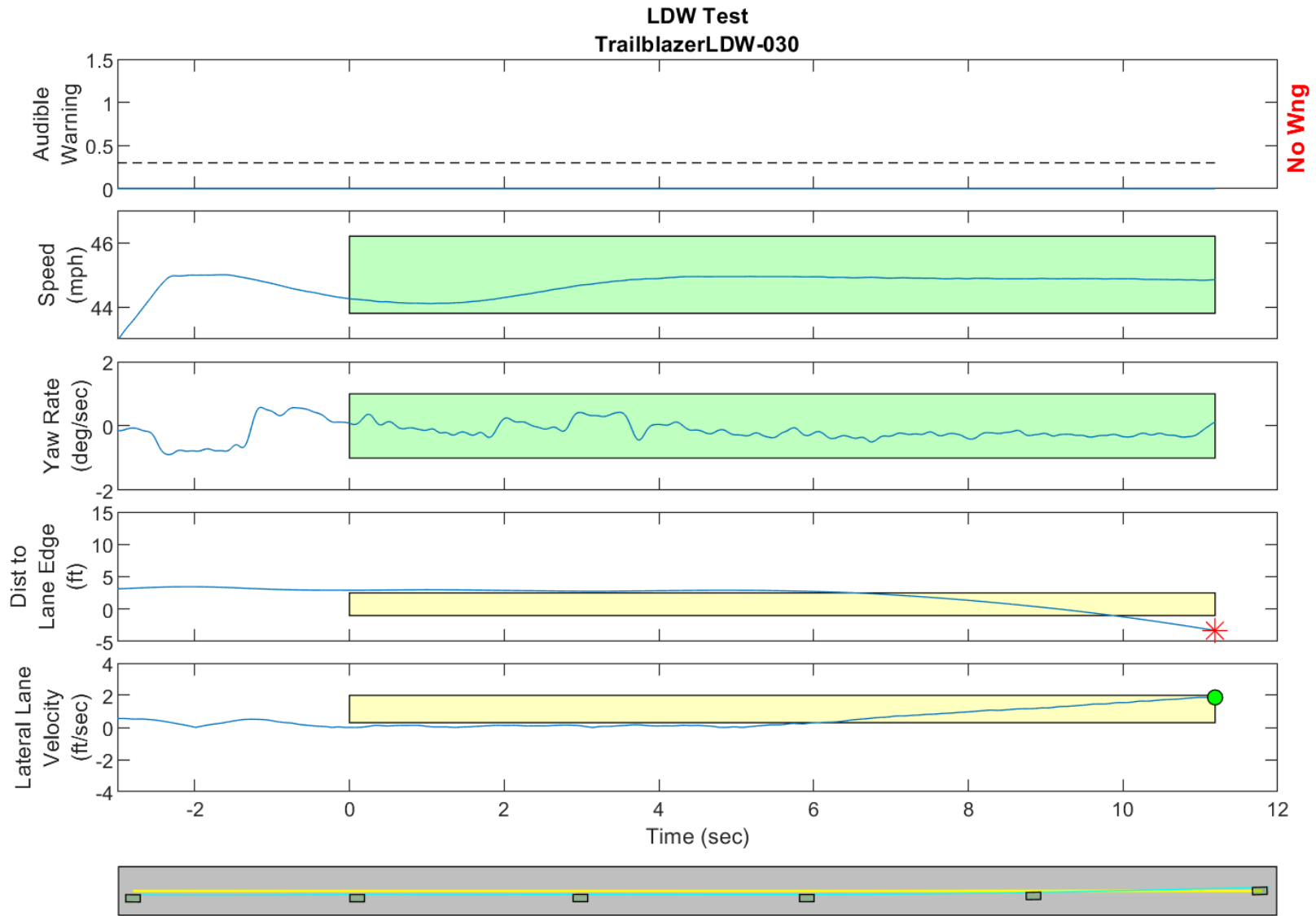


Figure D50. Time History for Run 29, Solid Line, Left Departure, Audible Warning



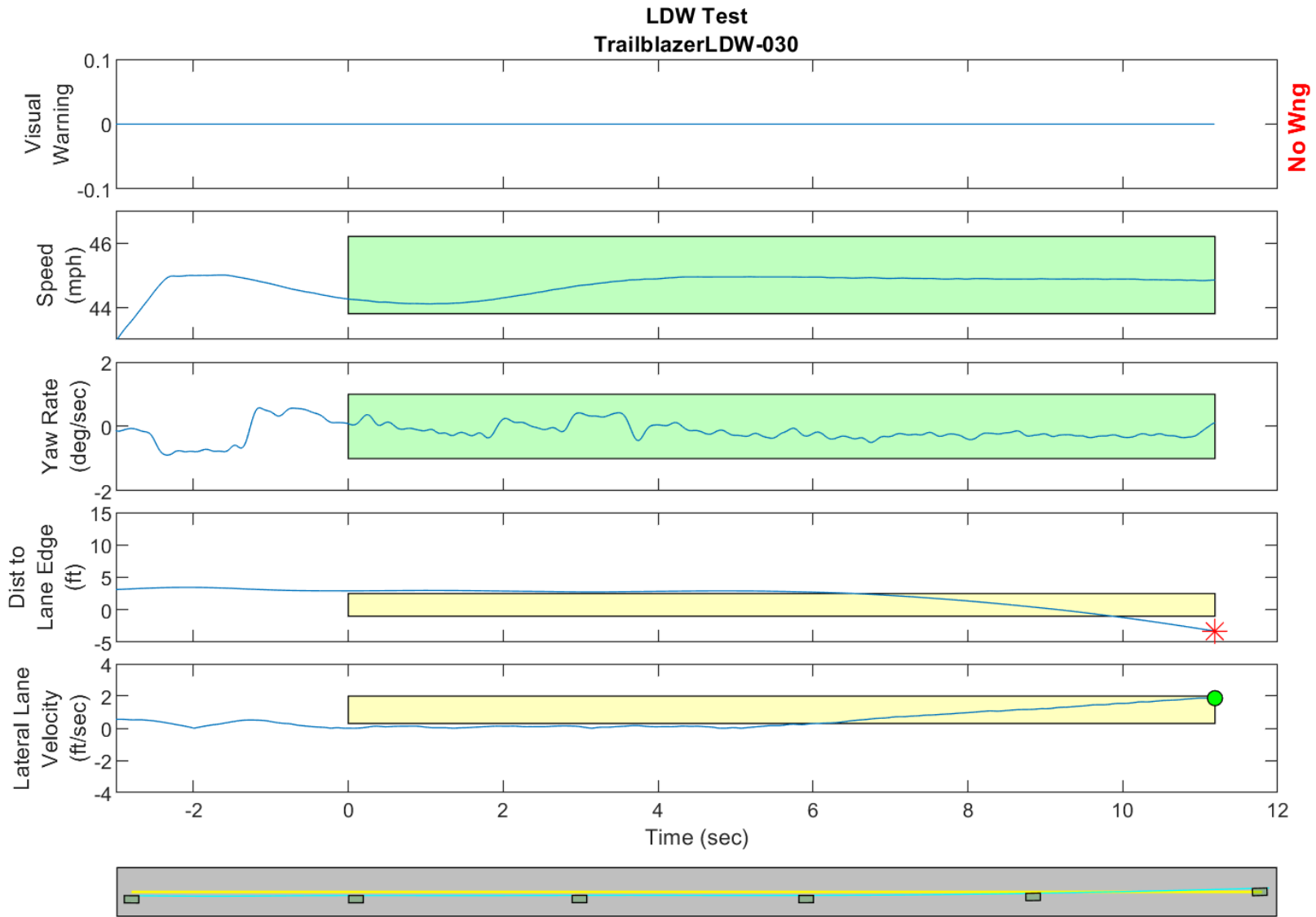
GPS Fix Type: RTK Fixed

Figure D51. Time History for Run 29, Solid Line, Left Departure, Visual Warning



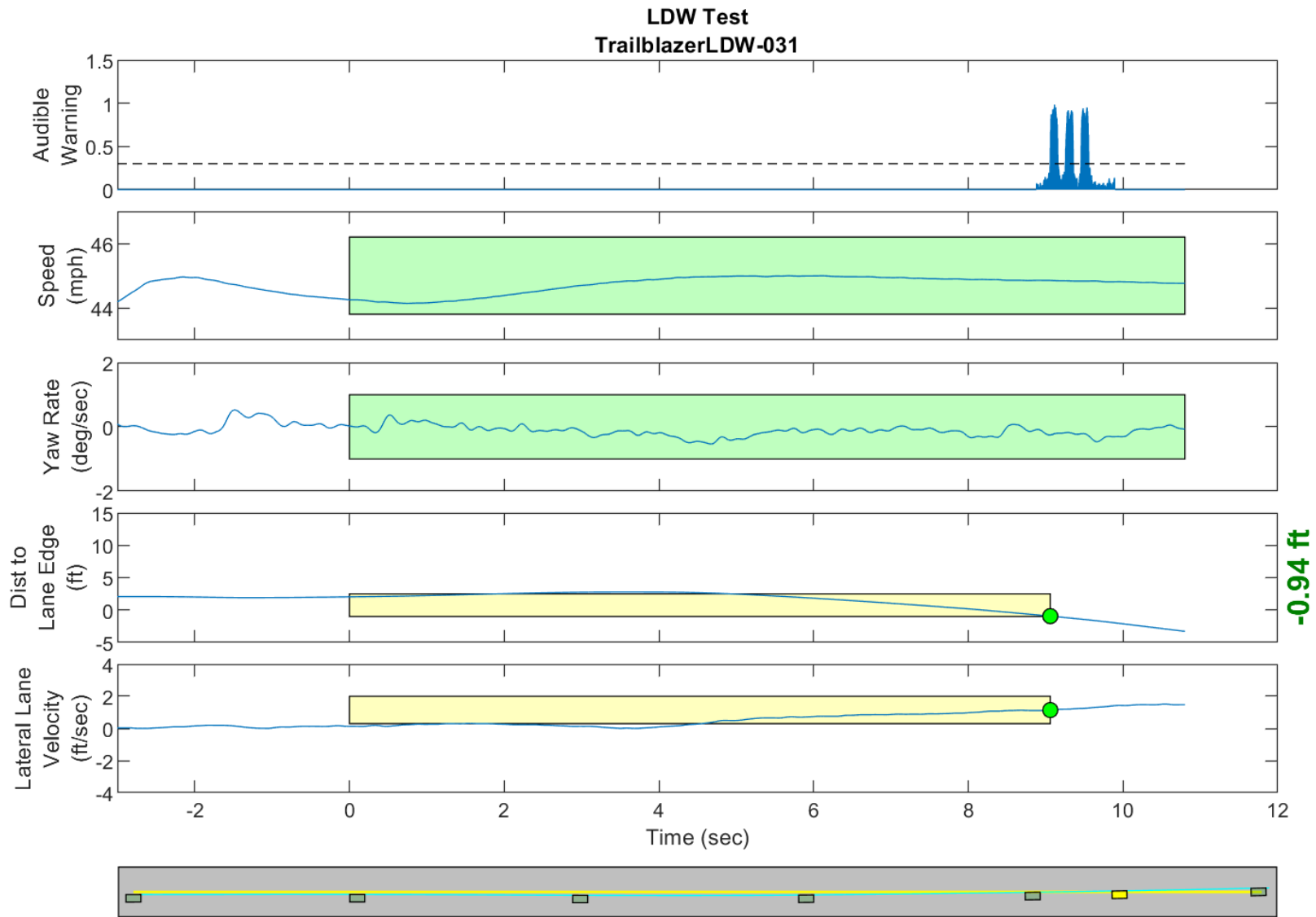
GPS Fix Type: RTK Fixed

Figure D52. Time History for Run 30, Solid Line, Left Departure, Audible Warning



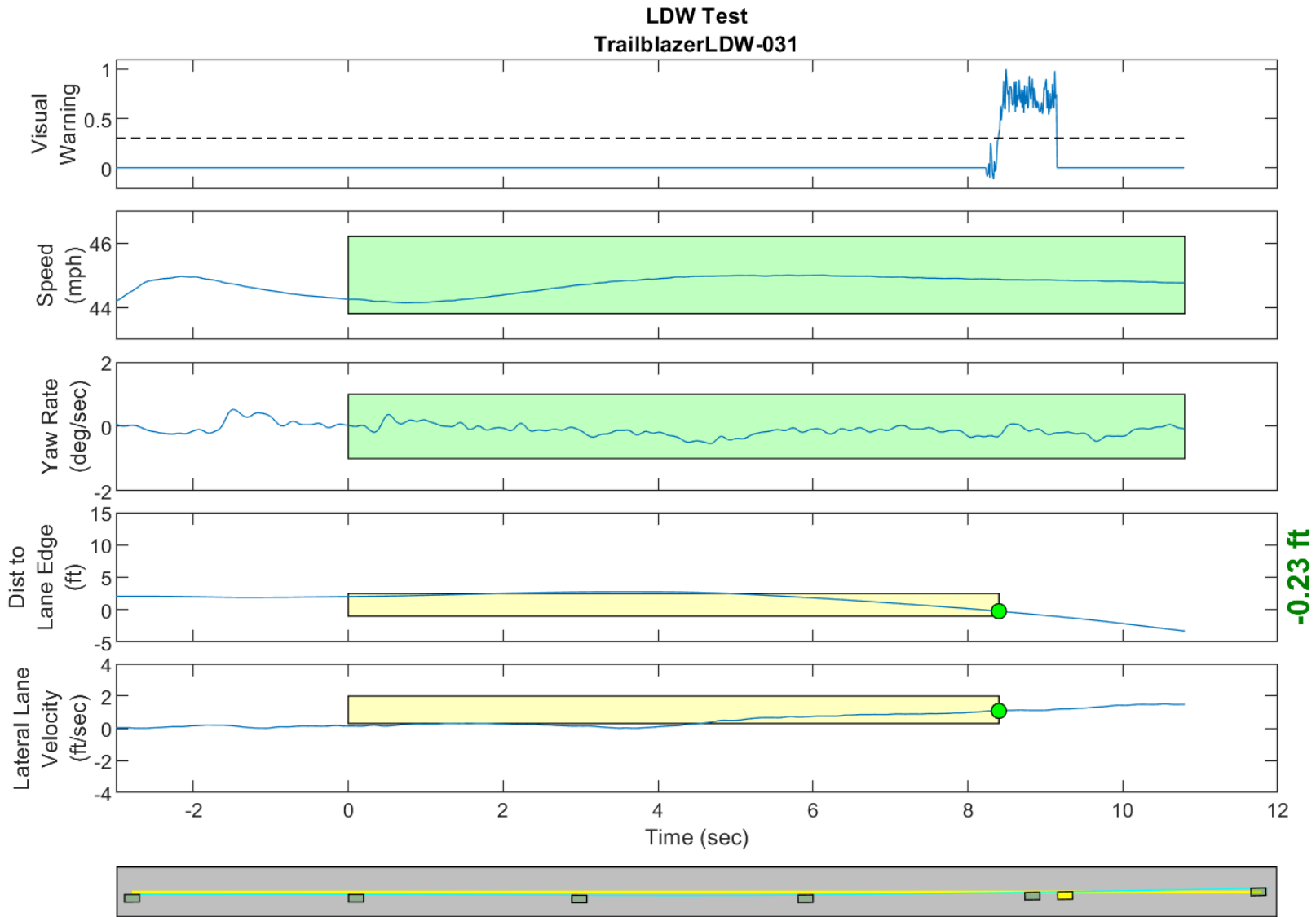
GPS Fix Type: RTK Fixed

Figure D53. Time History for Run 30, Solid Line, Left Departure, Visual Warning



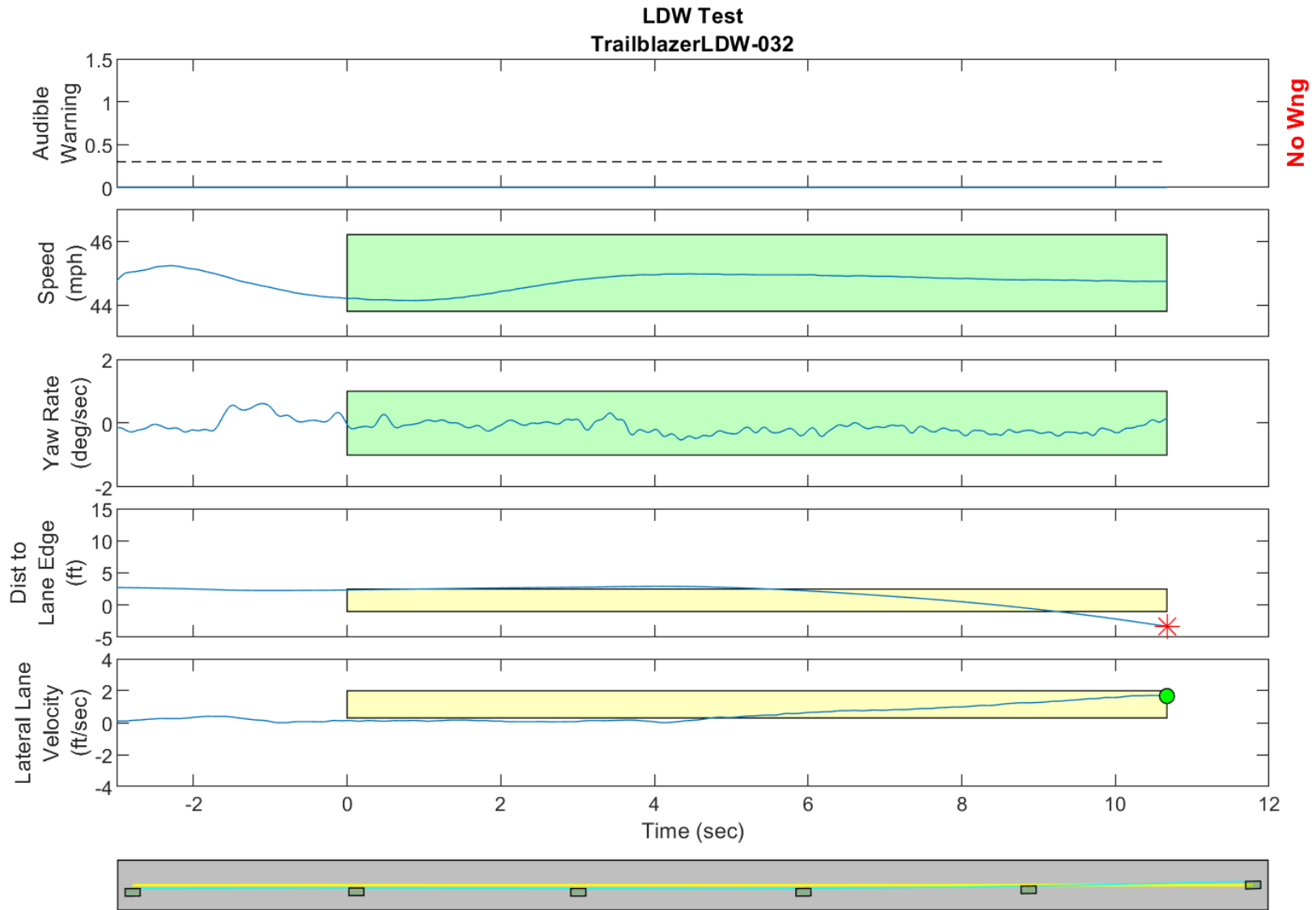
GPS Fix Type: RTK Fixed

Figure D54. Time History for Run 31, Solid Line, Left Departure, Audible Warning



GPS Fix Type: RTK Fixed

Figure D55. Time History for Run 31, Solid Line, Left Departure, Visual Warning



GPS Fix Type: RTK Fixed

Figure D56. Time History for Run 32, Solid Line, Left Departure, Audible Warning

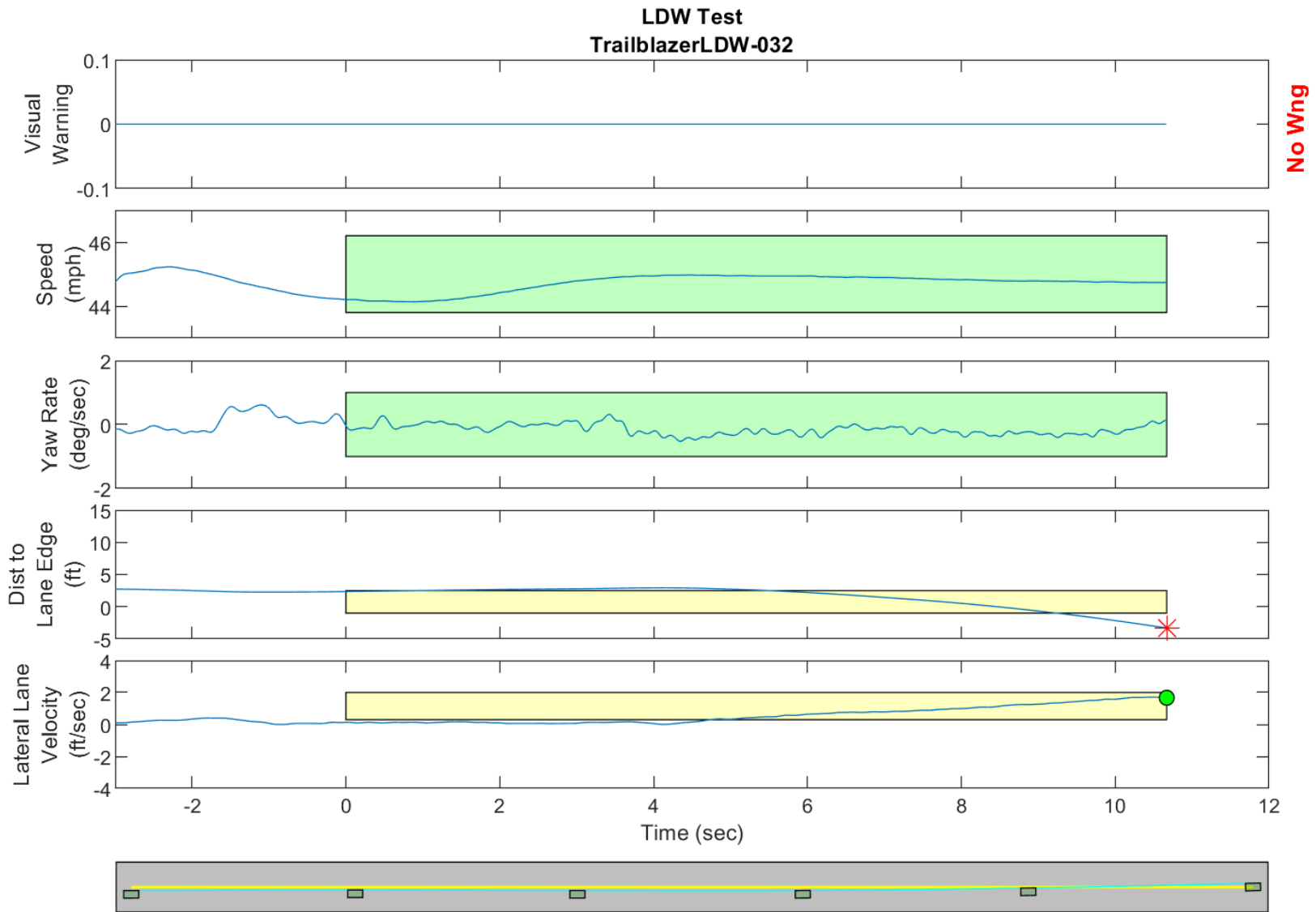
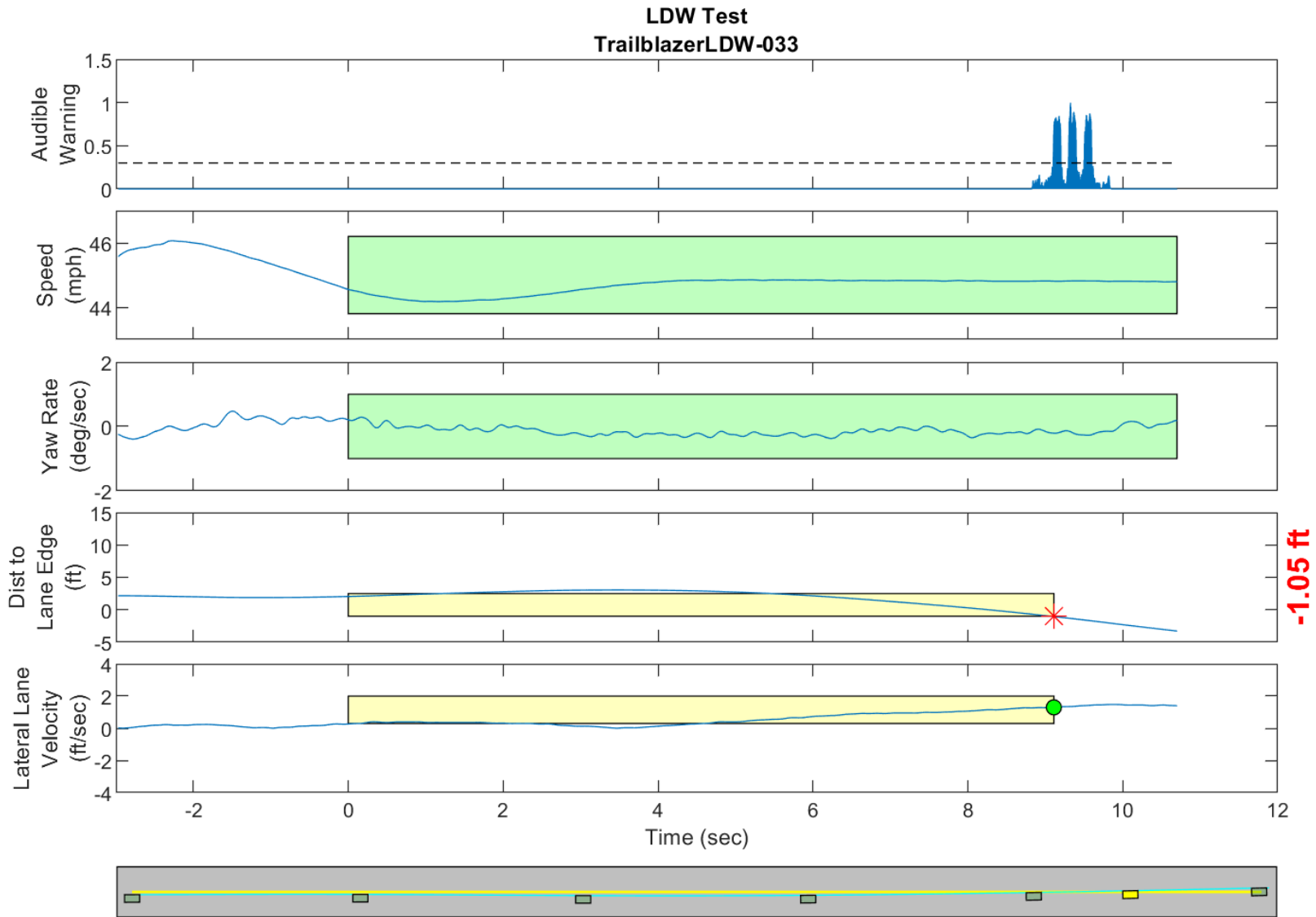
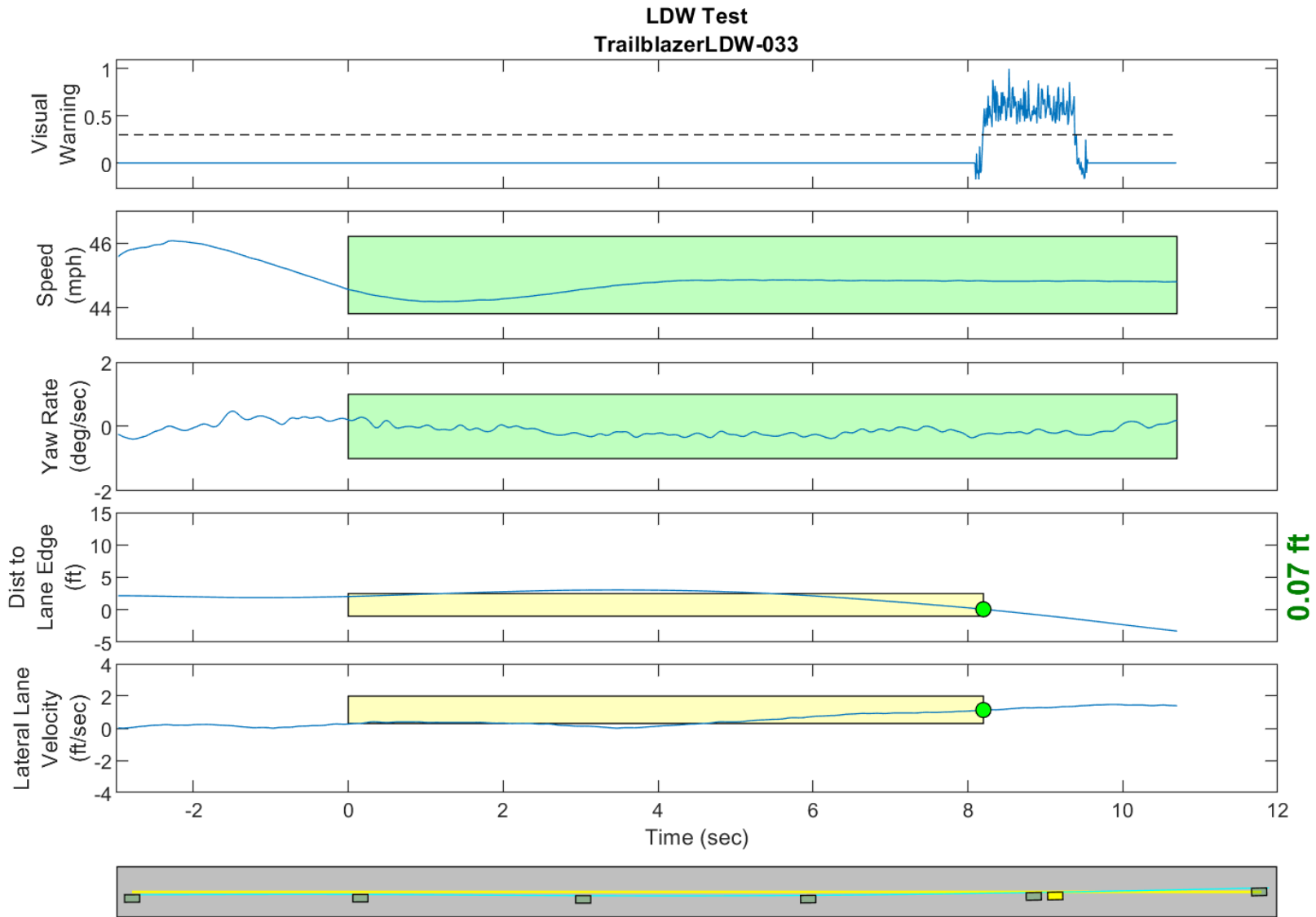


Figure D57. Time History for Run 32, Solid Line, Left Departure, Visual Warning



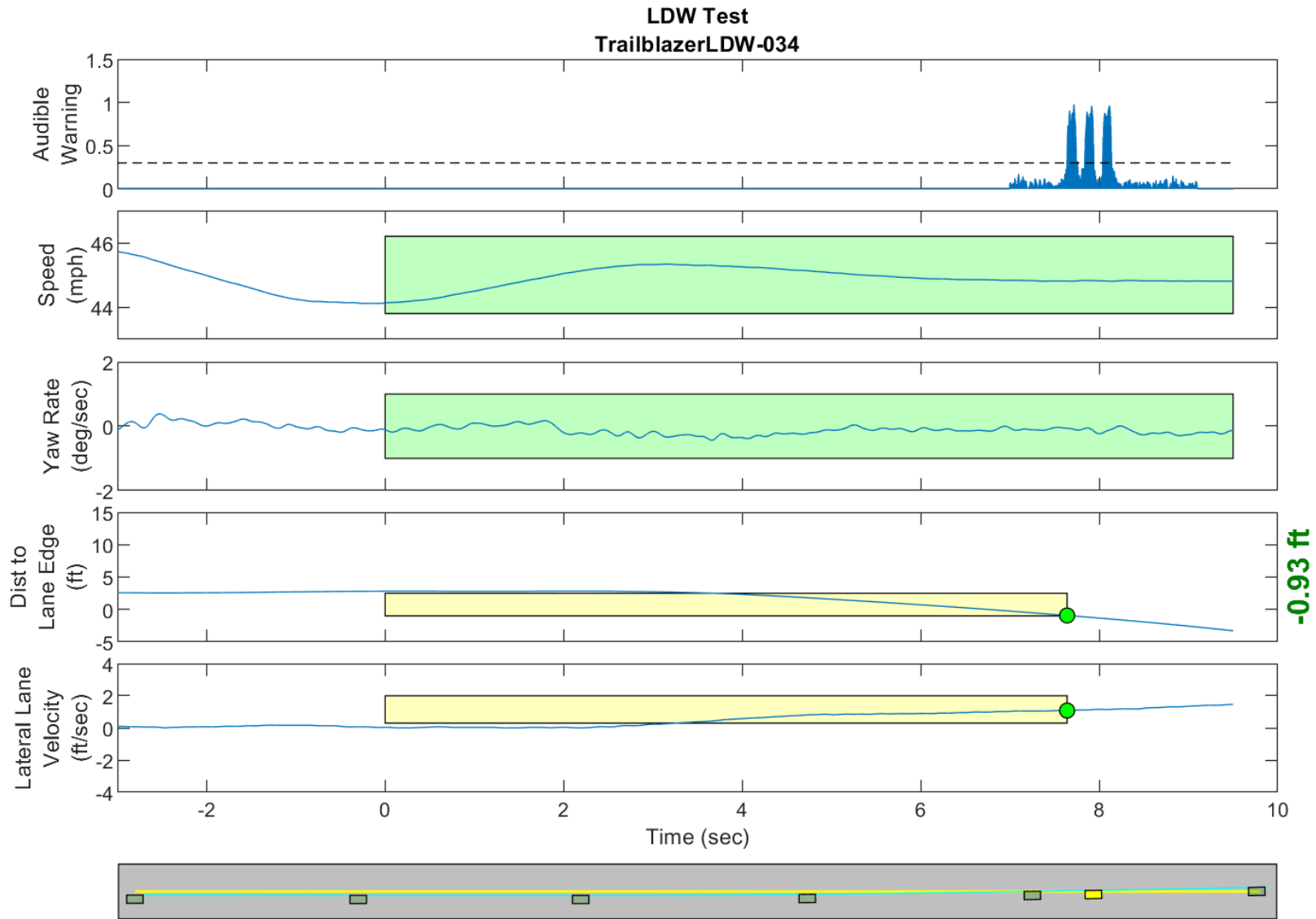
GPS Fix Type: RTK Fixed

Figure D58. Time History for Run 33, Solid Line, Left Departure, Audible Warning



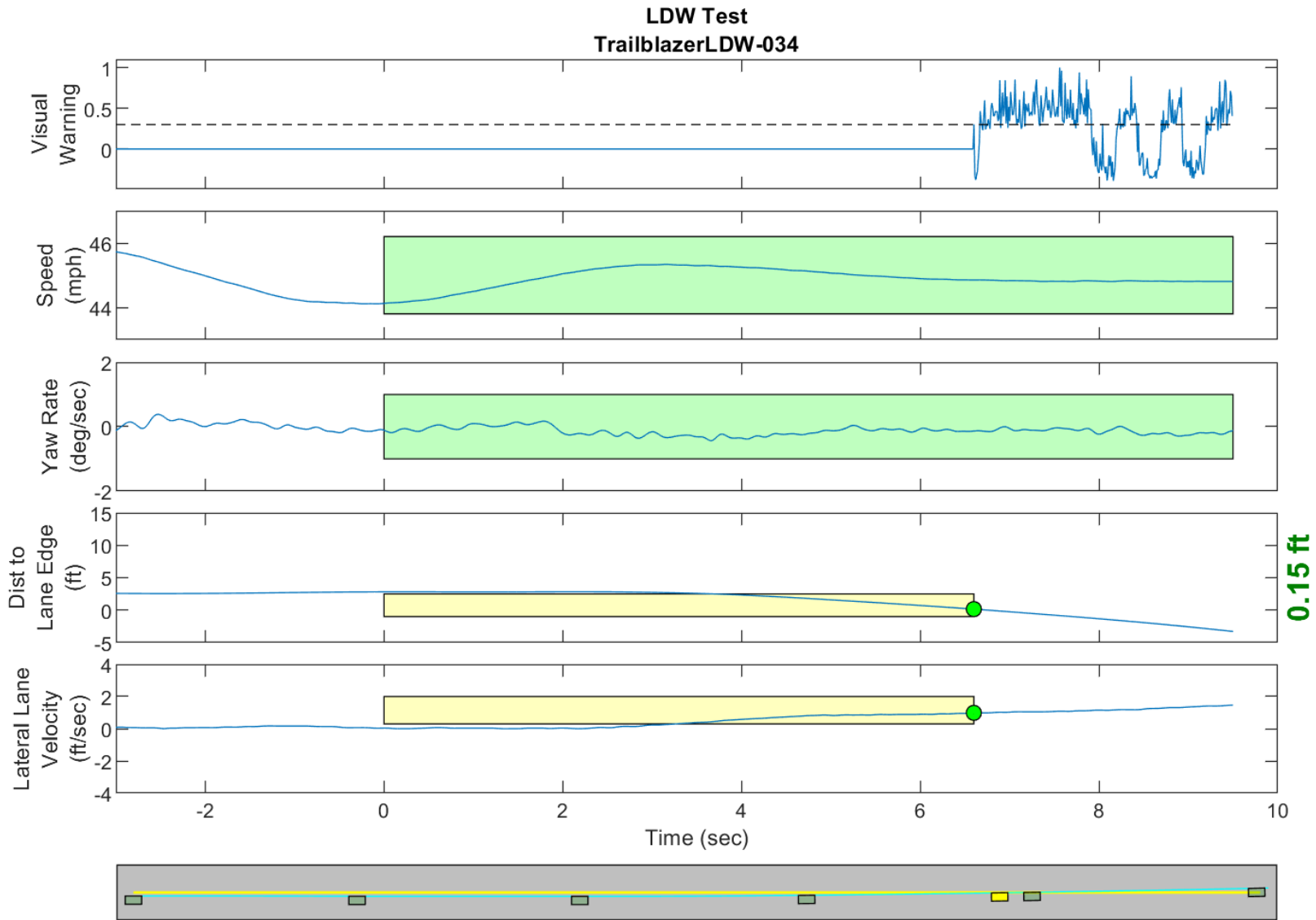
GPS Fix Type: RTK Fixed

Figure D59. Time History for Run 33, Solid Line, Left Departure, Visual Warning



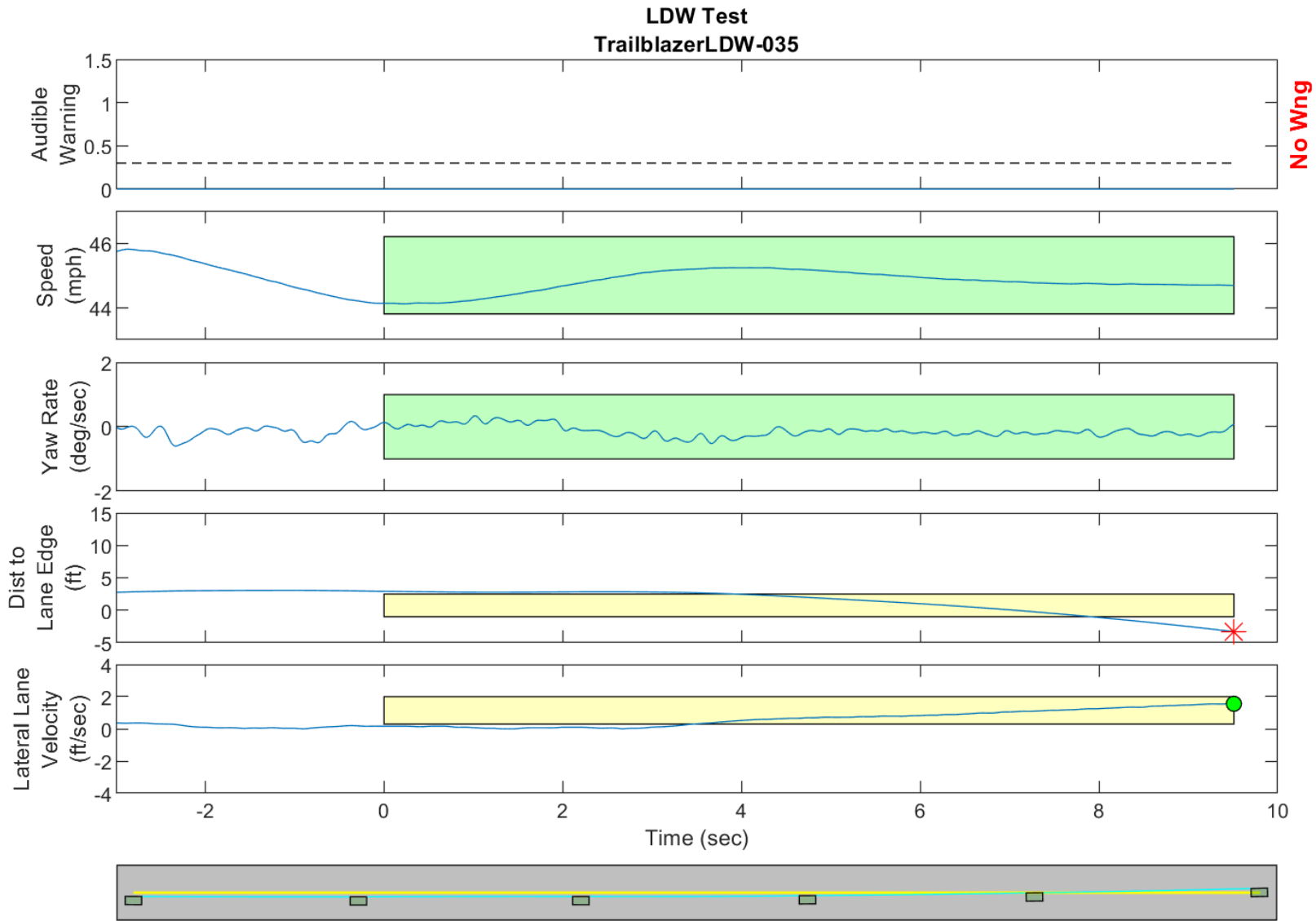
GPS Fix Type: RTK Fixed

Figure D60. Time History for Run 34, Dashed Line, Left Departure, Audible Warning



GPS Fix Type: RTK Fixed

Figure D61. Time History for Run 34, Dashed Line, Left Departure, Visual Warning



GPS Fix Type: RTK Fixed

Figure D62. Time History for Run 35, Dashed Line, Left Departure, Audible Warning

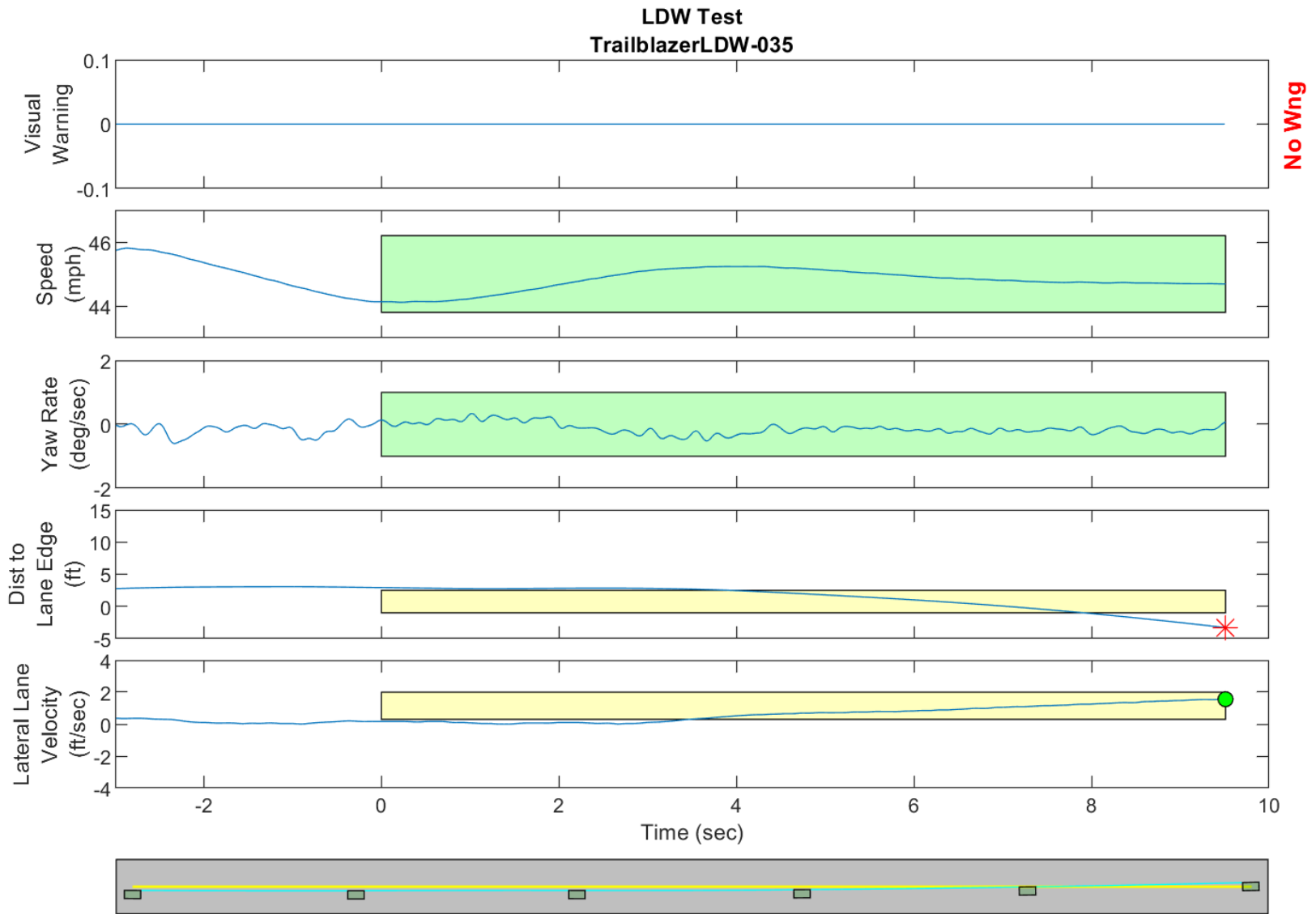
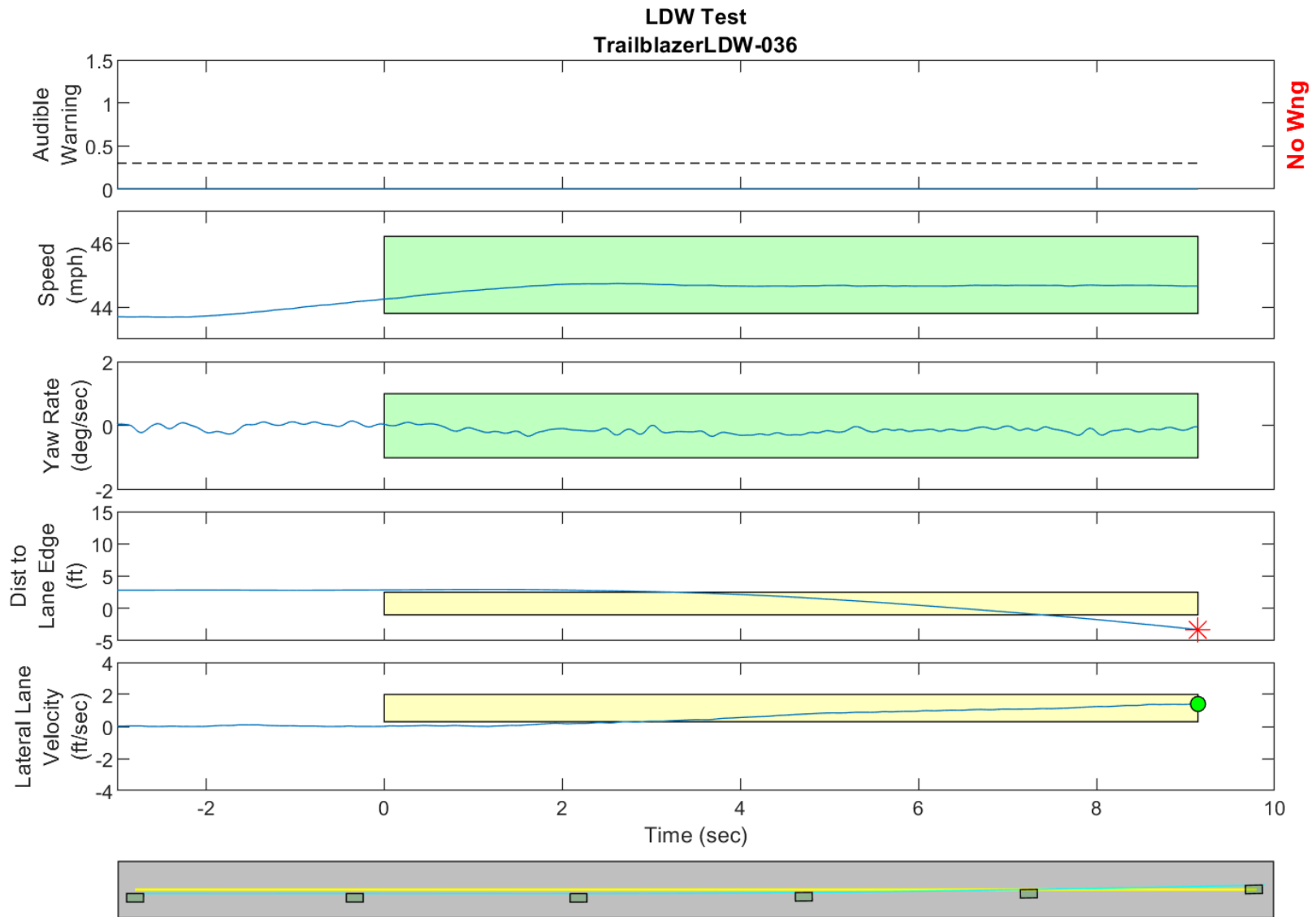
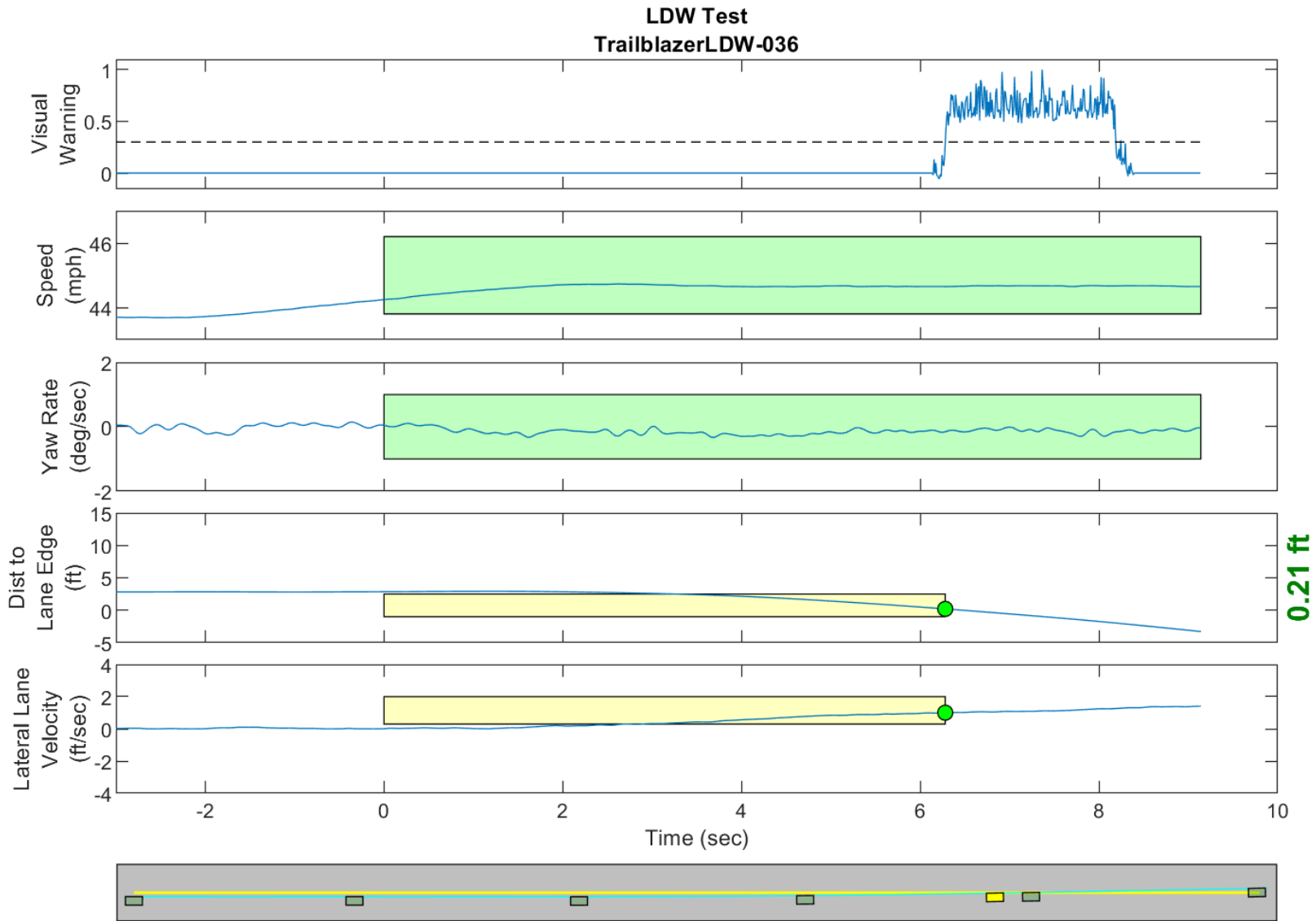


Figure D63. Time History for Run 35, Dashed Line, Left Departure, Visual Warning



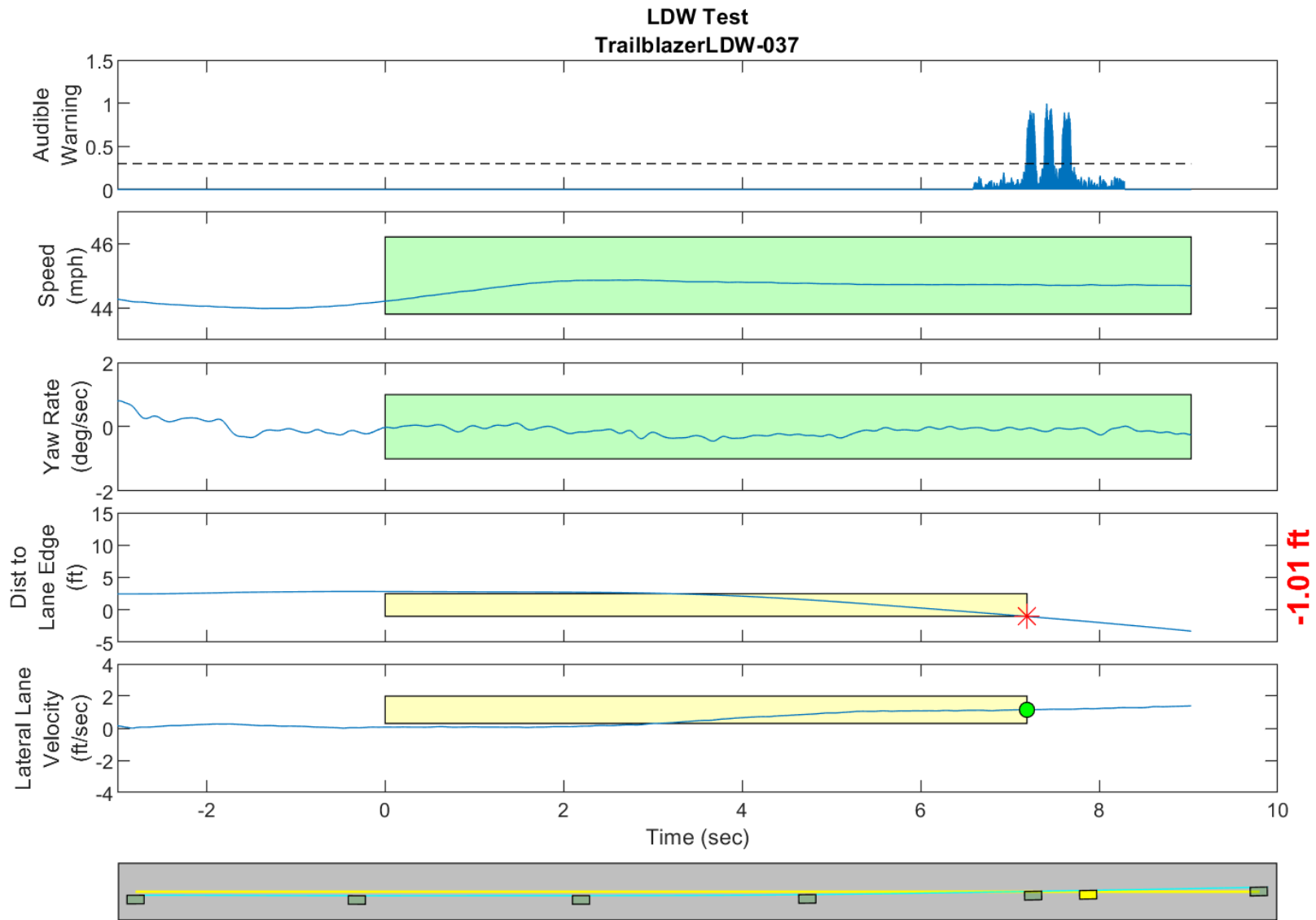
GPS Fix Type: RTK Fixed

Figure D64. Time History for Run 36, Dashed Line, Left Departure, Audible Warning



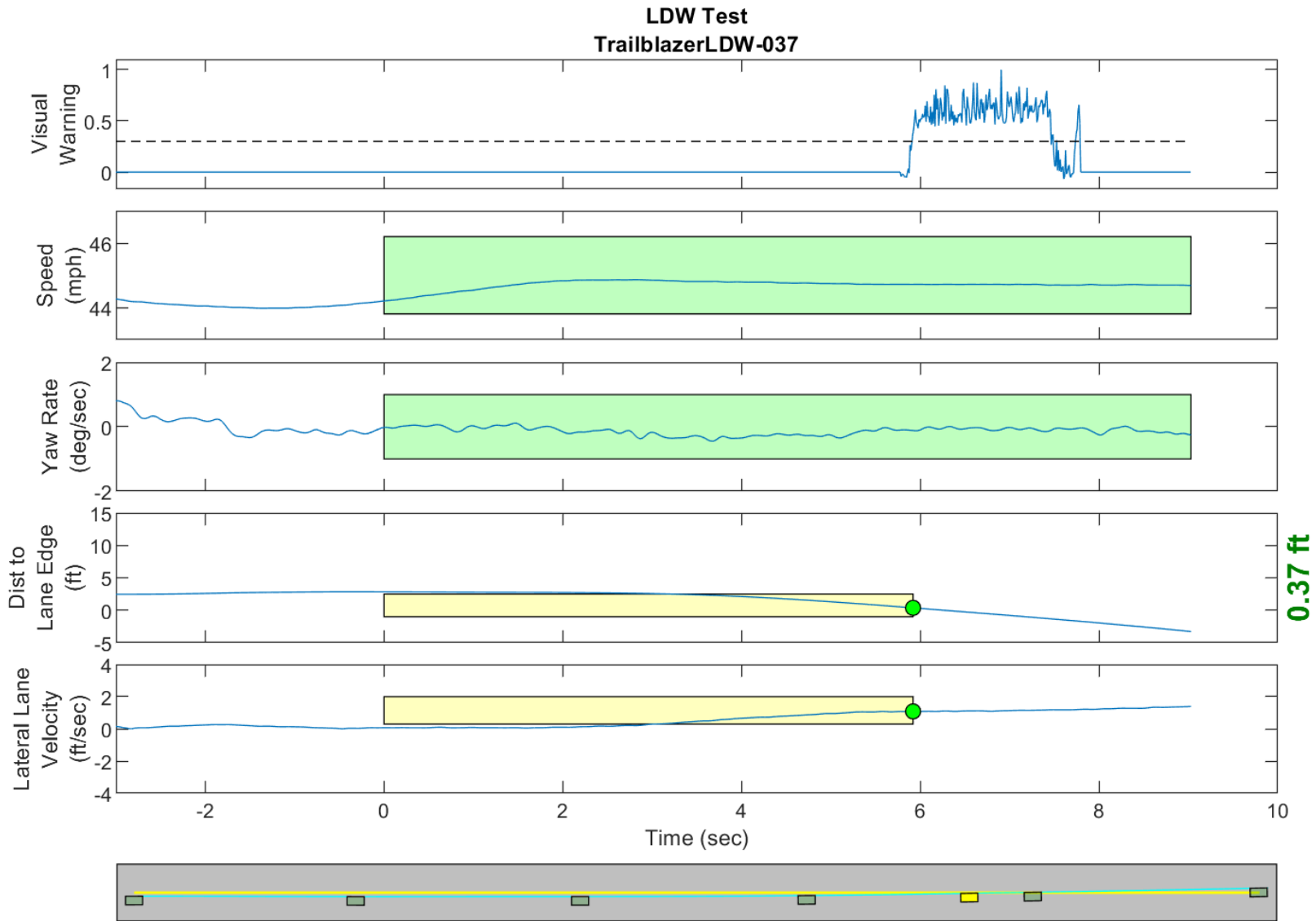
GPS Fix Type: RTK Fixed

Figure D65. Time History for Run 36, Dashed Line, Left Departure, Visual Warning



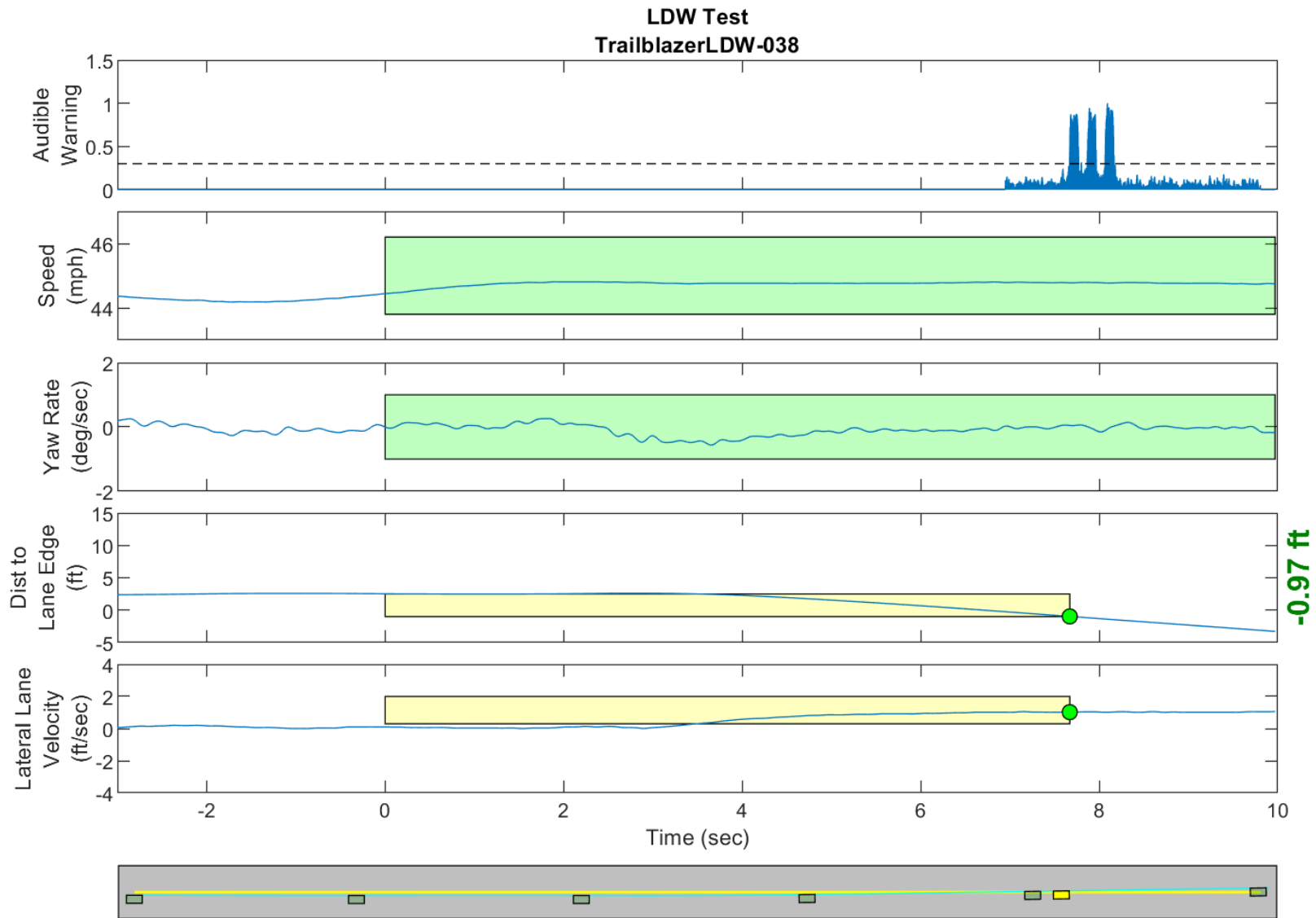
GPS Fix Type: RTK Fixed

Figure D66. Time History for Run 37, Dashed Line, Left Departure, Audible Warning



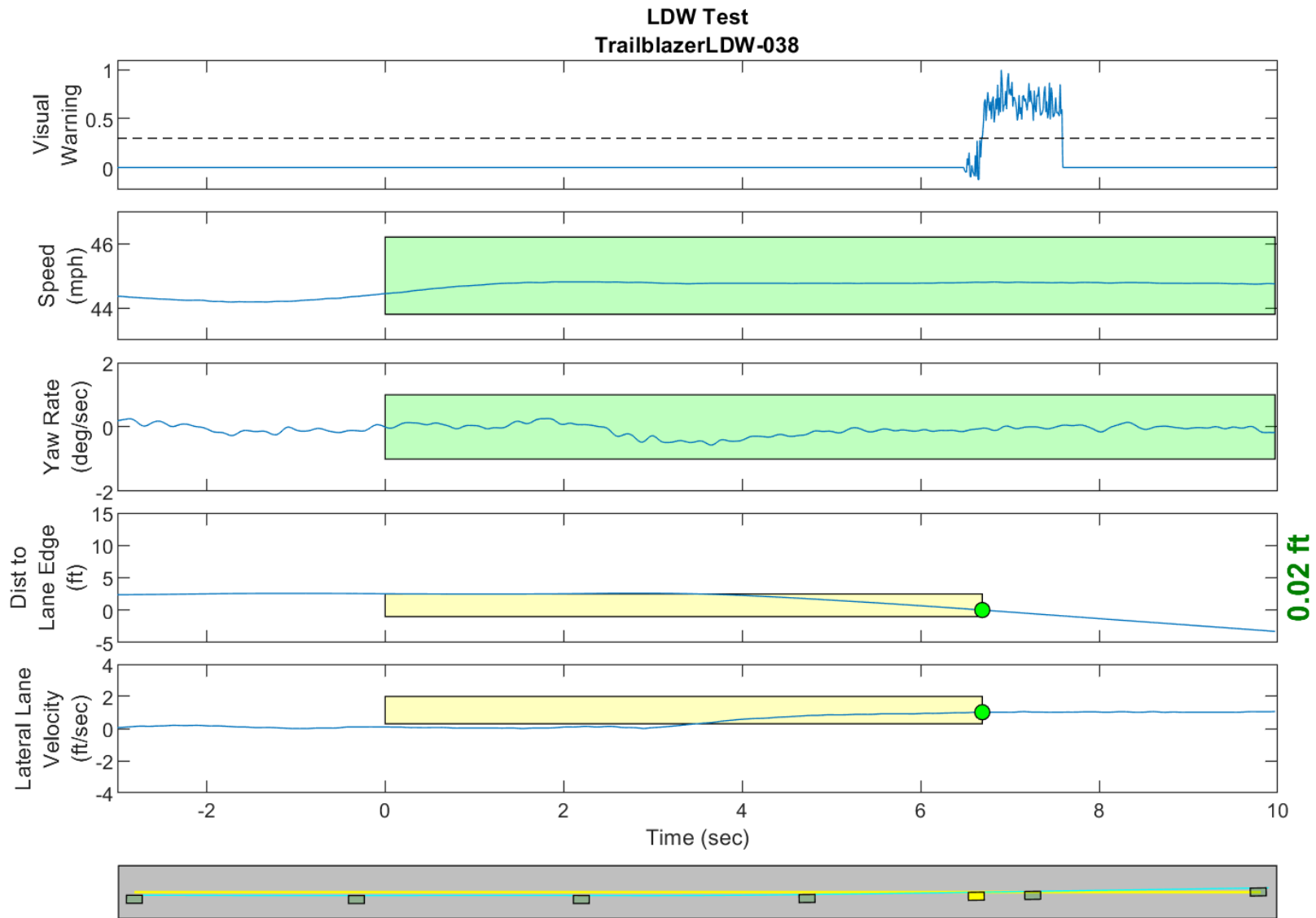
GPS Fix Type: RTK Fixed

Figure D67. Time History for Run 37, Dashed Line, Left Departure, Visual Warning



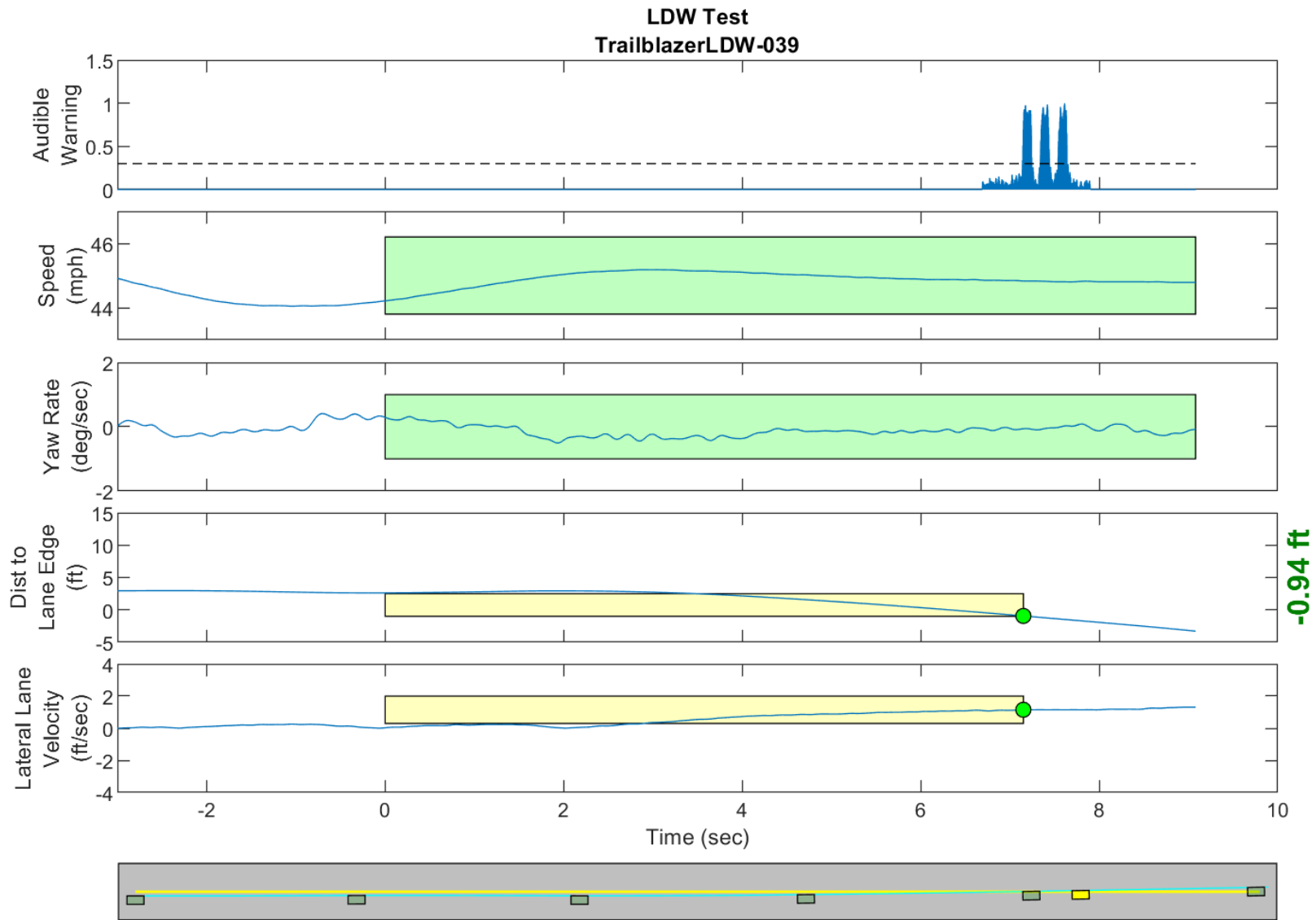
GPS Fix Type: RTK Fixed

Figure D68. Time History for Run 38, Dashed Line, Left Departure, Audible Warning



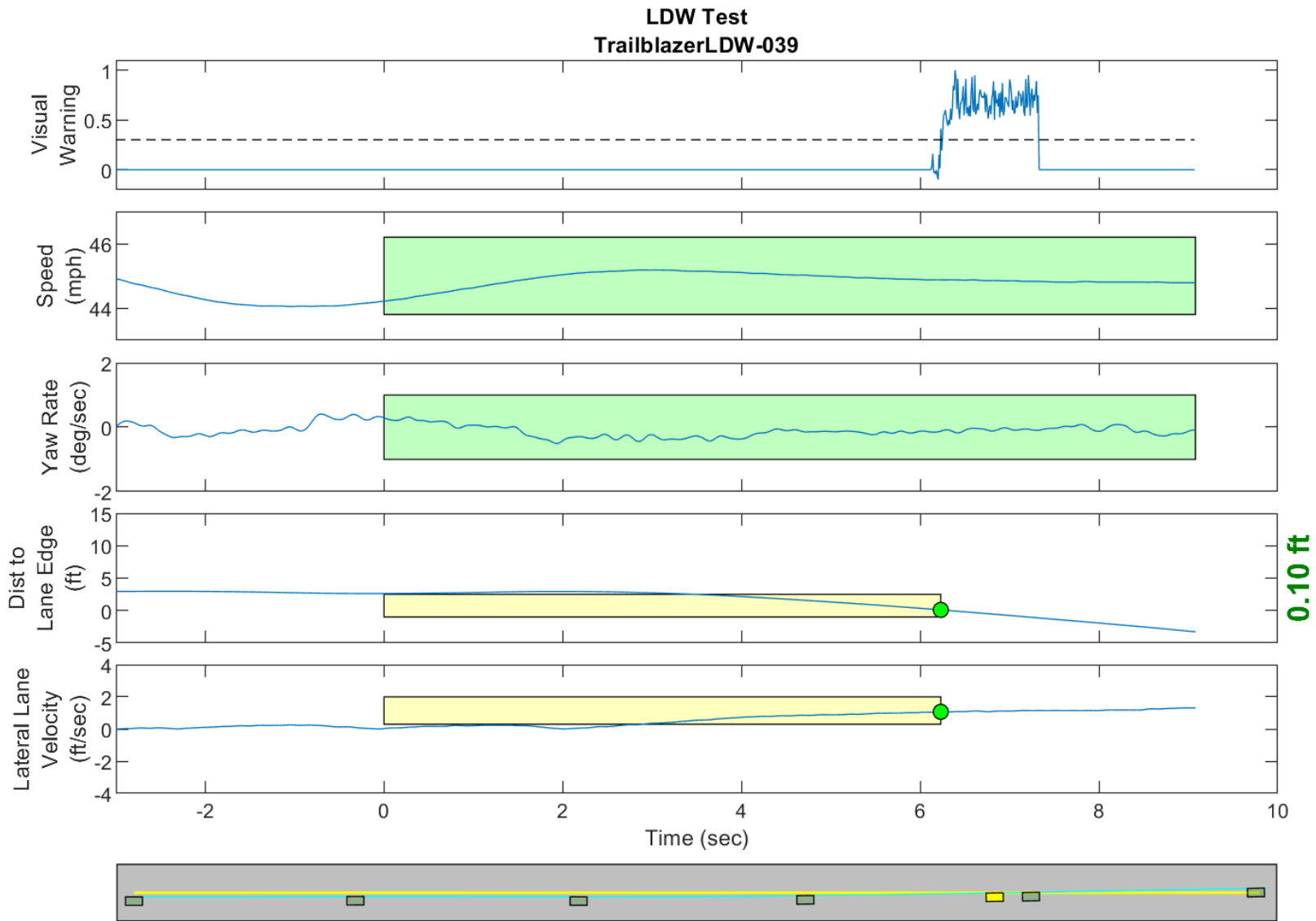
GPS Fix Type: RTK Fixed

Figure D69. Time History for Run 38, Dashed Line, Left Departure, Visual Warning



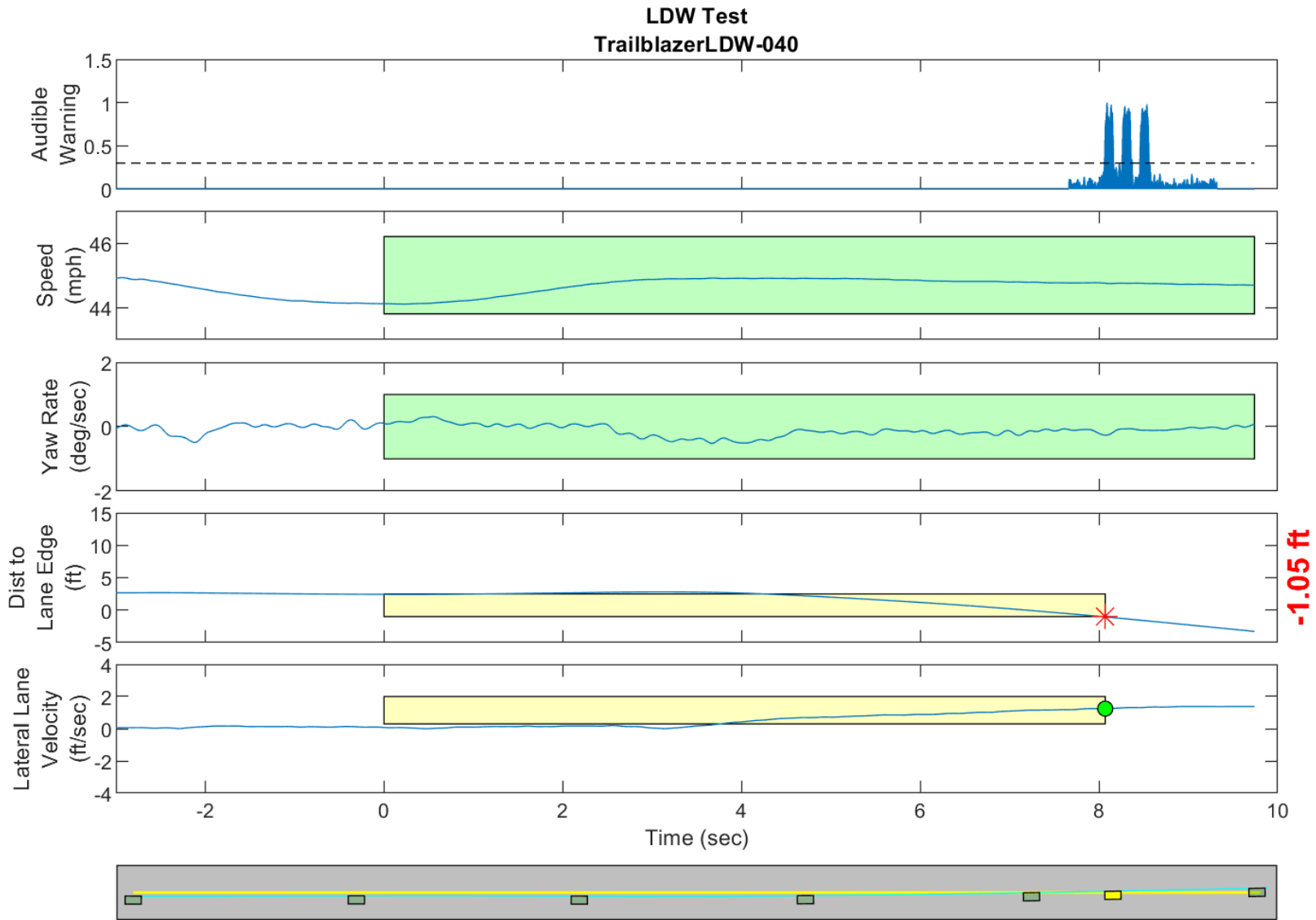
GPS Fix Type: RTK Fixed

Figure D70. Time History for Run 39, Dashed Line, Left Departure, Audible Warning



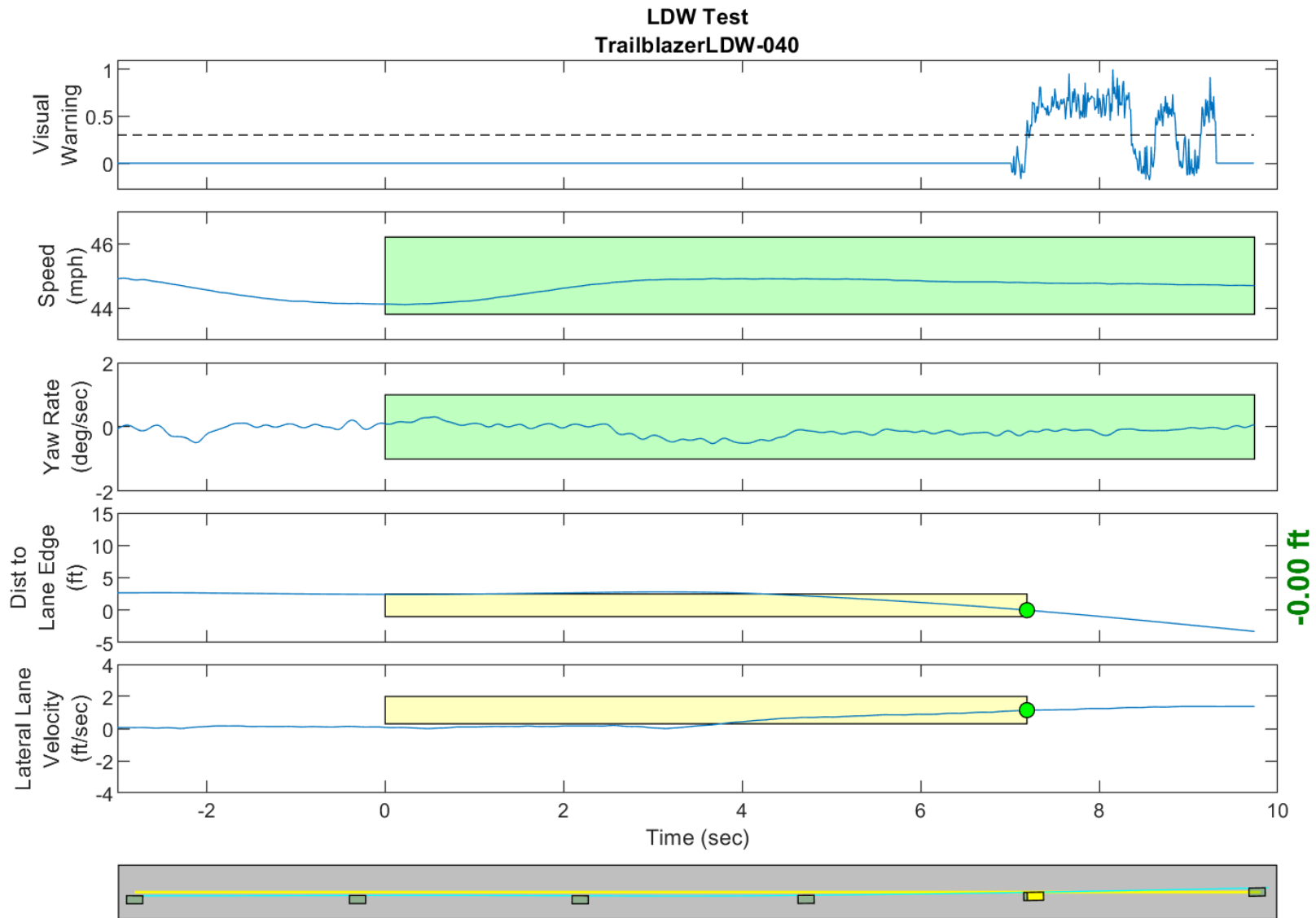
GPS Fix Type: RTK Fixed

Figure D71. Time History for Run 39, Dashed Line, Left Departure, Visual Warning



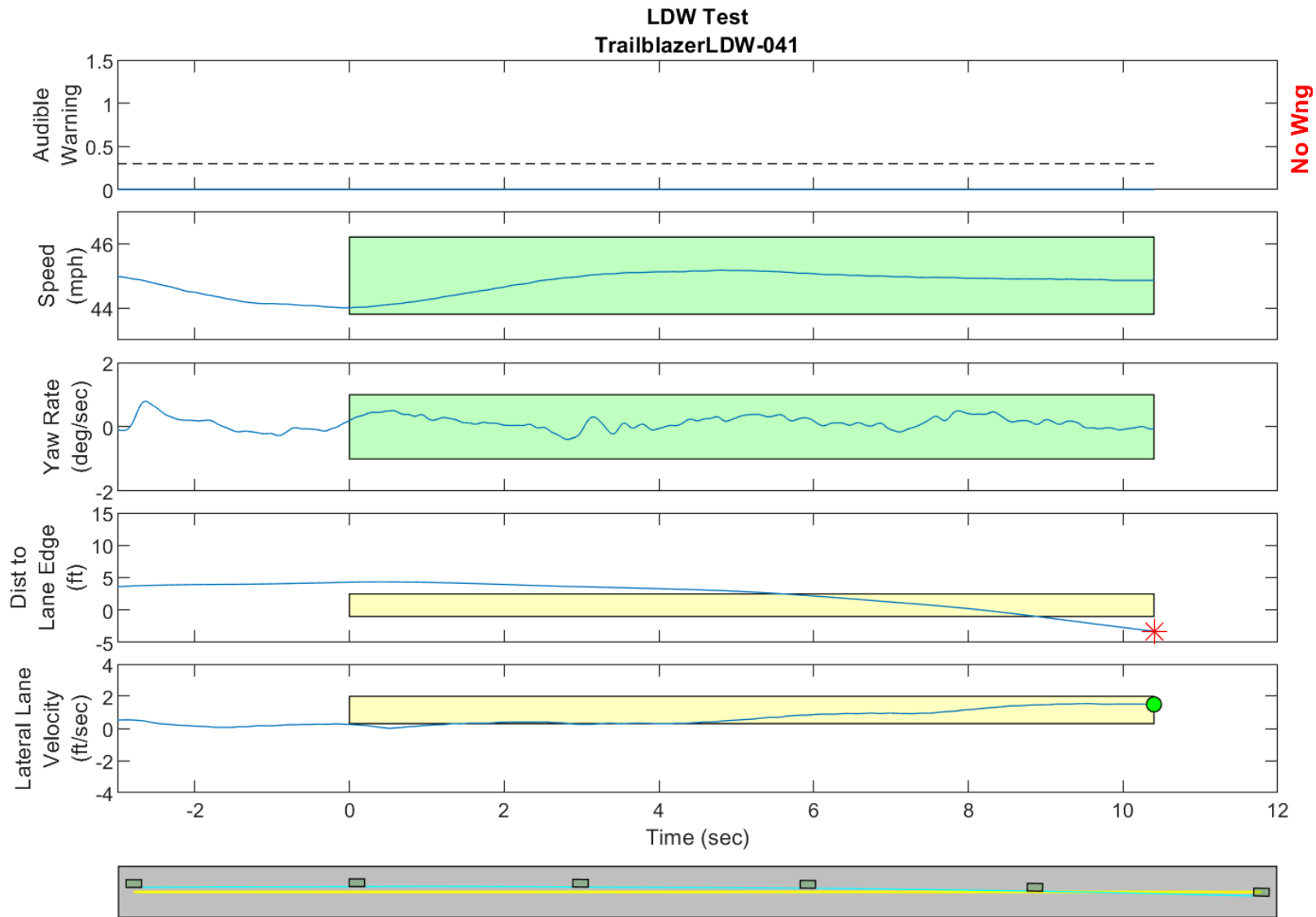
GPS Fix Type: RTK Fixed

Figure D72. Time History for Run 40, Dashed Line, Left Departure, Audible Warning



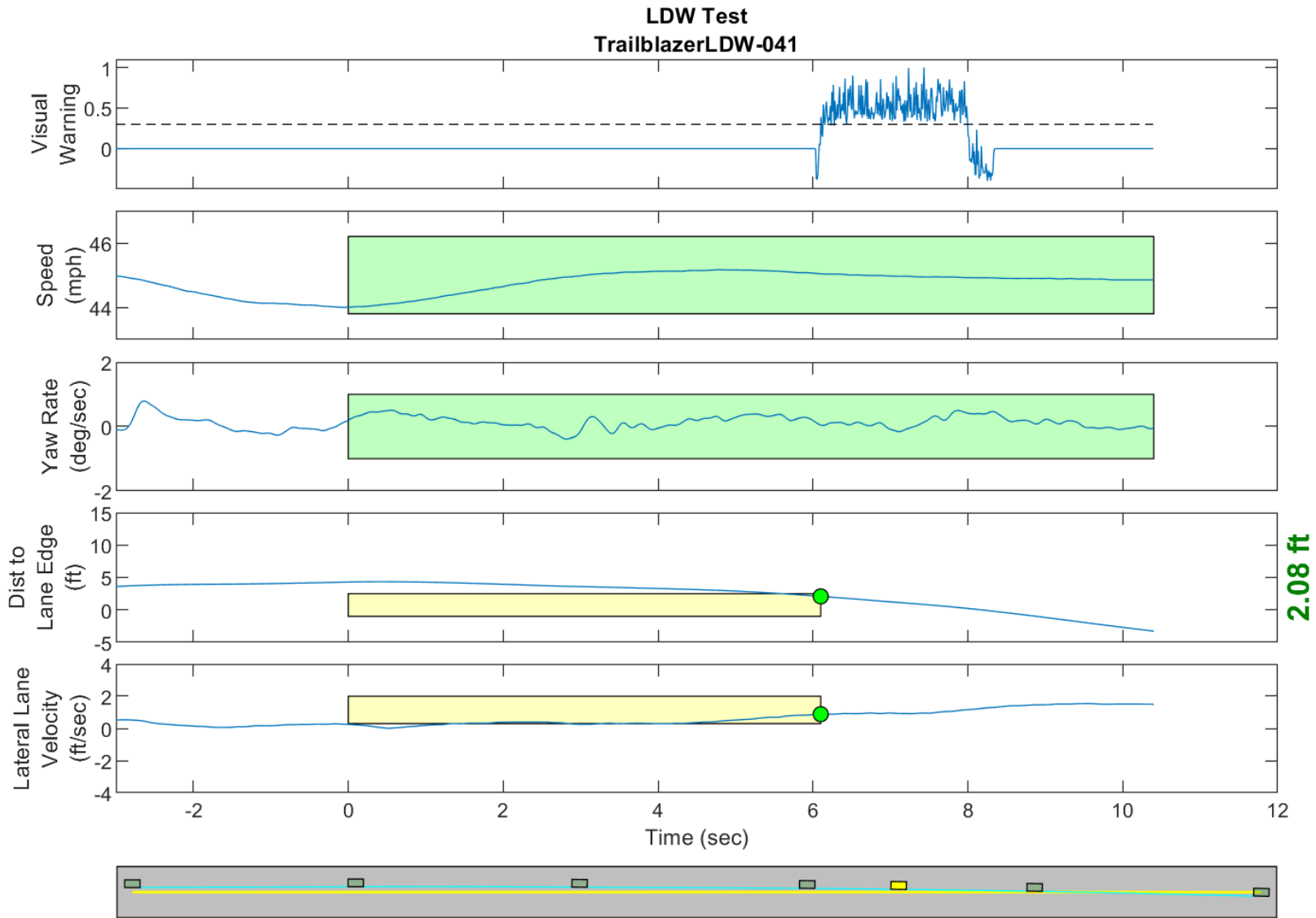
GPS Fix Type: RTK Fixed

Figure D73. Time History for Run 40, Dashed Line, Left Departure, Visual Warning



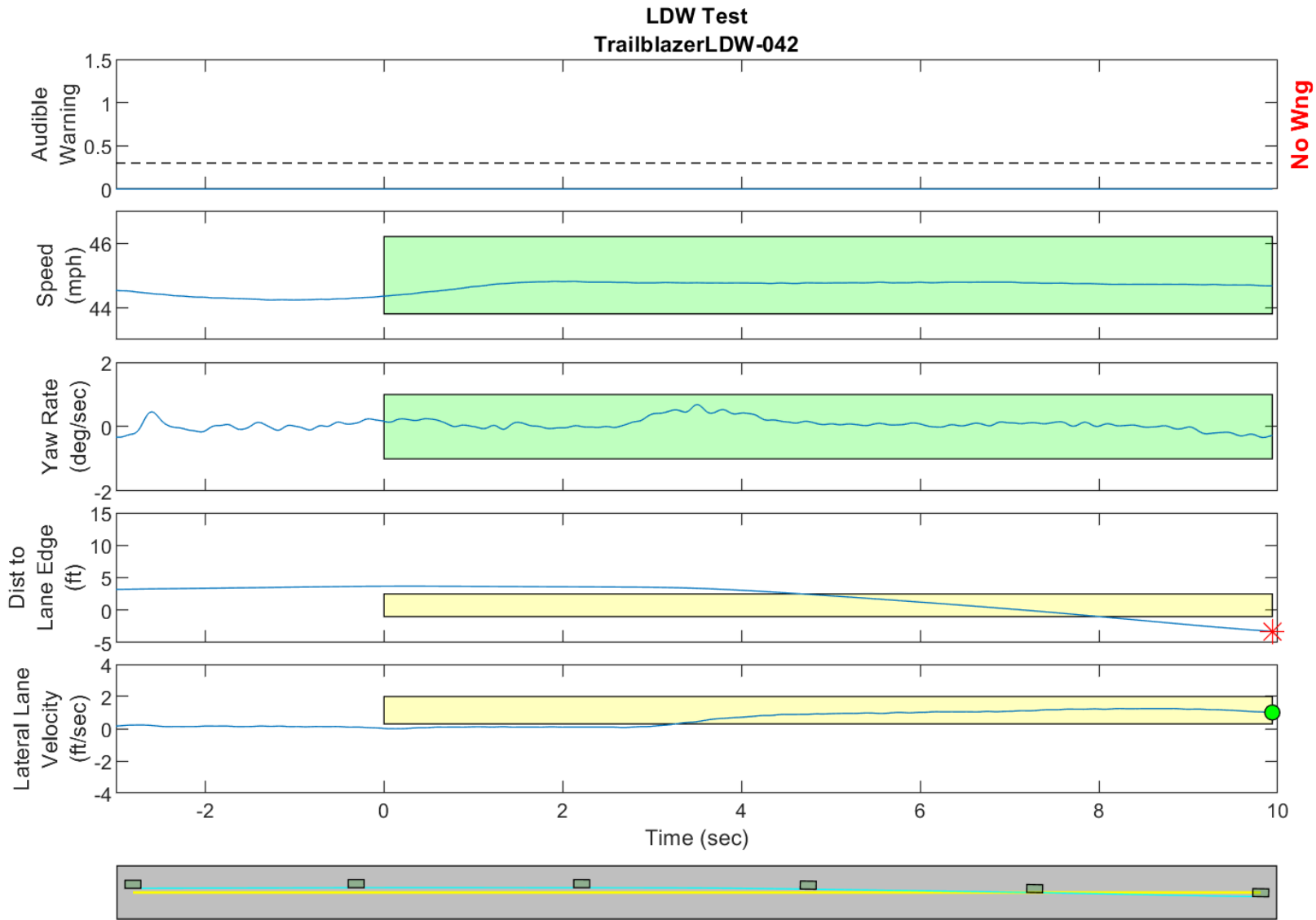
GPS Fix Type: RTK Fixed

Figure D74. Time History for Run 41, Dashed Line, Right Departure, Audible Warning



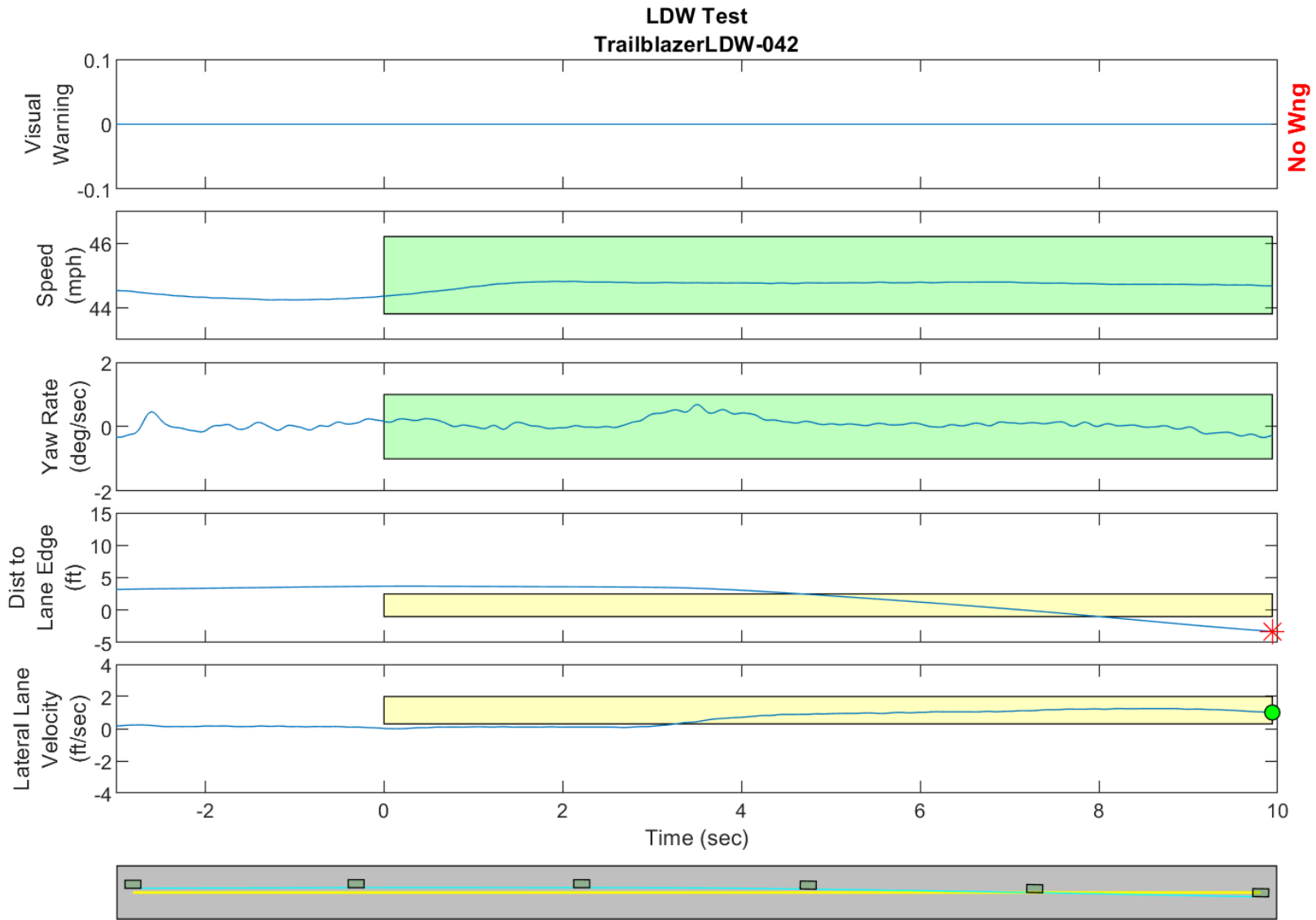
GPS Fix Type: RTK Fixed

Figure D75. Time History for Run 41, Dashed Line, Right Departure, Visual Warning



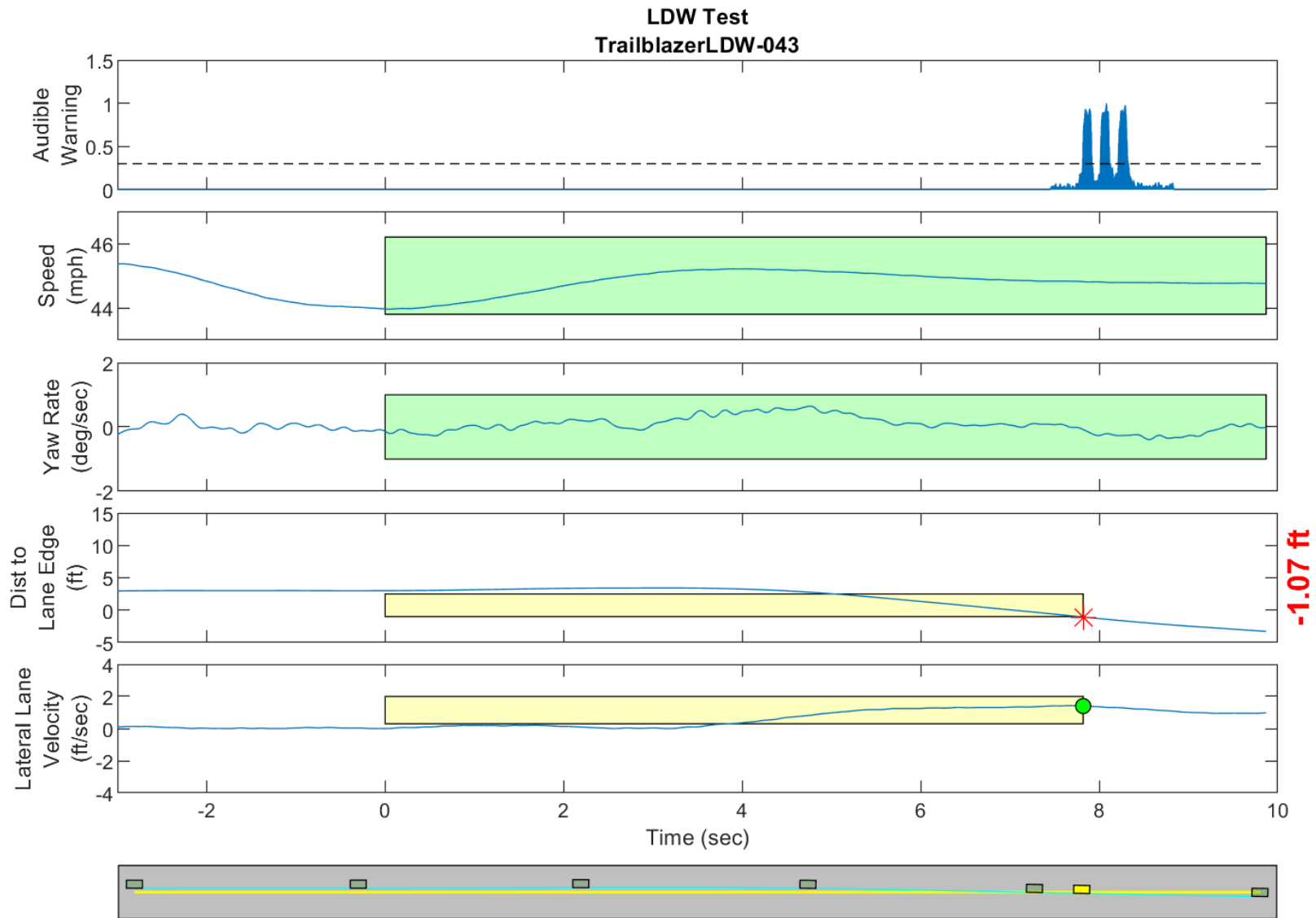
GPS Fix Type: RTK Fixed

Figure D76. Time History for Run 42, Dashed Line, Right Departure, Audible Warning



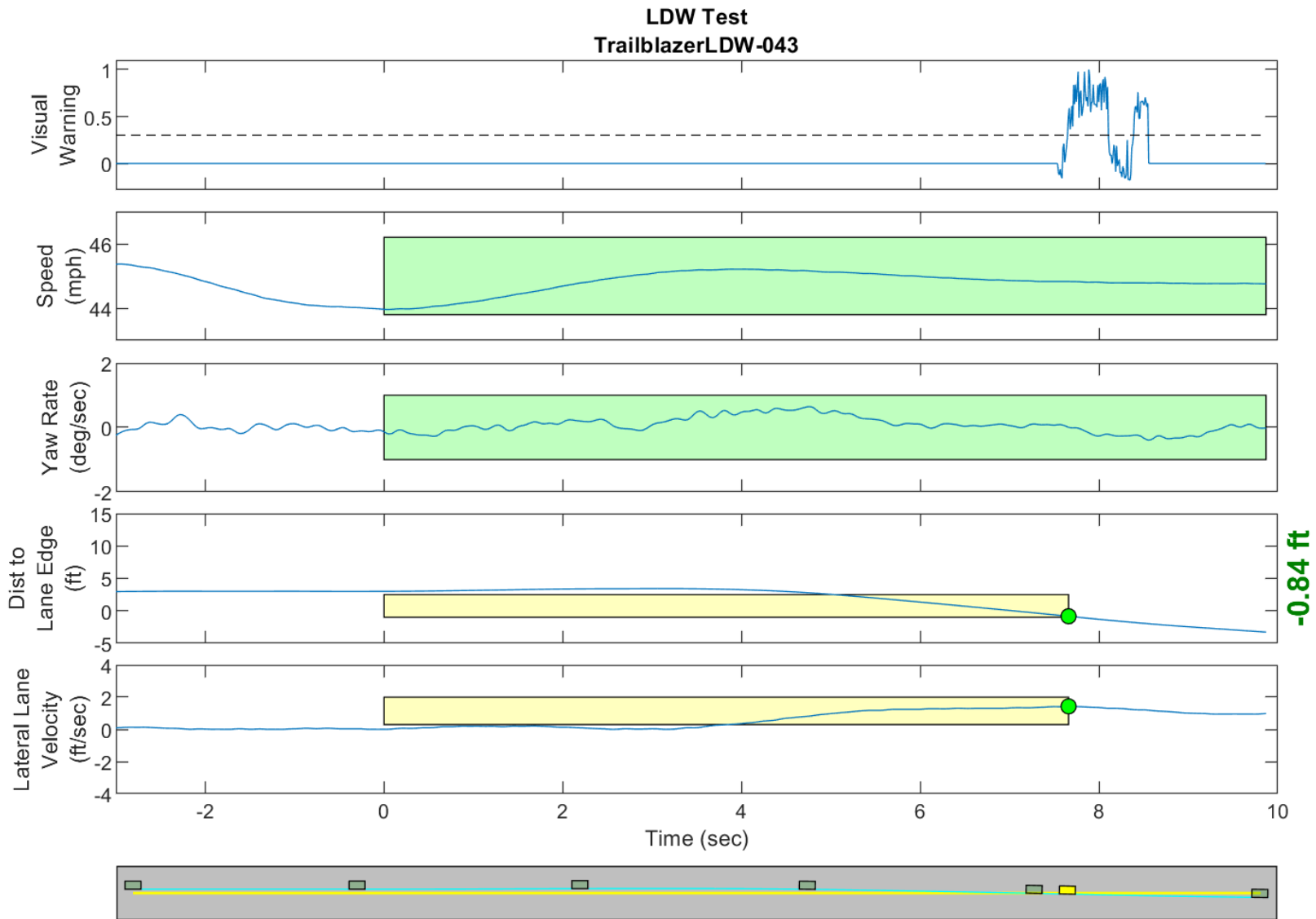
GPS Fix Type: RTK Fixed

Figure D77. Time History for Run 42, Dashed Line, Right Departure, Visual Warning



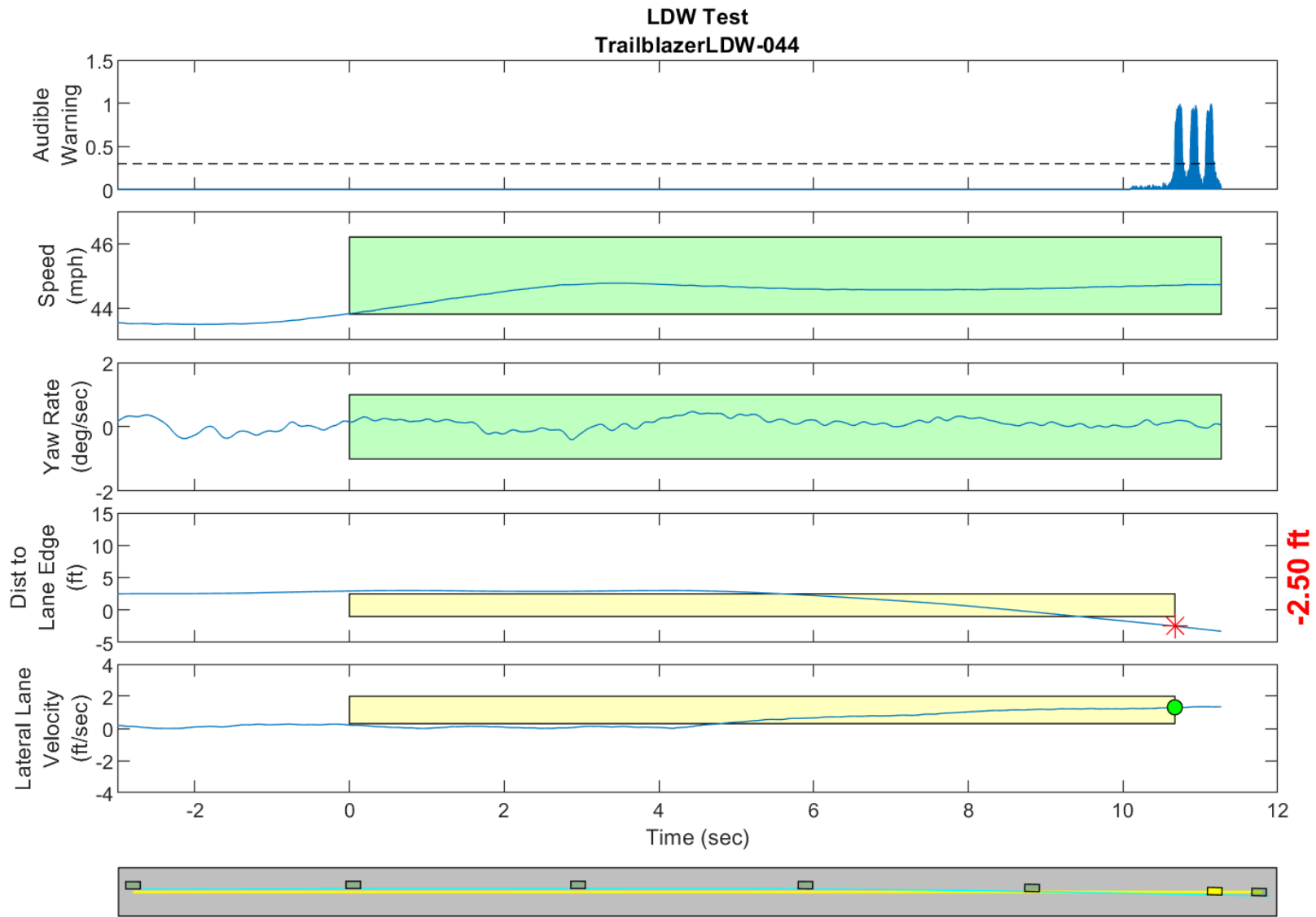
GPS Fix Type: RTK Fixed

Figure D78. Time History for Run 43, Dashed Line, Right Departure, Audible Warning



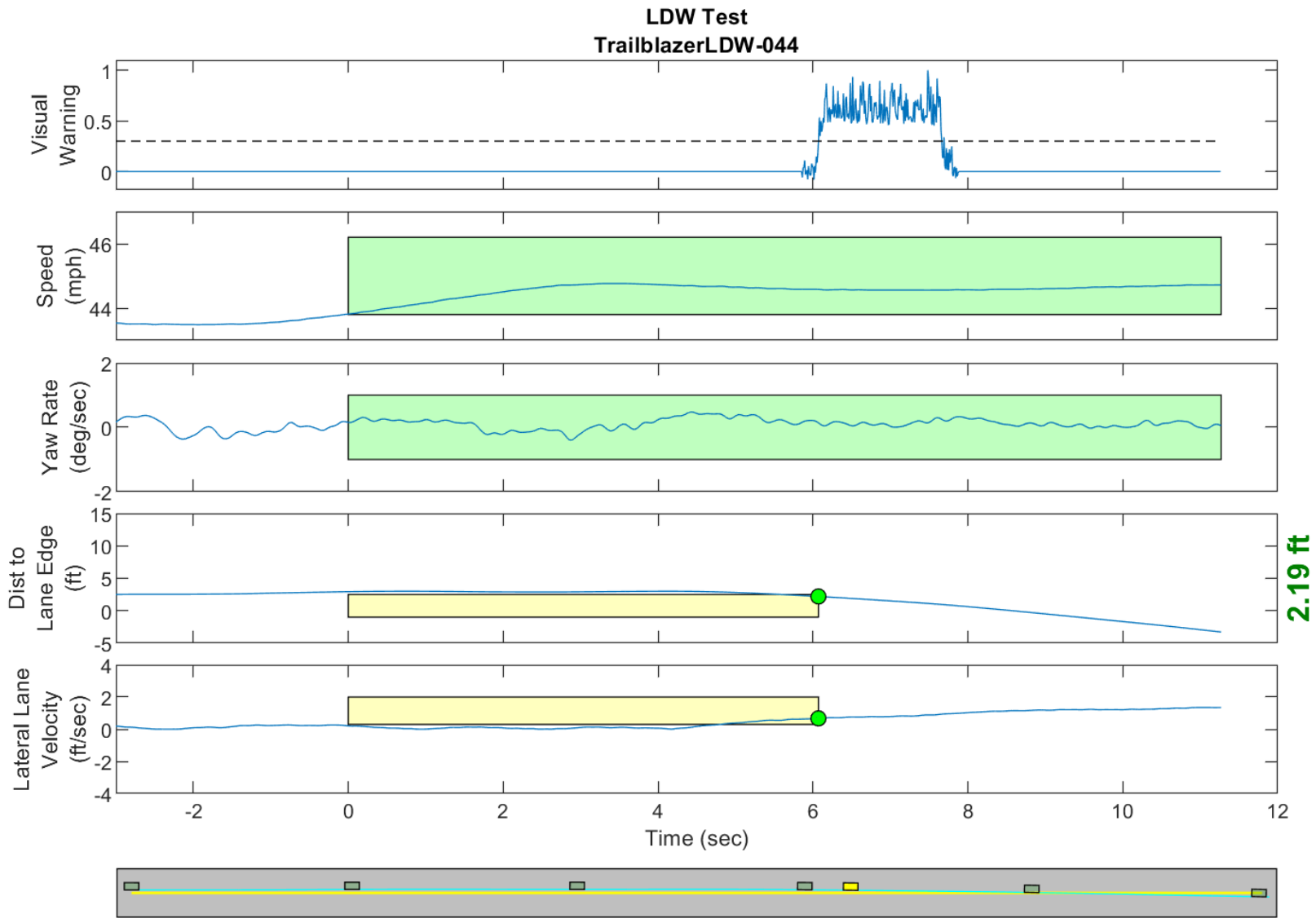
GPS Fix Type: RTK Fixed

Figure D79. Time History for Run 43, Dashed Line, Right Departure, Visual Warning



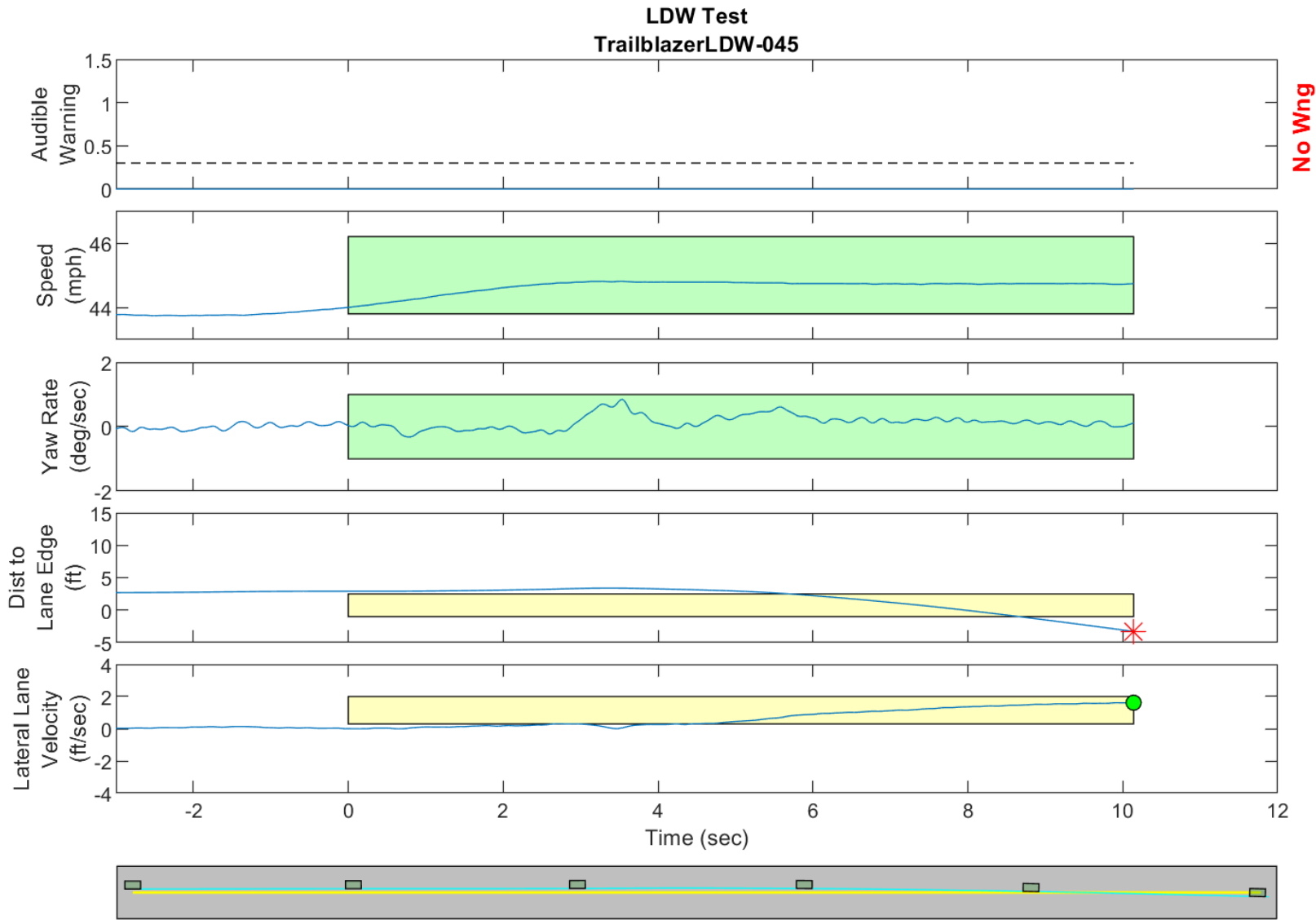
GPS Fix Type: RTK Fixed

Figure D80. Time History for Run 44, Dashed Line, Right Departure, Audible Warning



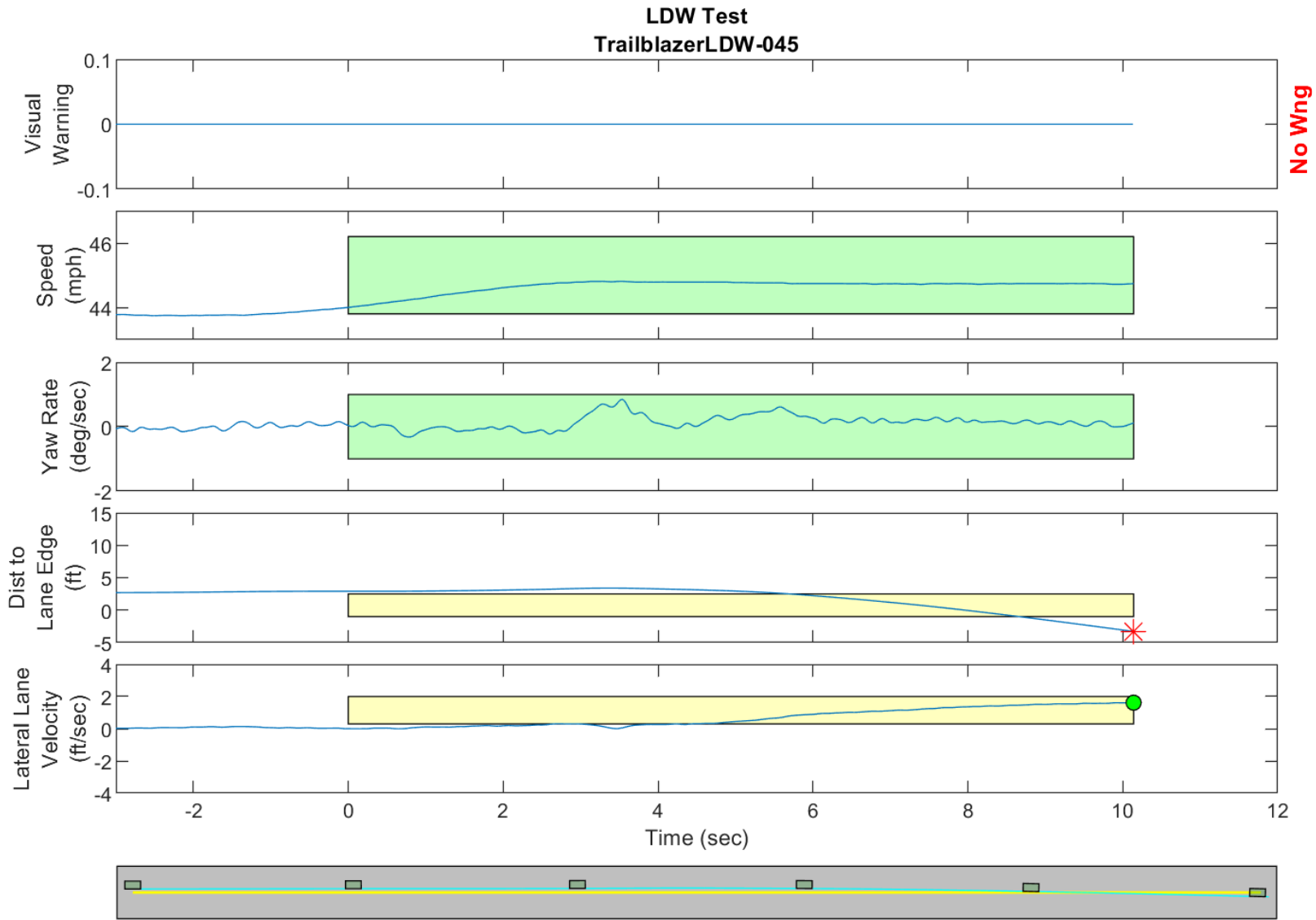
GPS Fix Type: RTK Fixed

Figure D81. Time History for Run 44, Dashed Line, Right Departure, Visual Warning



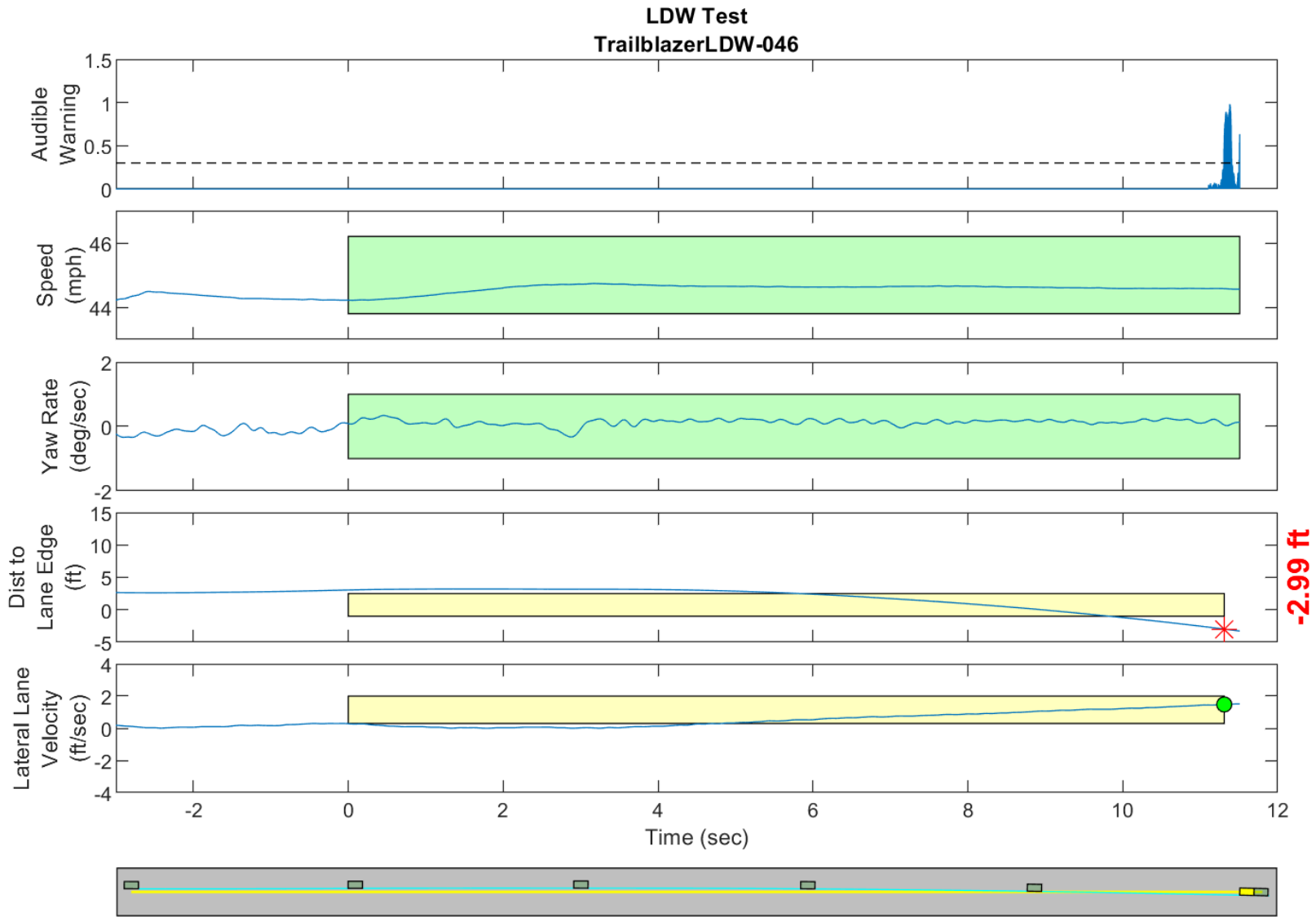
GPS Fix Type: RTK Fixed

Figure D82. Time History for Run 45, Dashed Line, Right Departure, Audible Warning



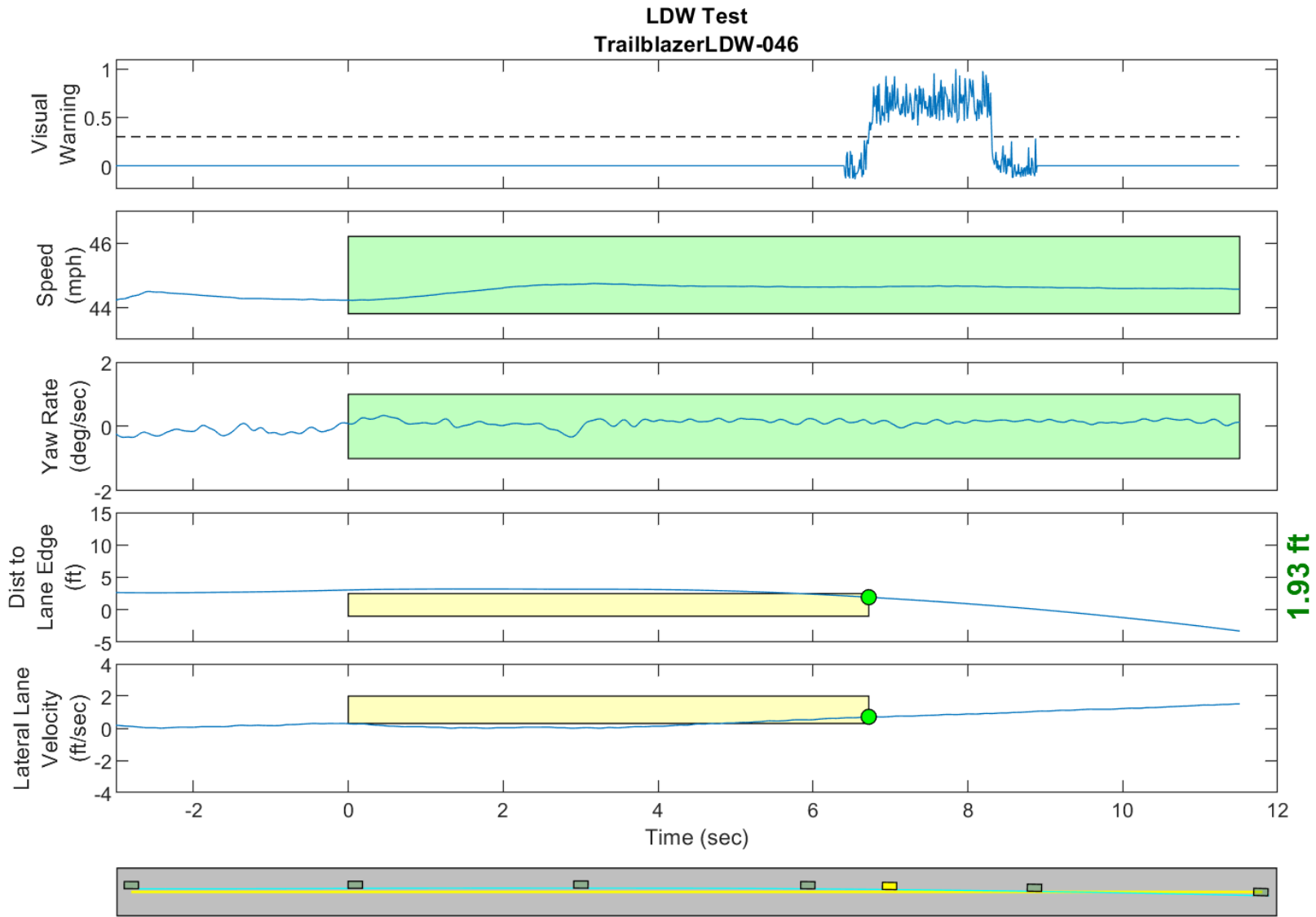
GPS Fix Type: RTK Fixed

Figure D83. Time History for Run 45, Dashed Line, Right Departure, Visual Warning



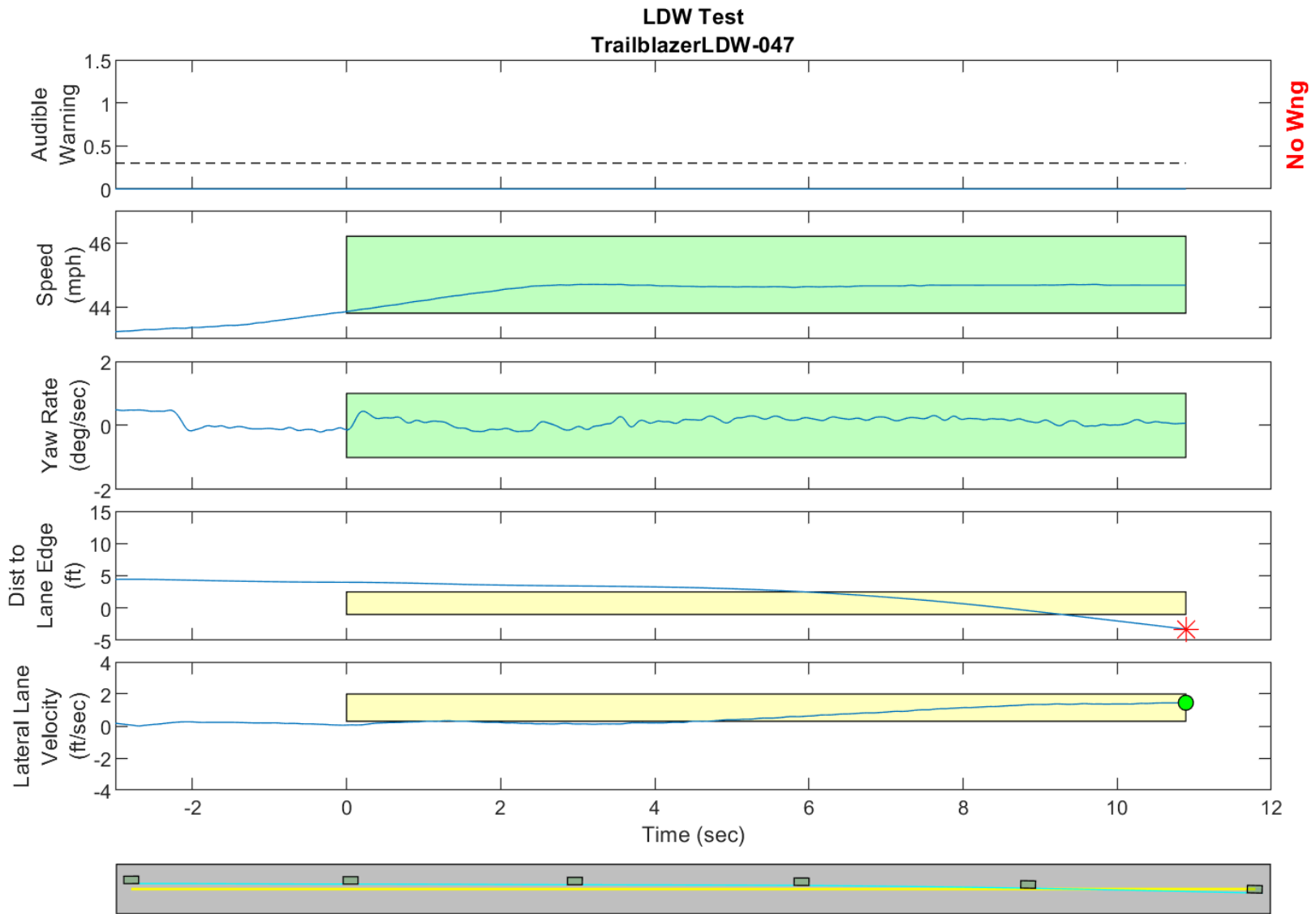
GPS Fix Type: RTK Fixed

Figure D84. Time History for Run 46, Dashed Line, Right Departure, Audible Warning



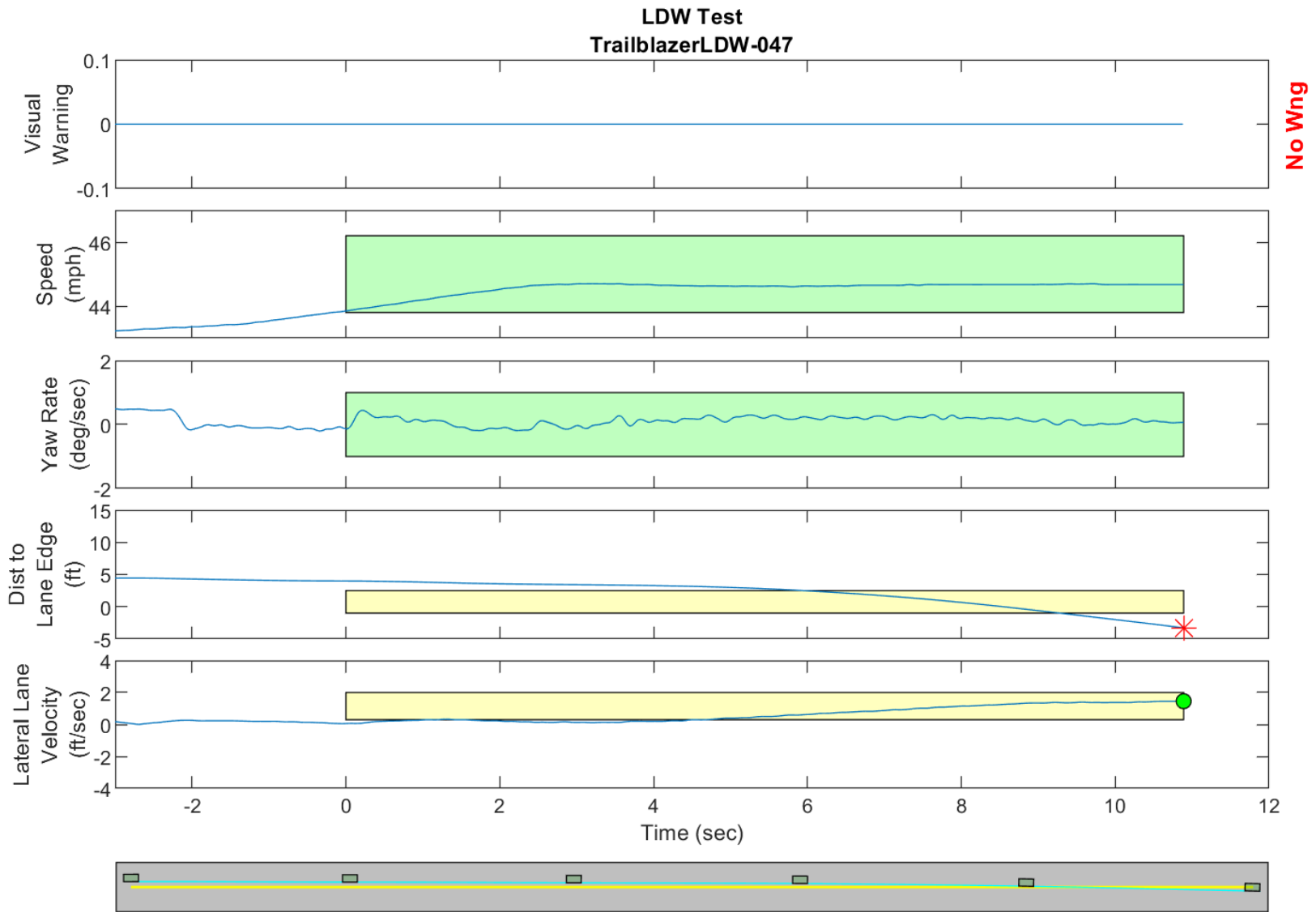
GPS Fix Type: RTK Fixed

Figure D85. Time History for Run 46, Dashed Line, Right Departure, Visual Warning



GPS Fix Type: RTK Fixed

Figure D86. Time History for Run 47, Dashed Line, Right Departure, Audible Warning



GPS Fix Type: RTK Fixed

Figure D87. Time History for Run 47, Dashed Line, Right Departure, Visual Warning