



U.S. Department  
of Transportation  
**National Highway  
Traffic Safety  
Administration**



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DOT HS 813 085

September 2021 (revised)

**Special Crash Investigations:  
On-Site Vehicle Rollaway Crash  
Investigation;  
Vehicle: 2008 Pontiac G6;  
Location: Indiana;  
Crash Date: March 2018**

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### Suggested APA Format Citation:

Transportation Research Center. (2021, September, revised). *Special crash investigations: On-site vehicle rollaway crash investigation; Vehicle: 2008 Pontiac G6; Location: Indiana; Crash date: March 2018* (Report No. DOT HS 813 085). National Highway Traffic Safety Administration.

## Technical Report Documentation Page

<b>1. Report No.</b> DOT HS 813 085	<b>2. Government Accession No.</b>	<b>3. Recipient's Catalog No.</b>	
<b>4. Title and Subtitle</b> Special Crash Investigations: On-Site Vehicle Rollaway Crash Investigation; Vehicle: 2008 Pontiac G6; Location: Indiana; Crash Date: March 2018	<b>5. Report Date</b> September 2021 (revised)		<b>6. Performing Organization Code</b>
	<b>7. Author</b> Transportation Research Center		<b>8. Performing Organization Report No.</b> IN18007
<b>9. Performing Organization Name and Address</b> Transportation Research Center 501 South Madison Street, Suite 105 Bloomington, IN 47403	<b>10. Work Unit No. (TRAIS)</b>		<b>11. Contract or Grant No.</b> DTNH22-12-C-00270
	<b>12. Sponsoring Agency Name and Address</b> National Highway Traffic Safety Administration 1200 New Jersey Avenue SE Washington, DC 20590		<b>13. Type of Report and Period Covered</b> Technical Report
		<b>14. Sponsoring Agency Code</b>	
<b>15. Supplementary Notes</b> Each crash represents a unique sequence of events, and generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicles or their safety systems. This report and associated case data are based on information available to the Special Crash Investigation team on the date this report was published.			
<b>16. Abstract</b>  This incident occurred in an apartment complex parking lot and involved a retention pond located approximately 15 m (50 ft) west of the parking lot. The Pontiac was a 4-door sedan with an automatic transmission and a console-mounted shift lever. A 3-year-old female occupied the vehicle at the time of the incident. Her father was outside the vehicle engaged in conversation with a witness when the Pontiac began to roll backwards across the parking lot. The vehicle traversed a grassy area and entered the retention pond. The child's father and the witness entered the water to rescue the child. Neither the father nor the witness could swim, and the witness went back to the shore. The father retrieved the child from the vehicle and handed her to another witness who entered the pond from the far west side. The father drowned during the incident and was retrieved by police divers. He was transported by ambulance to a hospital and was pronounced dead approximately seven hours after the incident. The child occupant was transported to a hospital where she was admitted for treatment of hypothermia. The second witness was transported by ambulance to a hospital. The Pontiac was completely submerged in the pond and was recovered the following day. It was towed to police impound where it was inspected for this SCI investigation.  Through the course of the investigation, it was determined that the transmission shift cable was out-of-adjustment, which gave the child the ability to shift the vehicle from the Park position to Neutral without the ignition key and without applying the brake pedal.			
<b>17. Key Words</b> Rollaway, retention pond, transmission shift cable, recall, brake application, ignition key, fatality		<b>18. Distribution Statement</b> The document is available to the public from the National Technical Information Service, <a href="http://www.ntis.gov">www.ntis.gov</a> .	
<b>19 Security Classif. (of this report)</b> Unclassified	<b>20. Security Classif. (of this page)</b> Unclassified	<b>21 No. of Pages</b> 21	<b>22. Price</b>

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**Special Crash Investigations  
On-Site Vehicle Rollaway Crash Investigation  
Office of Defects Investigation  
Case Number: IN18007  
Vehicle: 2008 Pontiac G6  
Location: Indiana  
Crash Date: March 2018**

**BACKGROUND**

This report documents an on-scene investigation of a 2008 Pontiac G6 (**Figure 1**) that was involved in a rollaway incident. This incident investigation was initiated by the National Highway Traffic Safety Administration in April 2018 and assigned to the Special Crash Investigations (SCI) team at the Indiana University Transportation Research Center. The Pontiac G6 was the subject of a NHTSA recall involving the malfunction of transmission shift cables. The incident occurred in March 2018 in Indiana and was investigated by a local police department. The Pontiac was inspected in May 2018 in conjunction with the police investigator and an engineer from General Motors. A partial interview with one of the non-motorists was conducted in September 2018.



**Figure 1.** The 2008 Pontiac G6.

This incident occurred in an apartment complex parking lot and involved a retention pond located approximately 15 m (50 ft) west of the parking lot. The Pontiac was a 4-door sedan with an automatic transmission and a console-mounted shift lever. A 3-year-old female occupied the vehicle at the time of the incident. Her father was outside the vehicle engaged in conversation with a witness when the Pontiac began to roll backwards in a westerly direction across the parking lot. The vehicle traversed a grassy area and entered the retention pond. The child's father and the witness entered the water to rescue the child. Neither the father nor the witness could swim, and the witness went back to the shore. The father retrieved the child from the vehicle and handed her to another witness who entered the pond from the far west side. The father drowned during the incident and was retrieved by police divers. He was transported by ambulance to a hospital and was pronounced deceased approximately seven hours after the incident. The child occupant was transported to a hospital, where she was admitted for treatment of hypothermia. The second witness was transported by ambulance to a hospital. The Pontiac was completely submerged in the pond and was recovered the following day. It was towed to police impound, where it was inspected for this SCI investigation.

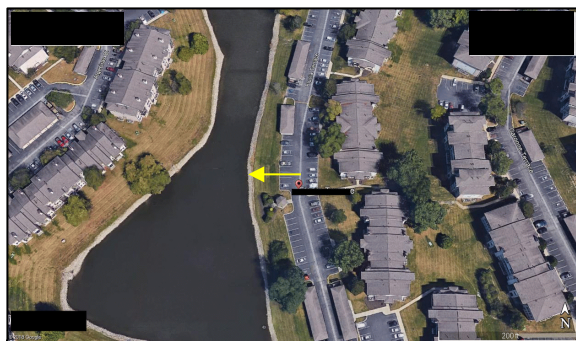
Through the course of the investigation, it was determined that the transmission shift cable was out-of-adjustment, which gave the child the ability to shift the vehicle from the Park position to Neutral without the ignition key and without applying the brake pedal.

## SUMMARY

### *Incident Site*

This incident occurred during the afternoon hours in an apartment complex parking lot (**Figure 2**). At the time of the incident, the weather conditions were clear with east winds at 23 km/h (14 mph) and an ambient temperature of 6.1 °C (43 °F), according to local weather reports.

A rendering of the incident site was created from satellite imagery. The apartment complex parking lot had one row of parking spaces facing east toward the apartment buildings and another row facing west, toward the pond. A parking lot access roadway traversed in a north/south direction between the two rows of parking spaces. The parking lot grade was -5.4% toward the pond, and a grass-surfaced embankment sloped downward from the parking lot to the retention pond. A mountable-type concrete curb bordered the west edge of the asphalt surfaced parking lot. The pond was located approximately 15 m (50 ft) west of the parking lot and was estimated to be 7.6 m (25 ft) deep with a water temperature of approximately 1.6 °C (35 °F). The incident diagram is included at the end of this report.



**Figure 2.** Satellite view of incident scene and apartment complex and path of the vehicle.

### *Pre-Incident*

Based on information from the police incident report, media reports, and interaction with the investigating police officer, the following occurred prior to the incident: The 24-year-old male driver of the Pontiac (father of the 3-year-old child occupant) drove the vehicle into the parking lot and parked the Pontiac in one of the east-facing parking spaces. As he exited the vehicle, the driver removed the ignition key from the Pontiac and began a conversation with a 27-year-old witness in the parking lot who was positioned one parking space away from the Pontiac. While engaged in the conversation, the driver was holding the key chain in his hand.

The 3-year-old child occupant also got out of the vehicle, but her father instructed her to get back in the vehicle. She apparently entered the left front door and sat in the driver's position.

### *Incident*

The first witness stated in the police report that the child climbed into the driver's seat and apparently shifted the console-mounted transmission shift lever from the Park-position. The vehicle began to roll backward in a westerly direction across the parking lot for a distance of 13 m (43 ft). The Pontiac overrode the mountable concrete curb and rolled 15 m (50 ft) down the grassy embankment into the pond (**Figure 3**). The father and the first witness both ran after the vehicle. Reportedly, neither the father nor the witness knew how to swim, but both went into the water to rescue the child from the vehicle. The first witness returned back to the east shore of the pond while the father removed the child from the vehicle.

A second witness, a 30-year-old male, was seated on his balcony on the west side of the retention pond, approximately 110 m (360 ft) away from the parked vehicle. This second witness heard the commotion and ran down to the pond to assist. He stated that by the time he arrived at the pond, the vehicle was already submerged. This witness entered the water and swam to the father, who was holding the child. He was able to take the child from the father and swam back to the west bank of the pond with the child occupant. At this time, the police had arrived on-scene and were standing by to render aid. The second witness handed the child to the police. This witness went back into the water in an attempt to assist the father, but due to the low temperature of the water, returned back toward shore and was pulled from the water by the police. The father did not return to shore and submerged under the water.



**Figure 3.** Initial location of the Pontiac and trajectory toward the pond.

### ***Post-Incident***

The police were notified of the incident at 1637 hours and arrived on-scene at 1641 hours. Rescue and medical personnel also responded. The police removed the child’s wet clothing, wrapped her in a coat, and placed her in a police car. The Pontiac’s ignition key and key chain were found on the east grass embankment during the police investigation. It was theorized that the driver dropped them as he ran into the pond to rescue the child.

The father was retrieved by police divers and was transported by ambulance to a local hospital, where he was pronounced deceased approximately seven hours post-incident. The child sustained police reported “A-level” (incapacitating) injuries and was transported by ambulance to a children’s hospital for treatment of hypothermia. The second witness was also transported by ambulance to a hospital for evaluation and treatment for exposure. The Pontiac was retrieved from the water the next morning and towed to police impound, where it was inspected for this investigation.

## **2008 PONTIAC G6**

### ***Description***

The Pontiac G6 was a front-wheel-drive, 4-door sedan with the Vehicle Identification Number 1G2ZG57B484xxxxxx, manufactured in January 2008, and equipped with the SE trim package. The Pontiac was powered by a transverse-mounted, 2.4 liter, I-4 engine, linked to a 4-speed automatic transmission with a console-mounted shift lever. The vehicle’s specified wheelbase was 285 cm (112.2 in). Standard features included 4-wheel disc brakes with antilock, electronic brake force distribution, and traction control. Vehicle manufacturer recommended tire size was P225/50R17. The Pontiac was equipped with tires of the recommended size, mounted on 5-spoke alloy wheels.

The interior of the Pontiac (**Figure 4**) was configured with front row bucket seats with a fixed center console and a second row bench seat for seating of three occupants. The transmission

selector was located in the center console. Manual seat belts were available for all five seating positions. The Pontiac was equipped with a Certified Advanced 208-Compliant frontal air bag system that consisted of dual-stage driver's and passenger's seat frontal air bags, front row seat belt pretensioners, front-seat-mounted side impact air bags and inflatable curtain air bags.

### ***Exterior Damage***

There was no physical exterior damage associated to the Pontiac from the submergence into the pond. The right plane was abraded and scratched vertically from the tow and removal process from the pond.



**Figure 4.** Left view of the Pontiac interior.

### ***Event Data Recorder***

The Pontiac's EDR was imaged with version 17.7 of the Bosch Crash Data Retrieval software and was reported with version 19.4.1. External electrical power was applied to the fuse block to image the data via the diagnostic link connector. No events were reported as the ignition was in the "Off" position. The Bosch software did not support collection of General Motors powertrain control module (PCM) data and a proprietary scanning tool was necessary for collection of this data. The GM engineer determined that extensive water damage to the module prevented imaging the PCM with the General Motors scanning tool. The EDR report is attached at the end of this report as **Appendix A**.

### ***Interior Damage***

The interior of the Pontiac was water-soaked due to the submergence. There was no deployment of the supplemental restraint systems or any damage.

### ***NHTSA Recalls and Investigations***

A search of the NHTSA database in June 2020 by VIN ([safercar.gov](http://safercar.gov)) for potential open recalls revealed two open recalls for the involved 2008 Pontiac G6. The recalls are as follows.

*NHTSA Recall Number 12V460*, Manufacturer Recall Number N120106; Date: September 18, 2012. This recall was for Pontiac G6 vehicles equipped with 4-speed automatic transmissions. On these vehicles, the tabs on the transmission end of the shift cable end may fracture and separate. If the tabs were to fracture and separate, the shift lever and the actual position of the transmission gear may not match. The driver would be able to move the shifter to Park and remove the ignition key, but the transmission gear may not be in Park. The vehicle may not be able to be restarted and the vehicle could roll away after the driver has exited the vehicle, resulting in a possible crash without prior warning.

*NHTSA Recall Number 14V252*, Manufacturer Recall Number N130036; Date: May 14, 2014. This recall pertains to the involved vehicles, such that over time, an increase resistance can develop in the body control module (BCM) connection system and result in voltage fluctuations or intermittency in the brake apply sensor circuit that can cause service brake lamp malfunction.

As a result, the brake service lamps may illuminate when the service brakes are not being applied, or may not illuminate when the service brakes are being applied. Additionally, cruise control may not engage. If cruise control is engaged, additional service brake pedal travel may be required to disengage it. Service brake pedal application may not be required to move the shift lever out of Park. Traction control, electronic stability control, and panic braking assist features, if equipped, may be disabled. Service ESC and/or traction control tell-tales may illuminate with this condition.

A CARFAX report was obtained for this vehicle and showed that there were two General Motors recalls. The first #2012106, issued in December 2012, stated, "Shift lever indicator may not display correct gear." The second #2013036, issued August 2014, stated, "Brake lamp malfunction." The CARFAX report did not indicate any repair procedures involving these recalls.

### ***Transmission Shift Cable Discussion***

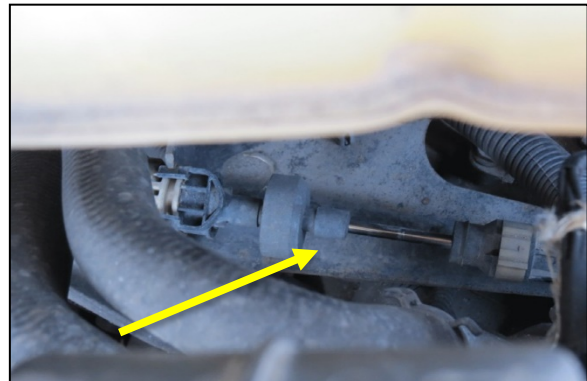
The Pontiac inspection was conducted in conjunction with an engineer from General Motors. No abnormalities were noted to the transmission selector cable in the engine compartment (**Figure 5**). However, when examined, with the ignition switch in the Lock position and the key removed from the switch, the gear shift lever was able to be moved from the Park position.

Further inspection revealed that the Park lock cable was loose and out-of-adjustment (**Figure 6**). When taut, this cable prevents movement of the shift lever. When the ignition switch is then turned from the Lock position to On or Run, the tautness of the cable is released. Since this cable was in a loose position, movement of the shift lever was possible with the ignition switch in the Lock position.

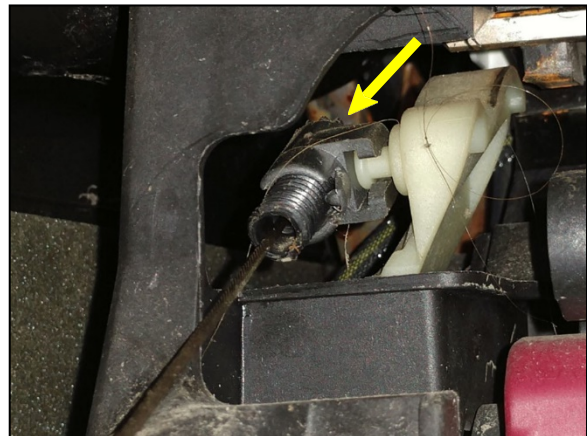
The police removed the Pontiac from the pond the morning after the incident, and their inspection found the gear shift lever in the Neutral position. The first witness stated to the police that the child "placed the vehicle in gear." It was theorized that the child was able to shift the vehicle from Park to Neutral without the ignition key and without an application of brake pedal.

### ***Occupant Data***

The Pontiac's occupant was a 3-year-old female (unknown height/weight) who was unbelted at the time of the incident. She was transported by ambulance to a hospital and treated for hypothermia. Further injury and treatment status is unknown.



**Figure 5.** Intact transmission selector cable in the engine compartment.



**Figure 6.** Loose park lock cable. Adjustment is in the back of the attachment point.

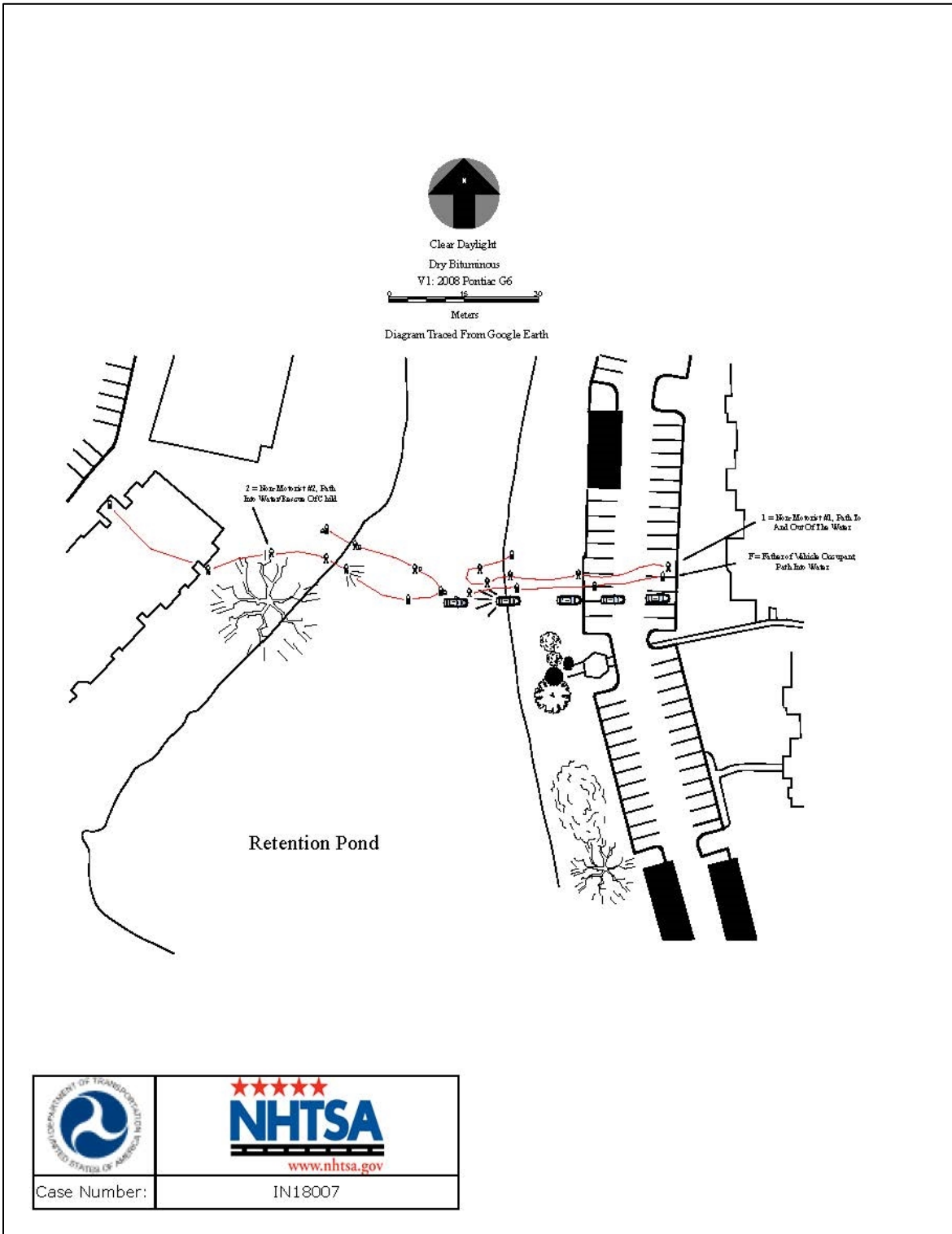
***Non-Motorist Data***

Non-motorist #1 was a 24-year-old male who was the father of the child. He ran after the rolling vehicle and entered the water to rescue his daughter from the vehicle. He drowned in his rescue effort and his body was retrieved by police divers. He was transported by ambulance to a hospital and was pronounced dead seven hours after arrival.

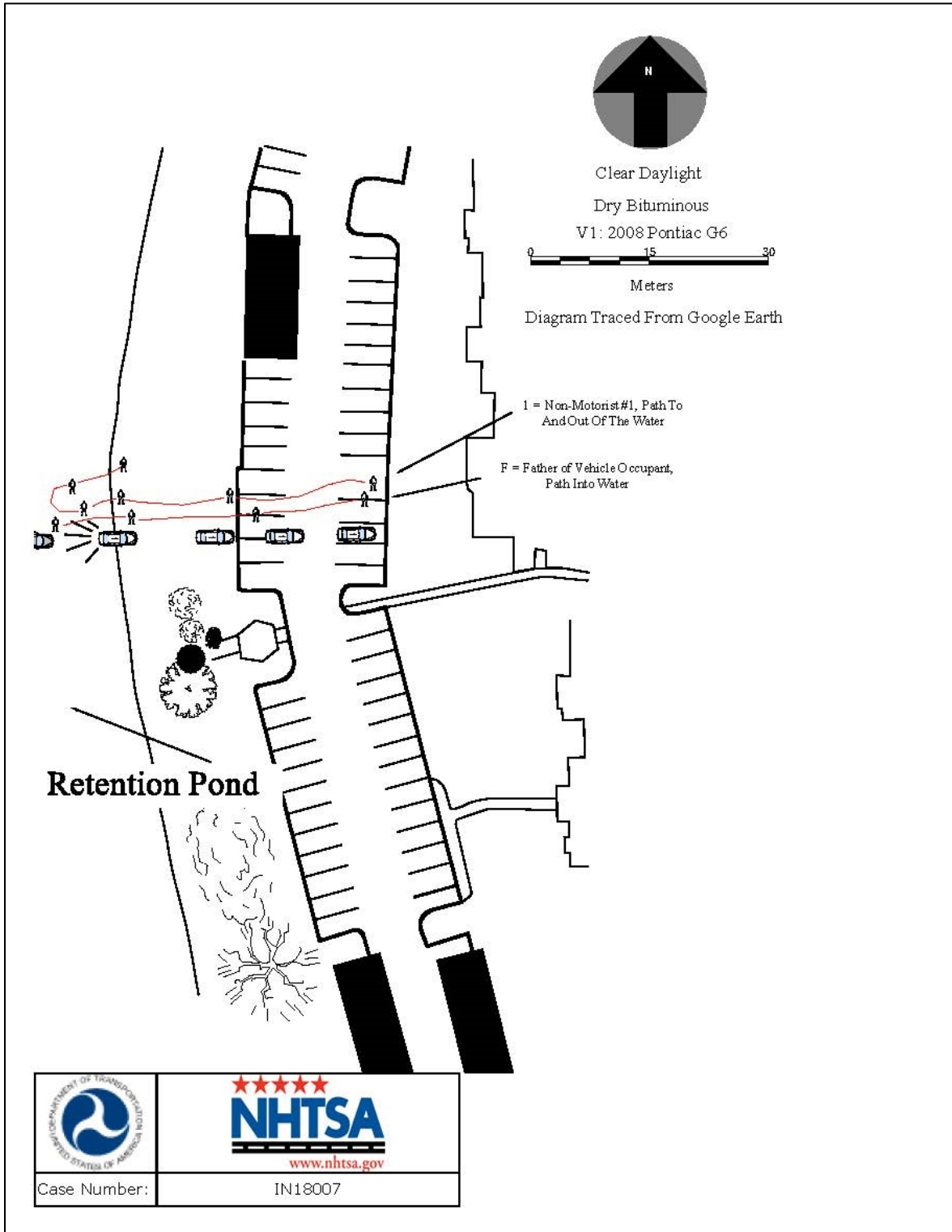
Non-motorist #2 was a 27-year-old male who also ran after the vehicle and entered the pond. He was not able to reach the vehicle and went back to the east bank of the pond. His injury and treatment statuses are unknown.

Non-motorist #3 went into the pond from the west bank and grabbed the child from the father, who had pulled her from the vehicle. He brought the child to the west bank, where police and rescue personnel were waiting to render further aid. He attempted to go back into the water to rescue the father but was unable to reach him. He was transported by ambulance to a hospital. His injury and treatment statuses are unknown.

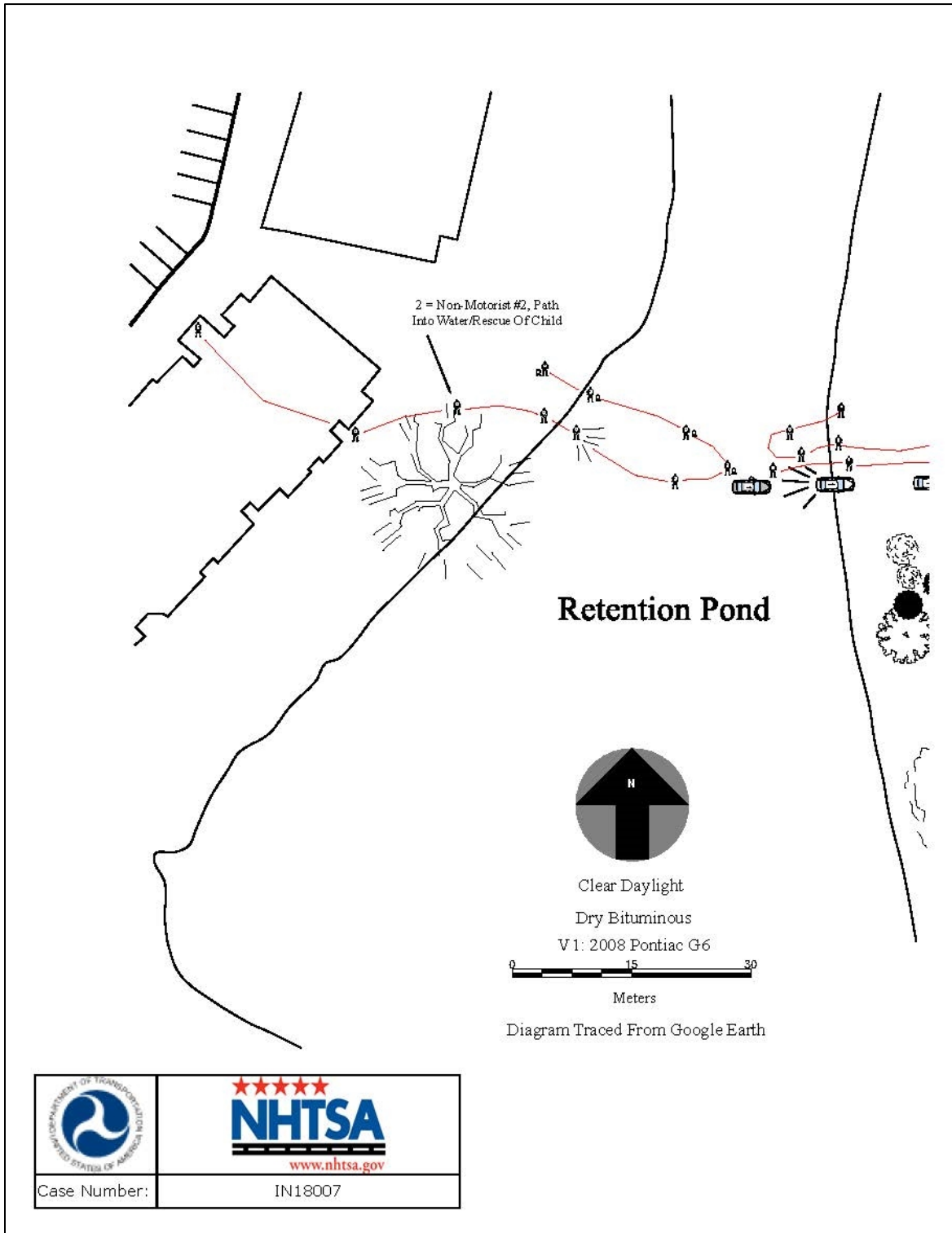
# INCIDENT DIAGRAM (Full View)



# INCIDENT DIAGRAM (East Half)



# INCIDENT SCENE (West Half)



## **APPENDIX A: Event Data Recorder Report for 2008 Pontiac G6<sup>1</sup>**

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<sup>1</sup> The EDR report contained in this technical report was imaged using the current version of the Bosch CDR software at the time of the vehicle inspection. The CDR report contained in the associated Crash Viewer application may differ relative to this report.

**IMPORTANT NOTICE:** Robert Bosch LLC and the manufacturers whose vehicles are accessible using the CDR System urge end users to use the latest production release of the Crash Data Retrieval system software when viewing, printing or exporting any retrieved data from within the CDR program. Using the latest version of the CDR software is the best way to ensure that retrieved data has been translated using the most current information provided by the manufacturers of the vehicles supported by this product.

### CDR File Information

User Entered VIN	1G2ZG57B484*****
User	
Case Number	
EDR Data Imaging Date	05/01/2018
Crash Date	
Filename	18007.CDRX
Saved on	Tuesday, May 1 2018 at 10:44:04
Imaged with CDR version	Crash Data Retrieval Tool 17.7
Imaged with Software Licensed to (Company Name)	NHTSA
Reported with CDR version	Crash Data Retrieval Tool 19.4.1
Reported with Software Licensed to (Company Name)	NHTSA
EDR Device Type	Airbag Control Module
Event(s) recovered	None

### Comments

No comments entered.

### Data Limitations

#### Recorded Crash Events:

There are two types of recorded crash events. The first is the Non-Deployment Event. A Non-Deployment Event records data but does not deploy the air bag(s). The minimum SDM Recorded Vehicle Velocity Change, that is needed to record a Non-Deployment Event, is five MPH. A Non-Deployment Event may contain Pre-Crash and Crash data. The SDM can store up to one Non-Deployment Event. This event can be overwritten by an event that has a greater SDM recorded vehicle velocity change. This event will be cleared by the SDM, after approximately 250 ignition cycles. This event can be overwritten by a second Deployment Event, referred to as Deployment Event #2, if the Non-Deployment Event is not locked. The data in the Non-Deployment Event file will be locked, if the Non-Deployment Event occurred within five seconds of a Deployment Event. A locked Non Deployment Event cannot be overwritten or cleared by the SDM. The second type of SDM recorded crash event is the Deployment Event. It also may contain Pre-Crash and Crash data. The SDM can store up to two different Deployment Events. If a second Deployment Event occurs any time after the Deployment Event, the Deployment Event #2 will overwrite any non-locked Non-Deployment Event. Deployment Events cannot be overwritten or cleared by the SDM. Once the SDM has deployed an air bag, the SDM must be replaced.

#### Data:

-SDM Recorded Vehicle Velocity Change reflects the change in velocity that the sensing system experienced during the recorded portion of the event. SDM Recorded Vehicle Velocity Change is the change in velocity during the recording time and is not the speed the vehicle was traveling before the event, and is also not the Barrier Equivalent Velocity. For Deployment Events, the SDM can record up to 220 milliseconds of data after Deployment criteria is met and up to 70 milliseconds before Deployment criteria is met. For Non-Deployment Events, the SDM can record up to the first 300 milliseconds of data after algorithm enable. Velocity Change data is displayed in SAE sign convention.

-The CDR tool displays time from Algorithm Enable (AE) to time of Deployment command in a Deployment event and AE to time of maximum SDM recorded vehicle velocity change in a Non-Deployment event. Time from AE begins when the first air bag system enable threshold is met and ends when Deployment command criteria is met or at maximum SDM recorded vehicle velocity change. Air bag systems such as frontal, side, or rollover, may be a source of an enable. The time represented in a CDR report can be that of the enable of one air bag system to the Deployment time of another air bag system.

-Maximum Recorded Vehicle Velocity Change is the maximum square root value of the sum of the squares for the vehicle's combined "X" and "Y" axis change in velocity. If a CDR Printout user were to calculate resultant velocity change using X and Y axis time history data, the calculated value may be different than the Maximum SDM Recorded Velocity Change parameter value displayed in the CDR report. This is due to the rounding that occurs within the SDM while calculating the Maximum SDM Recorded Velocity Change value.

-Event Recording Complete will indicate if data from the recorded event has been fully written to the SDM memory or if it has been interrupted and not fully written.

- SDM Recorded Vehicle Speed accuracy can be affected by various factors, including but not limited to the following:
  - Significant changes in the tire's rolling radius
  - Final drive axle ratio changes
  - Wheel lockup and wheel slip
- Brake Switch Circuit Status indicates the open/closed state of the brake switch circuit.
- Pre-Crash data is recorded asynchronously. The 1.0 second Pre-crash data value (most recent recorded data point) is the data point last sampled before AE. That is to say, the last data point may have been captured just before AE but no more than 1.0 second before AE. All subsequent Pre-crash data values are referenced from this data point.
- Pre-Crash Electronic Data Validity Check Status indicates "Data Invalid" if:
  - The SDM receives a message with an "invalid" flag from the module sending the pre-crash data
  - No data is received from the module sending the pre-crash data
  - No module is present to send the pre-crash data
- Vehicle speed, Transmission Gear Select, and Transmission Actual Gear will be marked as invalid for manual transmission vehicles
- Pre-crash data associated with this event will always be for the first event even if it is not recorded.
- Driver's and Passenger's Belt Switch Circuit Status indicates the status of the seat belt switch circuit, except: The Passenger Belt Switch Circuit Status for 2005 vehicles is available only on the Cadillac STS. The Passenger Belt Switch Circuit Status for 2006 Chevrolet Cobalt Sport Coupe (AP) model vehicles, with the option package that includes Recaro brand seats (RPO ALV), always reports a default value of "Buckled," because there is no passenger belt switch with the Recaro seat option. The Passenger Belt Switch Circuit Status for 2010 Chevrolet Cobalt and 2010 Pontiac G5 vehicles, with RPO Z49, will report a default value of "Buckled". The Passenger Belt Switch Circuit Status for 2010 and 2011 Chevrolet HHR, with the LS or LT trim package and RPO Z49, will report a default value of "Buckled".
- The Time Between Non-Deployment to Deployment Events is displayed in seconds. If the time between the two events is greater than five seconds, "N/A" is displayed in place of the time. If the value is negative, then the Deployment Event occurred first. If the value is positive, then the Non-Deployment Event occurred first. Time Between events is measured from end of one event to the beginning of a next event. An event may occur within 5 seconds of another event, known as an extended event. This occurs when three or more sequential events are separated by more than 5 seconds but each event in the sequence is no more than 5 seconds apart from a subsequent event. Pre-crash data is locked to the first event in an extended event.
- If power to the SDM is lost during a crash event, all or part of the crash record may not be recorded.
- The ignition cycle counter relies upon the transitions through OFF->RUN->CRANK power-moding messages, on the GMLAN communication bus, to increment the counter. Applying and removing of battery power to the module will not increment the ignition counter.
- Steering Wheel Angle data is reported in 16 degree increments. 2005 through 2010 Chevrolet Cobalt, 2005 and 2006 Pontiac Pursuit, 2007 through 2010 Pontiac G5, and 2006 through 2011 Chevrolet HHR, do not record Steering Wheel Angle data and should not be relied upon.
- If more than one event is recorded, use the follow to determine which event the Multiple Event Data is associated with:
  - If a Deployment event and not locked Non-Deployment event are recorded, the Multiple Event Data is associated with the Deployment event.
  - If a Deployment event and a locked Non-Deployment event are recorded, then the Multiple Event Data is associated with both events.
  - If a Deployment event and Deployment event #2 are recorded, then the Multiple Event Data is associated with both events.
- All data should be examined in conjunction with other available physical evidence from the vehicle and scene.

**Data Source:**

- All SDM recorded data is measured, calculated, and stored internally, except for the following:
  - Vehicle Status Data (Pre-Crash) is transmitted to the SDM, by various vehicle control modules, via the vehicle's communication network.
  - The Belt Switch Circuit is wired directly to the SDM.

**Data Element Sign Convention:**

The following table provides an explanation of the sign notation for data elements that may be included in this CDR report. Directional references to sign notation are all from the perspective of the driver when seated in the vehicle facing the direction of forward vehicle travel.

Data Element Name	Positive Sign Notation Indicates
Longitudinal Velocity Change	Forward
Lateral Velocity Change	Left to Right
Lateral Acceleration	Left to Right
Yaw Rate	Clockwise *
Steering Wheel Angle	Clockwise *

\*For Cadillac STS model vehicles with StabiliTrak 3.0 systems (RPO JL7), the positive sign notation Indicates a counterclockwise rotation.

**Hexadecimal Data:**

Data that the vehicle manufacturer has specified for data retrieval is shown in the hexadecimal data section of the CDR



report. The hexadecimal data section of the CDR report may contain data that is not translated by the CDR program. The control module contains additional data that is not retrievable by the CDR tool.

01016\_SDMEps\_r011



## Hexadecimal Data

```
$01 08 00 00 00 00 00 00
$02 30 00 00 00 00 00 00
$03 00 00 00 00 00 00 00
$04 00 00 00 00 00 00 00
$05 00 00 00 00 00 00 00
$06 00 0A 00 03 0A 00 00
$07 00 20 00 00 00 00 00
$08 00 00 00 00 00 00 00
$09 00 00 00 00 00 00 00
$0A 00 00 00 00 00 00 00
$0B 00 00 0F 0F 03 00 00
$0C 00 00 00 00 00 00 00
$0D 00 00 40 00 00 00 00
$0E 00 00 00 00 00 00 00
$0F 00 00 00 00 00 00 00
$10 00 00 00 00 00 00 00
$11 00 00 00 00 00 00 00
$12 00 00 00 00 00 00 00
$13 00 00 00 00 00 00 00
$14 00 00 00 00 00 00 00
$15 00 00 00 00 00 00 00
$16 03 06 0C 16 34 00 00
$17 00 00 00 00 00 00 00
$18 00 00 00 00 00 00 00
$19 00 00 00 00 00 00 00
$1B FF 30 00 67 00 7A 00
$1C FF 30 00 66 00 1A 00
$1D 00 00 00 00 00 00 00
$1E 00 00 00 00 00 00 00
$1F 28 00 00 00 00 00 00
$20 40 00 00 00 00 00 00
$21 00 00 00 00 F0 00 00
$22 00 93 00 00 00 00 00
$24 00 00 00 00 00 00 00
$25 00 00 00 00 00 00 00
$26 00 00 00 00 00 00 00
$27 FF 00 FF 00 00 00 00
$2A 00 00 00 00 00 00 00
$2B 00 00 00 00 00 00 00
$2D 00 00 00 00 00 00 00
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$31 FF FF FF FF FF 80 00
$32 F8 80 FF 80 00 00 00
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$B8 44 45 84 01 11
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$DB 00 00
$DC 00 00
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DOT HS 813 085  
September 2021 (revised)



U.S. Department  
of Transportation  
**National Highway  
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14940-090921-v6