



Stopped School Bus Drive-By Pilot Report



CrossSafeTM
by Teknisult 

BusSafe2Cross
by Teknisult 

Stopped School Bus Drive-By Pilot Report

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Objective:

- To determine the level of improvement to student safety around stopped school buses with reduced Drive-Bys through awareness and enforcement.
- To determine the level of violations around a stopped school bus.
- To compare the level of drive-bys between Rural and Urban settings.
- To develop factual and hypothesized conclusions on the results of this pilot.

Background:

- Teknisult invented and designed stop bus video technologies for use on Canadian school buses based on requests from Canadian School Division Transportation Departments.
- Teknisult has been an IT and computer networking company since 1984.
- Teknisult has been developing and producing school bus video technologies since 2004.
- Teknisult holds patents and IPs on our school bus and traffic video technologies designed for commercial Canadian environments.
- Teknisult school bus video technologies and video formats are evidence quality commercial grade systems.
- We ran 18 - 30 day proof of concept pilot tests in 2010-2011 with zero failures.
- Teknisult sponsored this 4 month enforceable pilot to collect data on the nature of drive-bys and how to improve student safety through awareness and enforcement.
- Teknisult is a design, development and supply company for school bus safety video solutions across Canada.
- Teknisult implements and manages enforceable stopped school bus programs with a focus on public awareness to reduce illegal drive-bys and return respect for School Bus and the extended flashing stop sign.

Pilot Data Collection:

- We offered to perform this data collecting pilot at no cost to school divisions across Canada.
- We installed our CrossSafe (BusSafe2Cross) stopped bus video systems on 10 school buses across Manitoba, Saskatchewan and Alberta.



- We completed the installation of the equipment on the designated school buses and presented a secure data collecting process and timelines to all school divisions involved in this pilot.
- We recorded violations when the stopped school bus had its stop sign extended and a vehicle (or vehicles) passed the stopped school bus.
- We collected and viewed every video for every time each school bus stopped and extended the stop sign.
- We collected and documented a wide variety of data from these videos.
- We created a DVD and paper copy of each valid violation and submitted to the appropriate school division. Each DVD contained a single violation video; a still image with GPS located map and a still image of the license plate.
- The school division submitted these DVD's as an attachment to the bus driver report and paper copies of the license plate image to their local law enforcement office in a cooperative manner.
- The DVD and the enclosed video is used as supporting evidence to further the investigation in order to process the violation into a ticket, warning or disregarded by the local law enforcement agency.

Topical Points:

- Teknisult investment to complete this 4 month pilot on 10 buses; \$32,750.
- Cost to school divisions; travel costs at par (only if required)
- Total number of stopped bus videos collected; 20,422
- Total number of stops where vehicles were present; 3704
 - Where there were no vehicles present, there was no potential for a violation.
- Total number of violations counted; 423
- Total number of violation DVD's processed and submitted; 240
- Probability to offend on an Urban school bus route; 7.1%
- Probability to offend on a Rural school bus route; 2.9%
- Law enforcement agencies involved in this pilot; 5
- School Divisions participating in this pilot; 5
- Number of participating school buses; 10
 - 7 – Manitoba, 1 - Saskatchewan, 2 - Alberta.
- Pilot length; 4 months (64 school days)



Next Steps for Teknisult:

- Create an effective public awareness program in cooperation with School Division Transportation Departments, Law Enforcement, Municipal and Provincial Governing bodies, Insurance Agencies, Media and others.
- Develop and implement an education program for vehicle drivers, bus drivers and students to clarify their respective roles in School Bus Student Safety.
- Improve and/or automate the violation/warning management process.
- Coordinate long term stopped school bus safety programs.
- Continue to provide cost effective evidence quality video solutions for school buses across Canada.
- Work with School Division Transportation Departments to implement product and program improvements learned from this pilot.



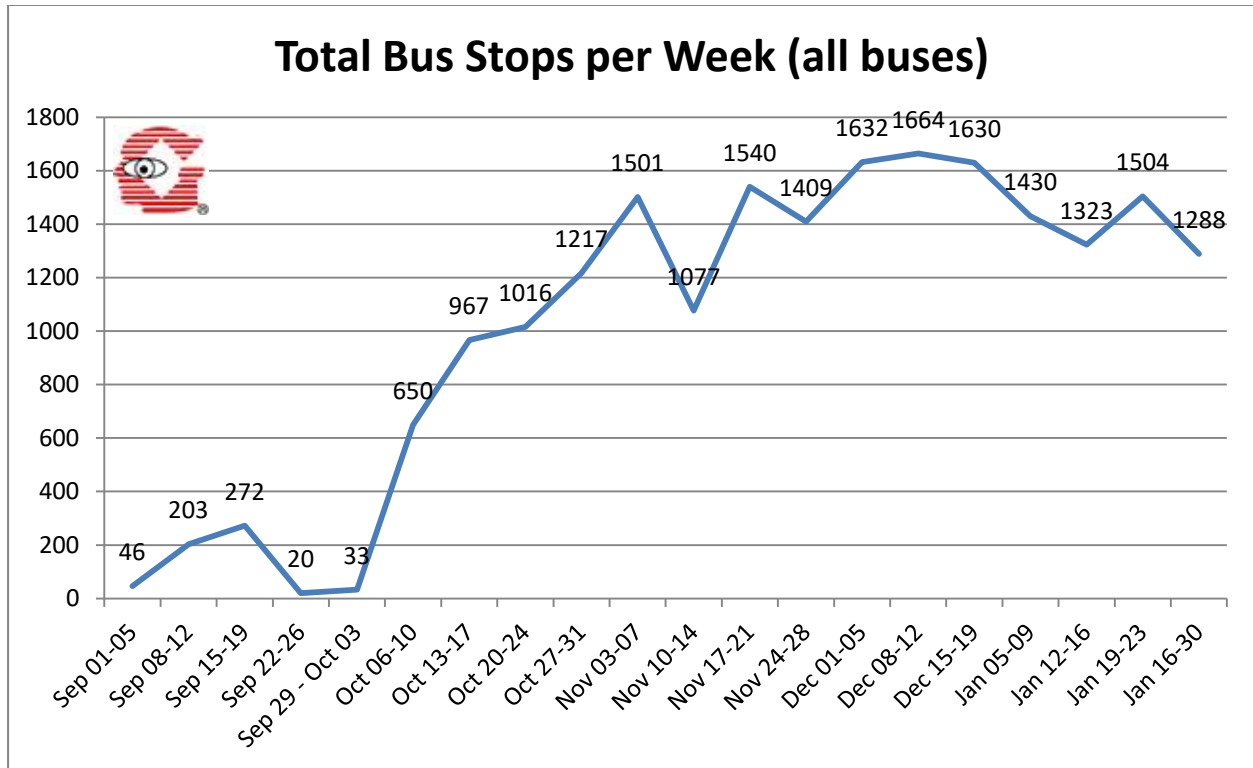
Hard Data:

Participating School Divisions:

- Seven Oaks School Division – Winnipeg MB – 2 urban participating school buses
- Interlake School Division – Stonewall MB – 4 rural participating school buses
- Brandon School Division – Brandon MB – 1 urban participating school bus
- Saskatchewan River School Division – Prince Albert SK – 1 rural participating school bus
- Black Gold School District – Luduc AB – 2 rural participating school buses

Local Law Enforcement Agencies Assigned to Manage Violation Reports from School Division Transportation Departments:

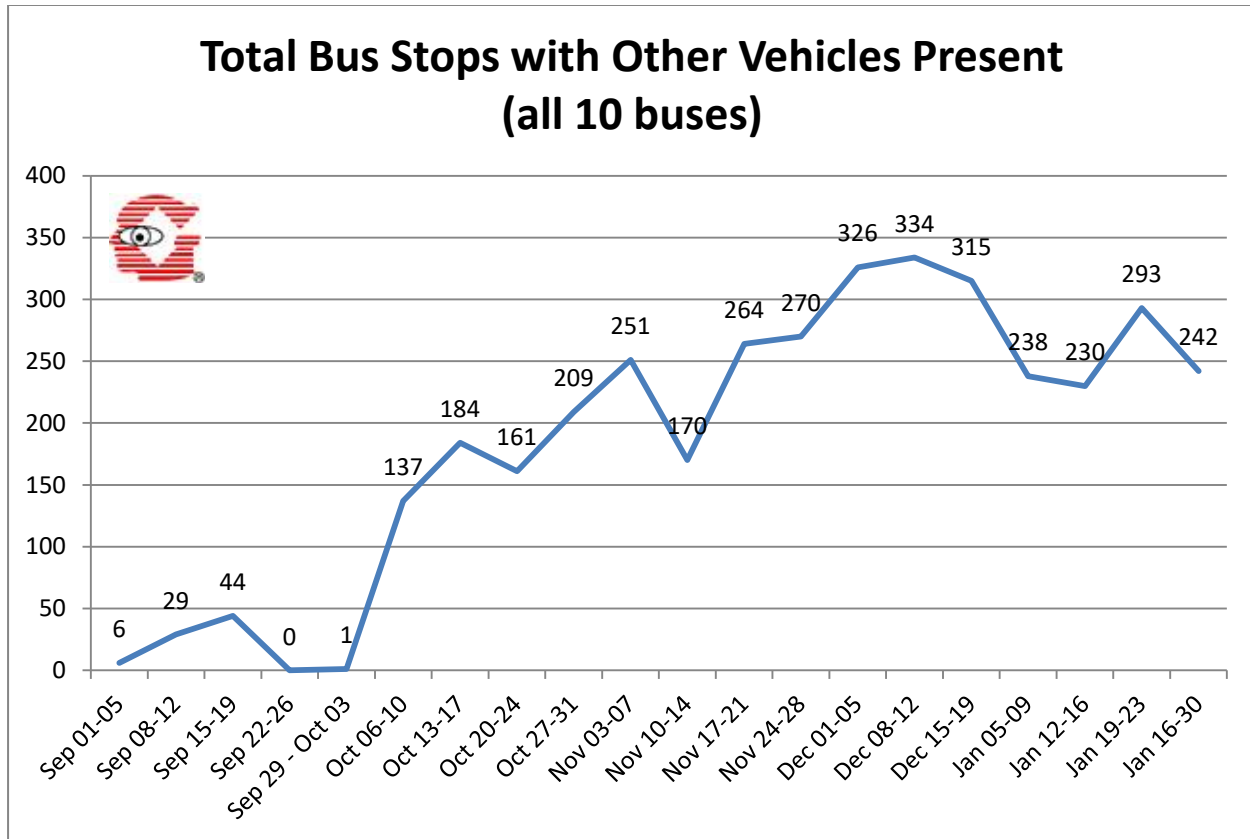
- Winnipeg Police Service
 - R.C.M.P. Stonewall
 - Brandon Police Service
 - R.C.M.P. Prince Albert
 - R.C.M.P. Luduc
-
- Stopped Bus Videos Collected – 20,422
 - Bus Stops with Other Vehicles Present– 3,704
 - Stopped Bus Violations Counted – 423
 - Violation DVD's Submitted – 240
-



Stopped Bus Videos Collected: **20,422**

ISD	46	203	272	20	33	409	559	457	570	715	432	666	477	709	647	678	583	697	638	592	9403
SO	0	0	0	0	0	241	408	397	503	506	419	429	506	520	558	532	540	300	543	363	6765
BSD	0	0	0	0	0	0	0	0	0	0	31	114	142	144	161	85	9	65	72	109	932
SR	0	0	0	0	0	0	0	0	0	85	45	64	68	42	72	77	53	63	72	61	702
BG	0	0	0	0	0	0	0	162	144	195	150	267	216	217	226	258	245	198	179	163	2620

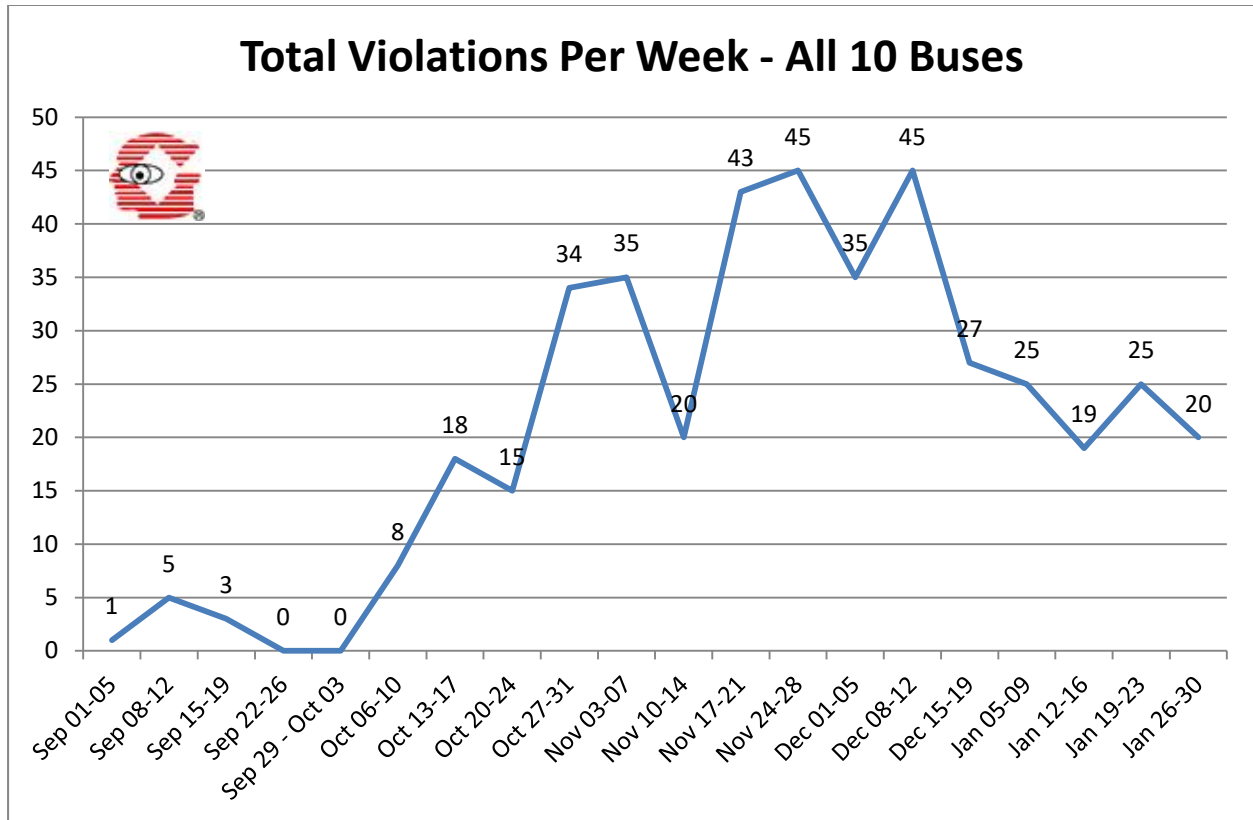
We collected and stored a video for each time a school bus stopped and extended its stop sign. This provided us with valuable data on the nature of traffic around a Stopped Bus and interactions with other vehicles.



Bus Stops with Other Vehicles Present: **3,704**

ISD	6	29	44	0	1	62	61	52	77	75	41	78	56	99	77	100	71	89	82	66	1166
SO	0	0	0	0	0	75	123	97	119	135	104	107	123	143	156	146	146	89	157	102	1822
BSD	0	0	0	0	0	0	0	0	0	0	7	29	47	45	55	21	1	14	23	37	279
SR	0	0	0	0	0	0	0	0	0	21	8	20	21	17	24	28	7	15	17	22	200
BG	0	0	0	0	0	0	0	12	13	20	10	30	23	22	22	20	13	23	14	15	237

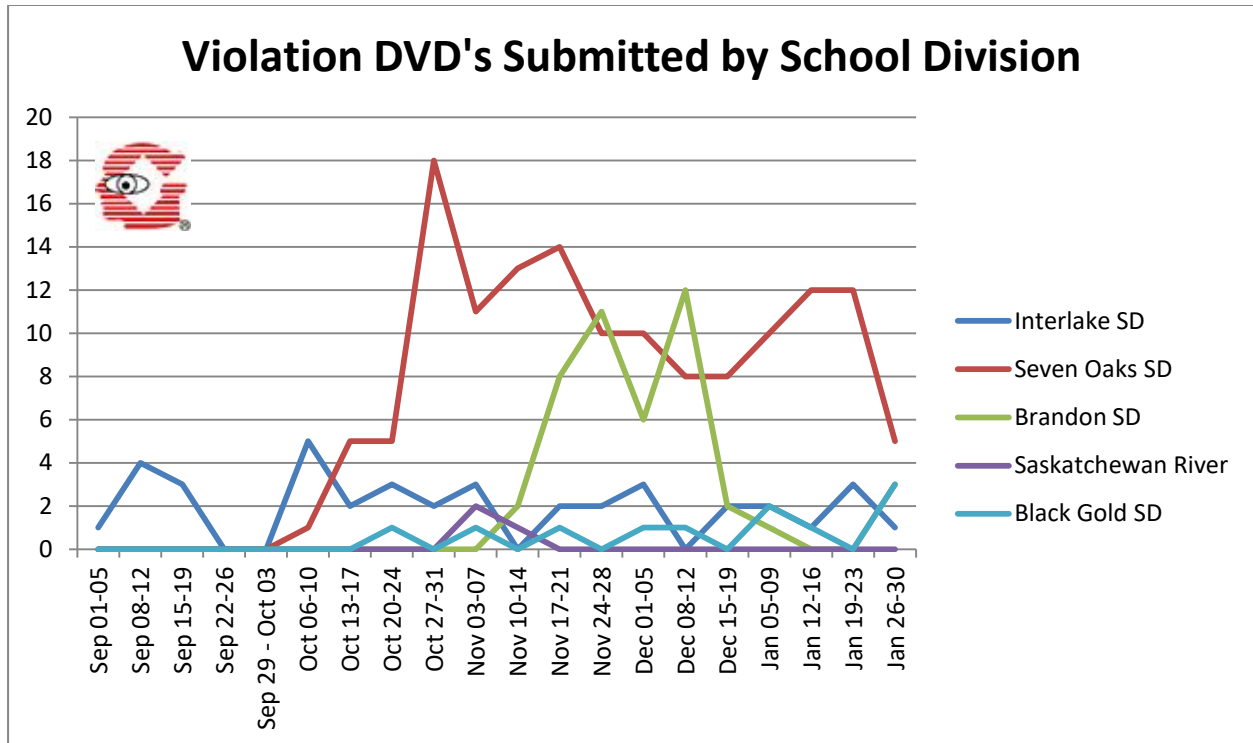
We counted each time the bus stopped with its stop sign extended and other vehicles were present. This gives us the data to calculate the Probability to Offend. As there is a zero possibility to offend when no other vehicles are present, this figure is used to calculate the probability to offend based on the actual number of violations compared to the number of stops where other vehicles were present.



Stopped Bus Violations Counted: **423**

ISD	1	5	3	0	0	5	3	3	2	3	0	2	2	4	2	4	2	1	4	1	47
SO	0	0	0	0	0	3	15	8	31	25	15	21	23	18	20	13	18	15	17	6	248
BSD	0	0	0	0	0	0	0	0	0	0	3	10	14	7	13	3	1	0	0	3	54
SR	0	0	0	0	0	0	0	0	0	2	1	1	2	1	0	0	0	0	0	0	7
BG	0	0	0	0	0	0	0	4	1	5	1	9	4	5	10	7	4	3	4	10	67

This is the actual number of violations recorded on all 10 buses participating in the pilot. We qualified a violation as anytime a vehicle passed the school bus while the school bus was stopped with its stop sign flashing lights activated and stop sign extended.



Violation DVD's Submitted: **240**

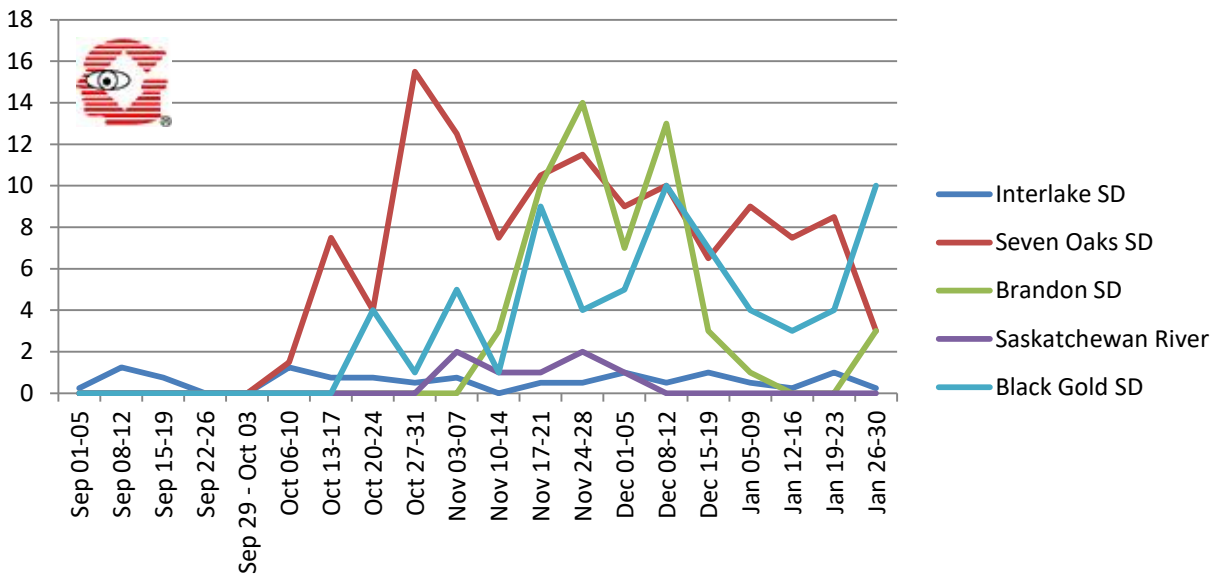
ISD	1	4	3	0	0	5	2	3	2	3	0	2	2	3	0	2	2	1	3	1	39
SO	0	0	0	0	0	1	5	5	18	11	13	14	10	10	8	8	10	12	12	5	142
BSD	0	0	0	0	0	0	0	0	0	0	2	8	11	6	12	2	1	0	0	3	45
SR	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	3
BG	0	0	0	0	0	0	0	1	0	1	0	1	0	1	1	0	2	1	0	3	11

For each enforceable violation, we submitted a DVD containing a full video of the violation, a single frame image of the license plate and a full environment image complete with GPS map and all telemetry information (Bus Number, Time/Date, Longitude/Latitude, GPS Speed, School Division Identifier, OSD of Ambers and Stop Sign activation). We also included paper copies of the License Plate and Environment images.

The School Division then completed a Bus Drivers' Report and delivered the Drivers' reports, the supporting documents and the DVDs to their local Police Agency.



Average Violations Captured Per Bus by School Division



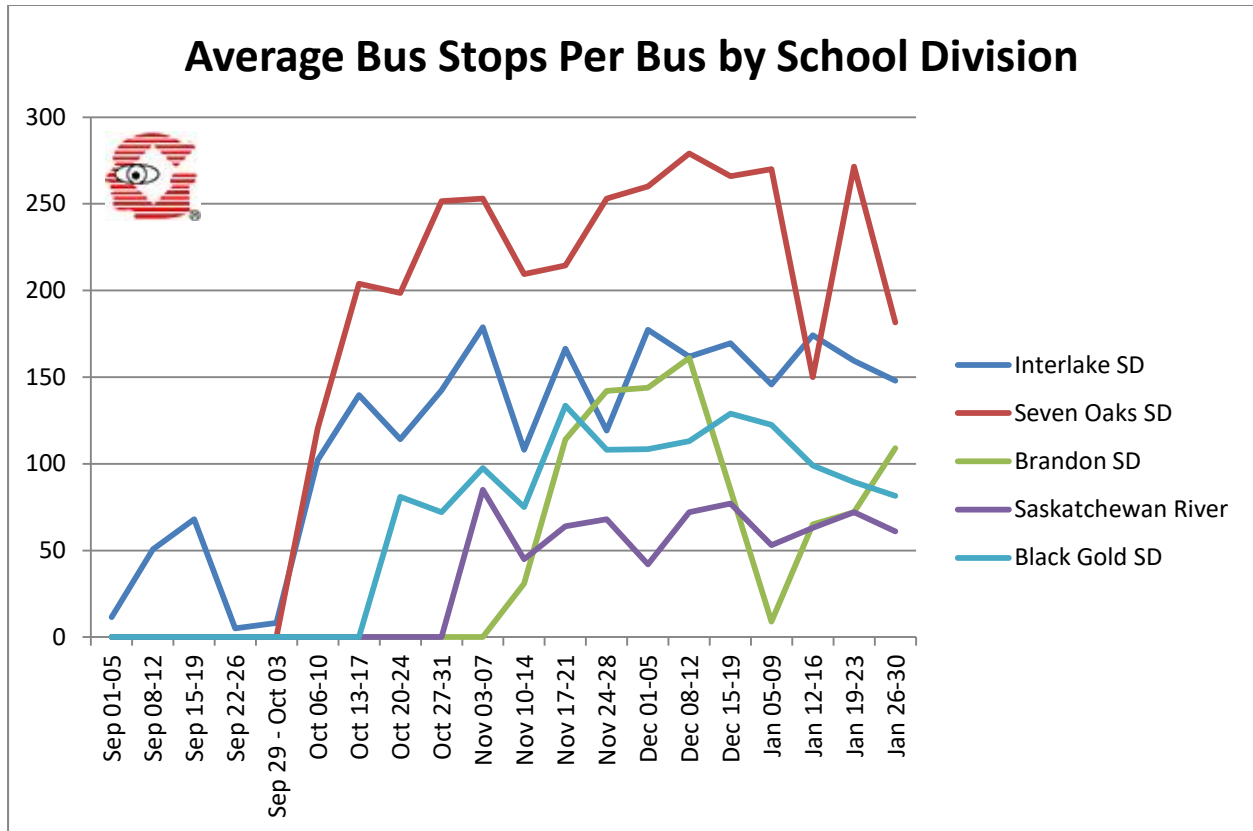
ISD	0.25	1.25	0.75	0	0	1.25	0.75	0.75	0.5	0.75	0	0.5	0.5	1	0.5	1	0.5	0.25	1	0.25	11.75
SO	0	0	0	0	0	1.5	7.5	4	15.5	12.5	7.5	10.5	11.5	9	10	6.5	9	7.5	8.5	3	124
BSD	0	0	0	0	0	0	0	0	0	0	0	3	10	14	7	13	3	1	0	0	54
SR	0	0	0	0	0	0	0	0	0	2	1	1	2	1	0	0	0	0	0	0	7
BG	0	0	0	0	0	0	0	2	0.5	2.5	0.5	4.5	2	2.5	5	3.5	2	1.5	2	5	33.5

The average number of violations per bus per School Division was derived by dividing the total number of violations for that School Division by the number of participating buses.

This shows that School Divisions that worked with cooperative Police Agencies effectively processing violations or warnings had a reduction of violations.

School Divisions that successfully utilized this pilot to improve student safety with reduced drive-bys were: Brandon School Division working with the Brandon Police Service, Black Gold School Division working with the Luduc R.C.M.P. and Saskatchewan River School Division working with the R.C.M.P. Prince Albert.

Interlake School Division working with the Stonewall RCMP found a flat response as the Stonewall RCMP had been regularly processing violations using Teknisult produced videos previous to this pilot. Interlake School Division had 4 rural bus routes contributing to this data.

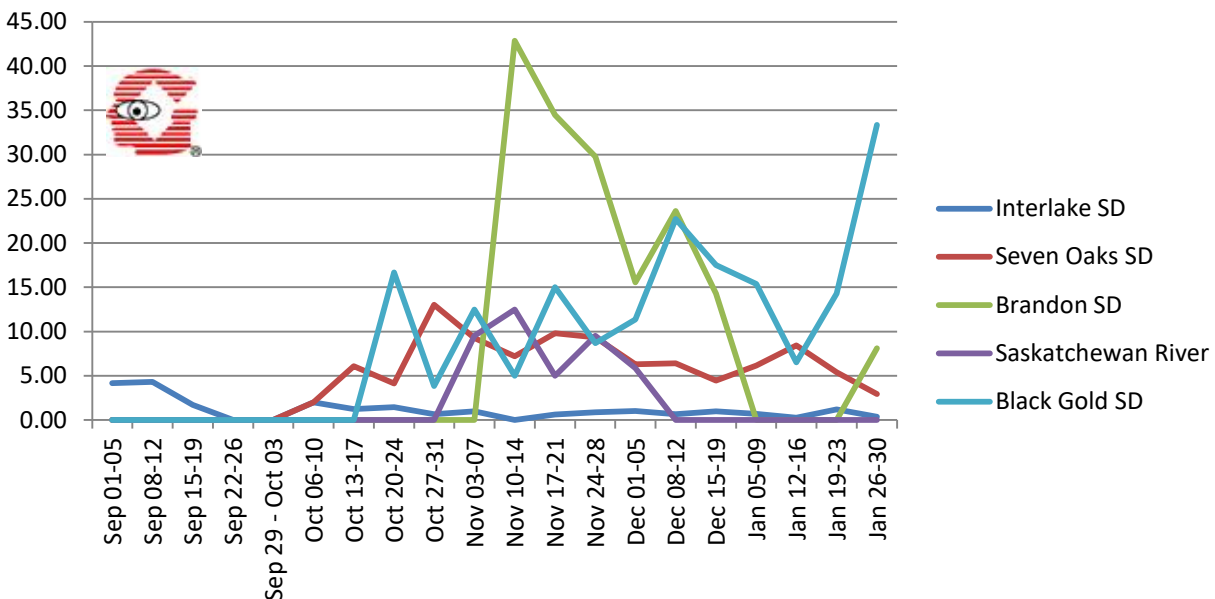


ISD	11.5	50.75	68	5	8.25	102.25	139.8	114.25	142.5	178.8	108	166.5	119.3	177.3	161.8	169.5	145.8	174.3	159.5	148	2350.75
SO	0	0	0	0	0	120.5	204	198.5	251.5	253	209.5	214.5	253	260	279	266	270	150	271.5	181.5	3382.5
BSD	0	0	0	0	0	0	0	0	0	0	31	114	142	144	161	85	9	65	72	109	932
SR	0	0	0	0	0	0	0	0	0	85	45	64	68	42	72	77	53	63	72	61	702
BG	0	0	0	0	0	0	0	81	72	97.5	75	133.5	108	108.5	113	129	122.5	99	89.5	81.5	1310

This represents the average number of times each bus made a stop to pick up or drop off students per week.



Average Per Bus Probability to Offend By School Division

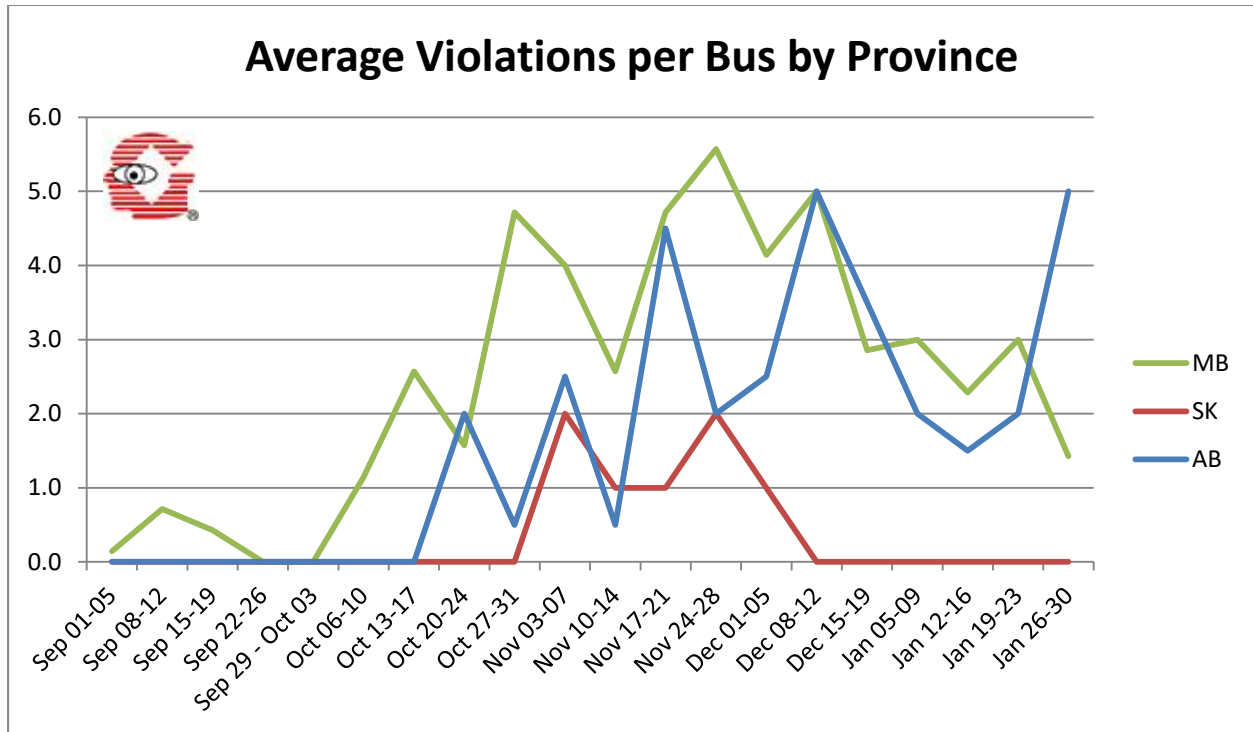


ISD	4.17	4.31	1.7	0	0	2.02	1.23	1.44	0.65	1	0	0.64	0.89	1.01	0.65	1	0.7	0.28	1.22	0.38	23.29
SO	0	0	0	0	0	2	6.1	4.12	13.03	9.26	7.21	9.81	9.35	6.29	6.41	4.45	6.16	8.43	5.41	2.94	100.97
BSD	0	0	0	0	0	0	0	0	0	0	42.86	34.48	29.79	15.56	23.64	14.29	0	0	0	8.11	168.73
SR	0	0	0	0	0	0	0	0	0	9.52	12.5	5	9.52	5.88	0	0	0	0	0	0	42.42
BG	0	0	0	0	0	0	0	16.67	3.85	12.5	5	15	8.7	11.36	22.73	17.5	15.38	6.52	14.29	33.33	182.83

The average probability to offend is calculated by the dividing the number of times the bus stopped where there were other vehicles present by the actual number of violations.

All School Divisions show a reduction of the probability to offend except Seven Oaks. This is due the awareness gained by the cooperative police agencies providing driver awareness by presenting tickets or warnings to violating drivers.

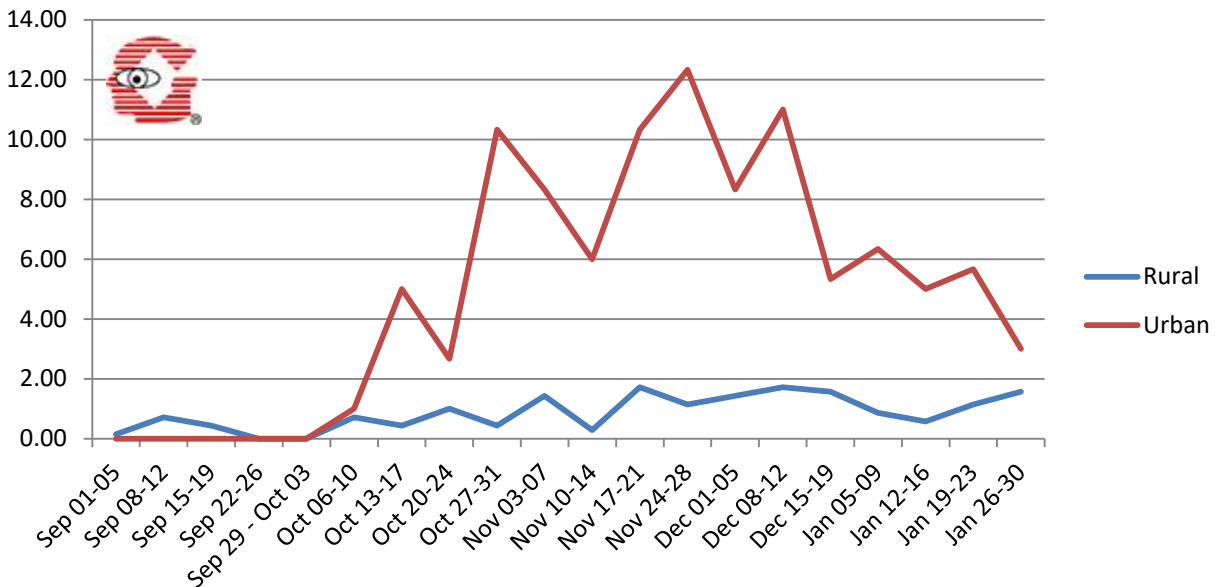
When awareness is not gained due to non-enforcement or lack of warnings, the driving public does not improve or modify their driving behaviors.



The average violations per bus by province is somewhat arbitrary as the inclusion of Urban and Rural bus routes are intermixed. This data does show the pattern for each province and can be synchronized with local driving habits and other provincial influences.



Average Violations per Bus; Rural vs Urban Routes

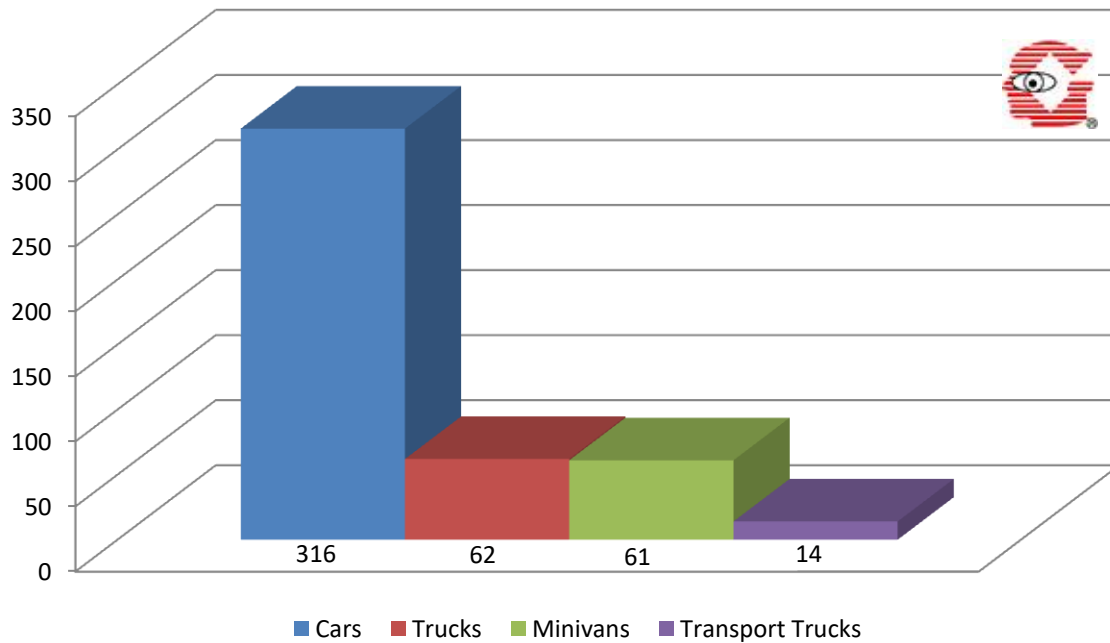


Urba	0	0	0	0	0	1	5	2.67	10.33	8.33	6	10.33	12.33	8.33	11	5.33	6.33	5	5.67	3	100.65
Rura	0.14	0.71	0.43	0	0	0.71	0.43	1	0.43	1.43	0.29	1.71	1.14	1.43	1.71	1.57	0.86	0.57	1.14	1.57	17.27

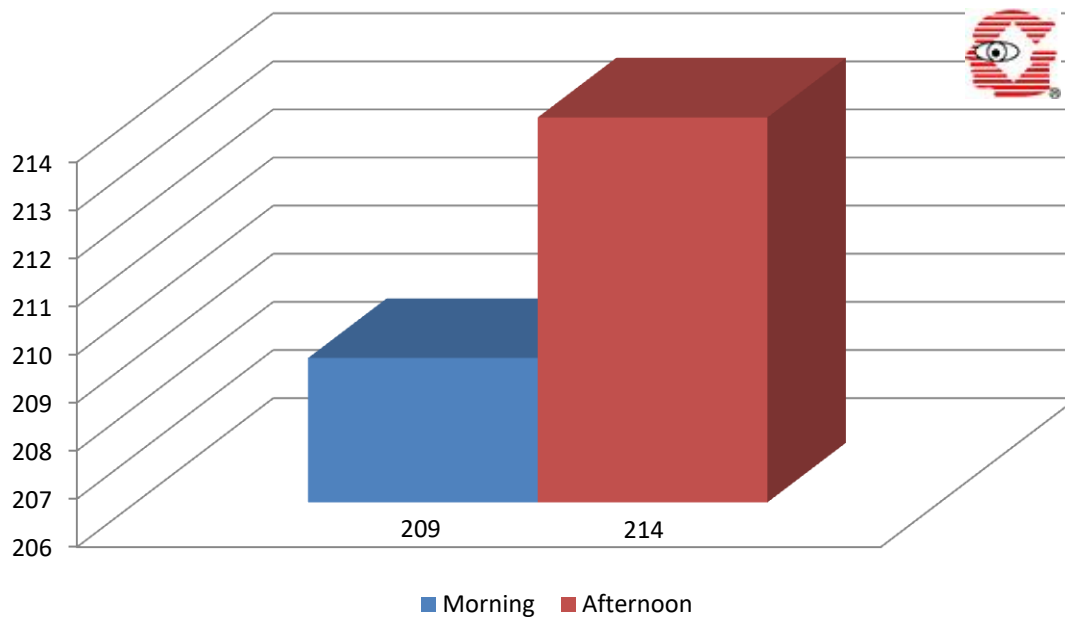
This data allows us to find the best placement for an effective program. Although Rural routes seem to have fewer violations, they are highly influenced by word of mouth and more receptive to local awareness campaigns. We have found that there are more dangerous (close calls) drive-bys in an urban setting.



Violating Vehicle Types on all 423 Violations

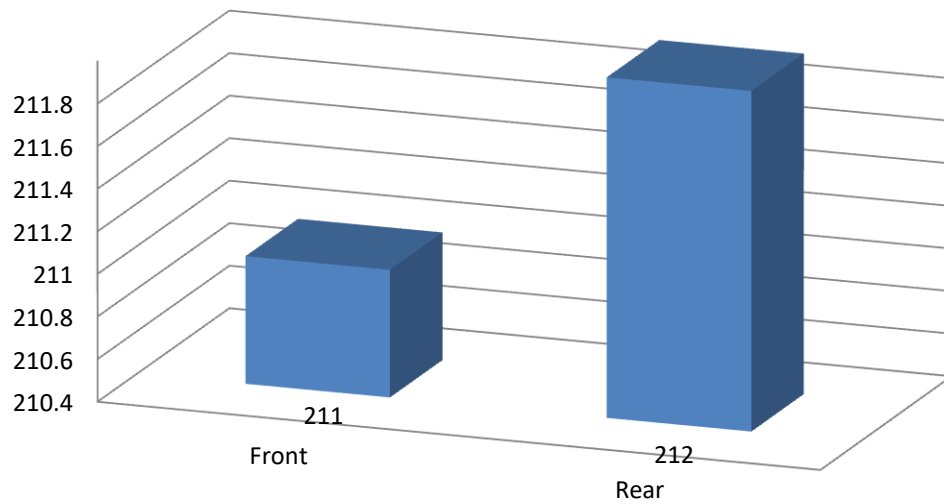


Morning vs Afternoon Violations





Violations from Front Bus Front vs Behind Bus





Hypothesis and Conclusions:

- Dangerous and illegal drive-bys are reduced through enforcement and awareness.
- The active participation of local law enforcement is imperative for driver awareness through processing violations or presenting warnings.
- Student safety is greatly improved with reduced drive-bys.
- Rural routes have less drive-by violations than urban routes.
- Once a ticket has been issued to the vehicle owner, the potential to re-offend is greatly reduced (studies show the potential to re-offend is less than 1%)
- Public and improved driver habits are reinforced through enforcement.
- Public and driver awareness is enhanced through media, word of mouth, and driver/student education.
- Vehicle drivers will positively respond to a stopped school bus by:
 - A desire to not receive an expensive violation.
 - Empathy for the children with an understanding of how dangerous it is to pass a stopped school bus.
 - Taking an alternate route to avoid legally stopped school buses.
 - * any of these improve student safety
- Reasons for passing a stopped school bus:
 - Lack of Enforcement
 - Complacency
 - Conscious decision to ignore the extended stop sign
 - Distraction
 - Intoxication
 - Lack of driver education

In conclusion, we found that drivers' behaviors were improved when the potential of an actual enforced violation exists. Student safety is improved with reduced drive-bys and student education. Vehicle drivers can learn to respect the Yellow School Bus, the Flashing Lights and the Extended Stop Sign.

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