

Potential Options for Further Study

Descripton	Edulog Scenario Reference	Do some buses have double runs on a single tier? (see note 1)	If public school bell times change do private school bell times also require change? (see note 2)	Time between starts for public school tiers	Potential Elementary School Hours	Potential Middle/High School Hours	Edulog Bus Estimation	Time of first morning bus pickup (see note 4)	Time of last afternoon drop-off (see note 4)
A. shift elementary after middle/high	scenario 4C1	No	Yes	40 min	8:45 AM to 3:15 PM	8:05 AM to 2:40 PM	add 10 buses	7:05 AM (WHMS)	4:03 PM (South)
B. shift elementary after middle/high	not explicitly studied by Edulog	Yes	No	60 min	9:15 AM to 3:45 PM 9:30 AM to 4:00 PM	8:15 AM to 2:50 PM 8:30 AM to 3:05 PM	add 8 buses (see note 3)	7:10 AM (APS secondary) 7:17 AM (Mont-Pike)	4:40 PM (HPE B-run) 4:55 PM (HPE B-run)
C. shift elementary after middle/high	scenario 4C2	No	No	40 min	8:55 AM to 3:25 PM 9:10 AM to 3:40 PM	8:15 AM to 2:50 PM 8:30 AM to 3:05 PM	add 13 buses (see note 3)	7:11 AM (Mont-Pike) 7:11 AM (Mont-Pike)	4:08 PM (South) 4:23 PM (South)
D. flip elementary before middle/high	scenario 6D	Yes	No	45 min	7:45 AM to 2:15 PM 8:00 AM to 2:30 PM	8:30 AM to 3:05 PM 8:45 AM to 3:20 PM	add 8 buses (see note 3)	7:00 AM (HPE & South) 7:11 AM (Mont-Pike)	4:03 PM (Mont-Pike) 4:03 PM (Mont-Pike)
current scenario (2019/20 school year)	N/A	Yes	Yes	60 min	8:45 AM to 3:15 PM	7:45 AM to 2:20 PM	N/A	6:40 AM (AHS)	4:20 PM (Mont-Pike)

Notes:

- (1) Edulog estimates it takes 6 buses to eliminate double runs.
- (2) **No** in this column indicates public school bell times can be set independent of private school bell times. This is accomplished by having students transported to private schools operating independent of public school transportation.
- (3) In 2019/20, APS transports approximately 128 students to private schools. For scenarios that decouple public/private school bell times, Edulog estimates it will take +8 buses to transport these private school students on dedicated buses. There may be other solutions.
- (4) Bus times determined by Edulog as part of their study or deduced from information in the study (including appendix charts), except for "B" options which were determined by the APS transportation department. Work will still need to be done to determine "road ready" routes.

Summary of Findings: Edulog Transportation Optimization Study, 15 November 2019

Scenario Name	Description	Do some buses have double runs on a single tier?	buses added in scenario	Time between public school tiers	Elementary Bell	MS/HS Bell	If public school bell times change in scenario, is there an impact to private school bell times?	Private School Bell	Earliest bus pickup AM	Latest bus dropoff PM	
1	status quo	elementary after middle/high	yes	0	60 minutes	8:45 AM	7:45 AM	yes	no change	6:43 AM (AHS-DMS)	4:23 PM (Mont-Pike)
2	flip	elementary before middle/high	yes	0	50 minutes	7:40 AM	8:30 AM	yes	each 60 min earlier	6:10 AM (Mont-Pike)	3:49 PM (WHMS)
3	flip	elementary before middle/high	no	6	45 minutes	7:45 AM	8:30 AM	yes	each 55 min earlier	6:10 AM (Mont-Pike)	3:49 PM (WHMS)
4A	shift	elementary after middle/high	no	6	60 minutes	9:15 AM	8:15 AM	yes	30 minutes later (same as public school shift)	7:15 AM (WHMS)	4:43 PM (Mont-Pike)
4B	shift	elementary after middle/high	no	8	40 minutes	9:15 AM	8:35 AM	yes	each 50 minutes later	7:35 AM (WHMS)	4:42 PM (Mont-Pike)
4C1	status quo (elem) + shift (ms/hs)	elementary after middle/high	no	10	40 minutes	8:45 AM	8:05 AM	yes	no change	7:05 AM (WHMS)	4:03 PM (South)
4C2	status quo or shift	elementary after middle/high	no	13	40 minutes	9:15 AM	8:35 AM	no	no change, at private school discretion (busing separate from public schools)	7:11 AM (Mont-Pike)	4:28 PM (South)
5	decouple middle and high school	elementary then middle then high	Impractical. Not evaluated.		35 minutes and 40 minutes	7:15 AM	7:50 AM / 8:30 AM	Impractical. Not evaluated.		6:24 AM (HPE & South)	4:26 PM (Mont-Pike)
6A	flip	elementary before middle/high	no	11	45 minutes	7:45 AM	8:30 AM	yes	each 10 minutes earlier	7:00 AM (HPE & South)	4:10 PM (Mont-Pike)
6B	flip	elementary before middle/high	yes	8	45 minutes	7:45 AM	8:30 AM	no	each 10 minutes earlier	7:00 AM (HPE & South)	3:54 PM (Mont-Pike)
6C	flip	elementary before middle/high	yes	5	45 minutes	7:45 AM	8:30 AM	no	STA -45 min and Pike/Mont +35 min to allow two-tier busing for privates (busing separate from public schools)	7:00 AM (HPE & South)	4:38 PM (Mont-Pike)
6D	flip	elementary before middle/high	yes	8	45 minutes	7:45 AM	8:30 AM	no	no change, at private school discretion (busing separate from public schools)	7:00 AM (HPE & South)	4:03 PM (Mont-Pike)

Notes:

- (1) This is not a comprehensive list of potential bell time options.
- (2) Edulog identified dependencies between private and public school bus routes. As indicated in the chart, some scenarios remove this dependency and have public and private school transportation operate independently.
- (3) Where public and private school transportation operate independently, bell times of public schools can be changed within a scenario without impacting private schools.
For example, adding or subtracting minutes to each public school bell time and each public school transportation route would result in new start time solutions in scenarios 4C2, 6B, 6C, or 6D.

More Technical Notes:

- (4) Scenarios 4C2, 6B, and 6D have private school students taking their own set of buses independent of public school students (single bus tier for these three schools). This requires 8 buses.
Scenario 6C has private school students taking their own set of buses independent of public school students, and private start times are spaced to allow two-tier busing for these three schools. This requires 5 buses.
- (5) Of the 13 buses required in scenarios 4C2, 8 allow private schools to bus independent of public schools (see note 5), and 5 allow elimination of double runs. "Tiers" in 4C2 can be set 40 min apart only because double runs are eliminated.
- (6) 4C1 requires 3 fewer buses than 4C2 because private school times in 4C1 align with public elementary times and 3 buses servicing STA can be incorporated into public elementary bus tier.