

HAMDEN PUBLIC SCHOOLS

Alternative Bell
Schedule Analysis
January 2023

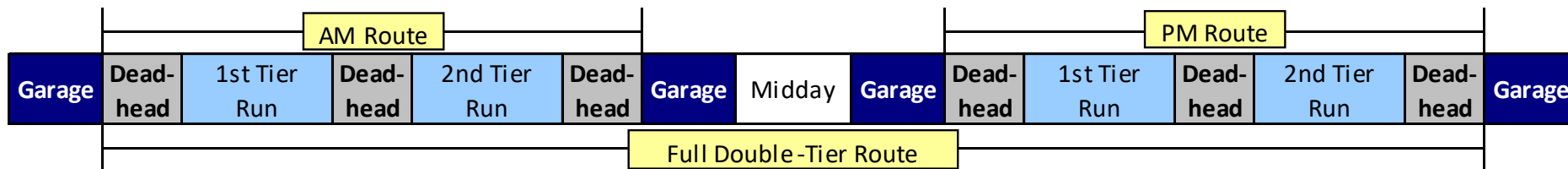
 **FIRST**student



STUDENT TRANSPORTATION TERMS & DEFINITIONS

This page contains definitions of transportation terms used frequently throughout this report.

- **Bus Run** – A sequence of bus stops where the bus begins at zero load and ends at zero load. A bus run terminates at a school or facility on an inbound run and begins at a school or facility on an outbound run
- **Bus Route or Bus** – A combination or series of bus runs and/or shuttle runs that make up a driver's daily work package
- **Tier** – A group of bus runs operating at the same time based on school bell schedule. A multi-tiered system seeks to leverage the bell schedule to maximize the operation of multiple bus runs by a single bus route
- **Single, Double, Triple** – Refers to the number of bus runs assigned to a bus route in the AM or PM time period
- **Deadhead** – Refers to travel between bus runs when a bus is empty
- **Operating Window** – The time between tier bell times
- **Live Run Time** – Operating Window less unload (AM) or load (PM) less tier deadhead
- **Typical Double-Tier Route**



BACKGROUND

- Hamden Public Schools (HPS) currently operates 49 big buses and 16 small buses.
- The bell schedule consists of four tiers with High School first, Middle School second and Elementary Schools split into two later tiers.
- Buses also transport Non-Public riders. Non-Public schools operate on their own schedules that do not correspond to the HPS schedule.
- The schedule is tight, particularly in the PM, and many buses are consistently late.

FPS was asked to model an alternative schedule for public schools which incorporates the following conditions:

- *Public schools do not vary more than 20 minutes from current schedule.*
- *Late connections are eliminated.*
- *All public elementary schools on the same schedule is preferable.*
- *Length of day stays the same.*

METHODOLOGY

1. Created 'snapshot' of current Edulog data
2. Ran Route Optimization on big bus routes, separately for AM and PM schedules.
3. Where possible moved AM runs to mirror PM route assignments.
4. Edited runs to fit alternative bell schedule and minimize number of buses.
5. Compiled metrics for comparison with current set of big bus routes.

BELL SCHEDULE - SY 2022-23

School	Tier	AM Arr.	AM Bell	PM Bell	PM Dep.	Day
HS	1	7:15	7:31	2:00	2:07	6:29
MS	2	7:45	7:55	2:29	2:36	6:34
Early ES	3	8:00	8:15	3:04	3:11	6:49
Late ES	4	8:30	8:45	3:34	3:41	6:49

Tier	AM	PM
1	60	22
2	30	28
3	15	23
4	30	60

Available live route time in minutes

Observations

- Four-tier schedule with HS, MS then Early and Late ES.
- There are only 20 minutes between the middle school and early elementary bells in the AM.
- With bell times so close together it is difficult to package routes as triples or quadruples.
- Bell schedule and length of day for Non-Public schools vary from those of public schools.
- Teachers contract end times are 15 minutes past PM dismissal time.

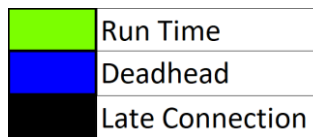
ROUTE METRICS - SY 2022-23

Metric	AM	PM
Routes	49	49
Runs	114	115
Runs Per Rte	2.33	2.35
Singles	5	2
Doubles	23	25
Triples	21	21
Riders	3,466	3,620
Riders Per Run	30.4	31.5
Riders Per Rte	70.7	73.9

Observations

- HPS currently operates 49 big buses.
- Runs per route averages over a double at 2.33 AM and 2.35 PM, but well below a triple in a four-tier system.
- Average riders per run (30 AM and 31 PM) is well below capacity indicating that time rather than seats is the main routing constraint for the district.

ROUTE DISPLAY - SY 2022-23



Observations

- For SY 2022-23 HPS is operating 49 AM and 49 PM big buses.
- Route 9043 is PM only and route 9031 is AM only.
- 10 AM routes have late connections as scheduled in Edulog.
- 23 PM routes have late connections as scheduled in Edulog.

ALTERNATIVE BELL SCHEDULE

School	Tier	AM Arr	AM Bell	PM Bell	PM Dep.	Day
HS	1	7:00	7:20	1:49	1:56	6:29
MS	2	7:40	8:00	2:34	2:41	6:34
ES	3	8:25	8:35	3:24	3:31	6:49

Tier	AM	PM
1	60	38
2	40	43
3	45	60

Available live route
time in minutes

Observations

- Three-tier schedule with HS first, MS second and ES third.
- All elementary schools are moved to the same schedule.
- Length of day stays as is.
- Time between tiers is increased.

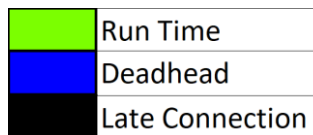
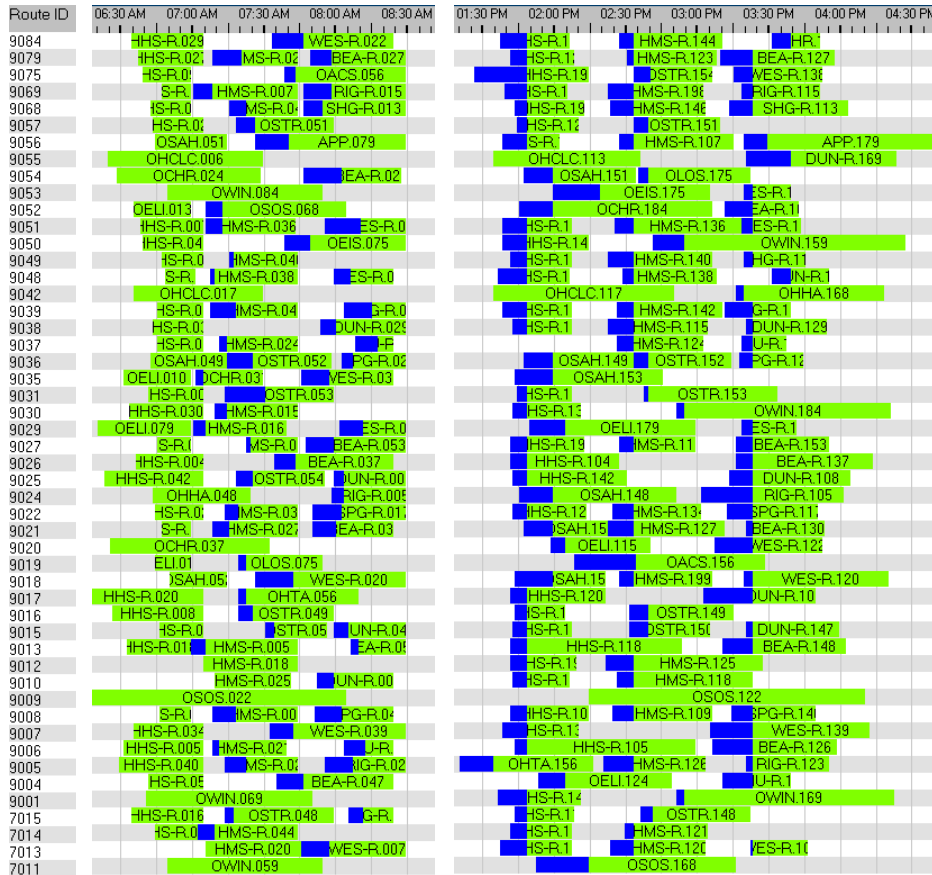
ROUTE METRICS – ALTERNATIVE SCHEDULE

Metric	AM	PM
Routes	50	50
Runs	113	116
Runs Per Rte	2.26	2.32
Singles	7	4
Doubles	23	26
Triples	20	20
Riders	3,466	3,620
Riders Per Run	30.7	31.2
Riders Per Rte	69.3	72.4

Results

- The alternative schedule resulted in 50 big buses an addition of one over SY 2022-23.
- All routes have on-time connections for 2nd and 3rd tier schools based on Edulog times.
- Non-Public runs are mixed in with Public school runs.

ROUTE DISPLAY - ALTERNATIVE SCHEDULE



Observations

- All 50 routes have on-time connections to 2nd and 3rd tier schools based on Edulog times.
- Non-Public school runs are mixed in with Public school runs.
- PM is the tighter schedule as it takes more time to stage and load at schools in the PM than to drop off students at schools in the AM

CONSIDERATIONS/OTHER POINTS

- Minimizing the number of routes requires that many routes are not mirrored. (i.e. some students may be assigned to different buses in the AM and PM.)
- We did not include small bus routes in this study.
- We mixed in Non-Public runs with HPS runs.
- It is possible to shift the bell times in the alternative schedule and achieve the same results, as long as time between tiers remains constant.
- This study is based on modeling data in Edulog. All findings require verification based on dry runs during school-time traffic conditions.