

# **LEXINGTON PUBLIC SCHOOLS**

## **School Transportation Efficiency Study and Later High School Start Time Analysis**

**October 30, 2018**

**Public Management Associates, LLC  
47 Bigwood Drive  
Westfield, MA 01085**

# **STUDY OBJECTIVES**

- 1. Determine the Cost Effectiveness and Efficiency of the Current Transportation Operation with Recommendations for Improvement**
  
- 2. Review Various Alternatives for a Later Start Time for the High School which will:**
  - \* Start the High School at 8:30 a.m.**
  
  - \* Minimize any Elementary and Middle School Schedule Changes (+/- 5-15 Minutes)**
  
  - \* Maintain the Current Length of School Day for All Schools**
  
  - \* Minimize Traffic Congestion at the District Schools During Drop Off and Pick Up Times**
  
  - \* Minimize Student Time on Vehicles to 30 Minutes or Less with Convenient Bus Stops**
  
  - \* Be Cost Neutral**

# **POLICIES and PRACTICES**

**Students K-6 are entitled to free school transportation if they reside more than 2 miles from their assigned school.**

**The District provides transportation services on a subsidized fee for service and on a space available basis. This fee for service generates over \$ 1 million per year. As a result there is a high parental demand for short routes and convenient bus stops.**

**The District's past practices have been a maximum of 30 minutes route time and no more than 2 students per seat (even at the elementary level).**

**No student should be picked up before 7:00 a.m. or dropped off later than 4:00 p.m.**

**These practices result in relatively high quality school transportation services; albeit not as efficient as possible.**

# **SCHOOL TRANSPORTATION EFFICIENCY**

**School transportation efficiency is generally determined by the following factors:**

- **Manual vs. computerized routing and scheduling**
- **The person who does the routing and scheduling determines the number of buses required.**
- **Student Riders: Scheduled vs. Actual Riders (Student Loading)**
- **Time available between school starting and ending times (Tiers)**
- **Distances and travel time between schools**
- **Population density, i.e. number of students per mile of bus travel**
- **Highway / road infrastructure and traffic patterns and congestion**
- **A.M. routes generally drive the number of buses required, as more students ride in the morning than in the afternoon due to after school activities.**

# **CAVEAT**

**Transportation management can sometimes “over consolidate” routes in order to eliminate a bus, only to have to reinstate it during the year or the following year due to required changes or routes which are too long. As a result an efficient transportation system requires some “excess” capacity in order to manage the routes and schedule changes from year to year in order to not have to add a bus and driver during the year and after the budget has been set.**

## **DEMOGRAPHICS**

**Population (2010): 31,394**

**Geographic Area: 16.5 Square Miles**

**Populations Density: 1903 Persons/Square Mile**

**Traffic Congestion (A.M. Drive Time): High**

**School Traffic Congestion (A.M & P.M.): High**

**Community Expectations: High**

**Distance between Middle Schools and High School: 1.5 miles**

**Therefore, based upon the preceding, school transportation efficiency is determined by other than strictly student ridership, such as route time and distance, as well as community expectations for high quality service.**

## **BUS FLEET UTILIZATION**

**The District currently transports approximately 3462 students, utilizing 37 - 71 passenger buses with a seating capacity of 47 students for high school and middle school age students.**

**In addition, the District past practice has been to schedule no more than 55 elementary students per route.**

**Based upon these parameters, the District routes consist of the following:**

<b>3 TIER ROUTES</b>	<b>24</b>
<b>2 TIER ROUTES</b>	<b>9</b>
<b>1 TIER ROUTES</b>	<b>4</b>
<b>UNSCHEDULED TIER BLOCKS</b>	<b>17</b>

# **COST EFFECTIVENESS**

## **TRANSPORTATION BUDGETS vs. DISTRICT BUDGETS**

	<b>2015-16</b>	<b>2016-17</b>	<b>2017-18</b>	<b>2018-19</b>
<b>TOTAL DISTRICT BUDGETS</b>	<b>\$ 89,282,114</b>	<b>\$ 95,352,613</b>	<b>\$ 101,655,182</b>	<b>\$ 108,111,445</b>
<b>TRANSPORTATION BUDGETS</b>	<b>\$ 2,845,976</b>	<b>\$ 3,370,195</b>	<b>\$ 3,835,406</b>	<b>\$ 4,403,256</b>
<b>%</b>	<b>3.19%</b>	<b>3.53%</b>	<b>3.77%</b>	<b>4.07%</b>

**FINDING:** For Districts with similar demographics, a transportation budget of 5% or less of the total district budget is considered cost effective by current industry standards.



## **ROUTING EFFICIENCIES**

**COMMENDATION:** The Transportation Coordinator is highly proficient with the Transfinder routing software and knowledgeable of the District transportation requirements, as well as community expectations. All data was readily available and answers to questions and explanations were provided. She does an excellent job in managing the transportation operation within the quality constraints required.

**FINDING:** Several (13) of the current routes make numerous stops within relatively short distances.

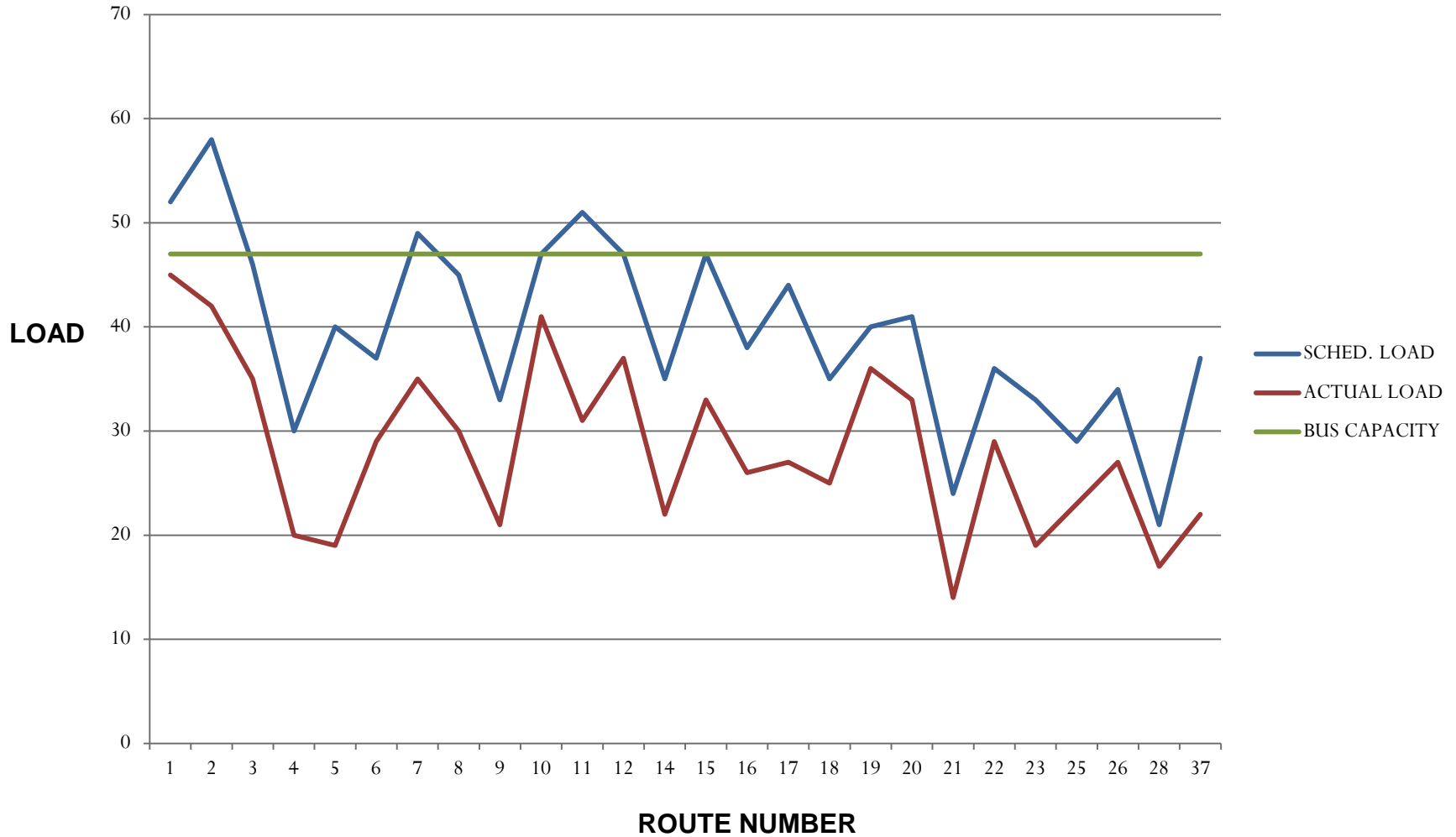
**FINDING:** Several (7) of the routes make stops well outside their assigned school boundaries.

**RECOMMENDATION:** Reconfigure the single tier Bus #38 Bridge Elementary School and transfer that route to Bus #20 and eliminate Bus #38.

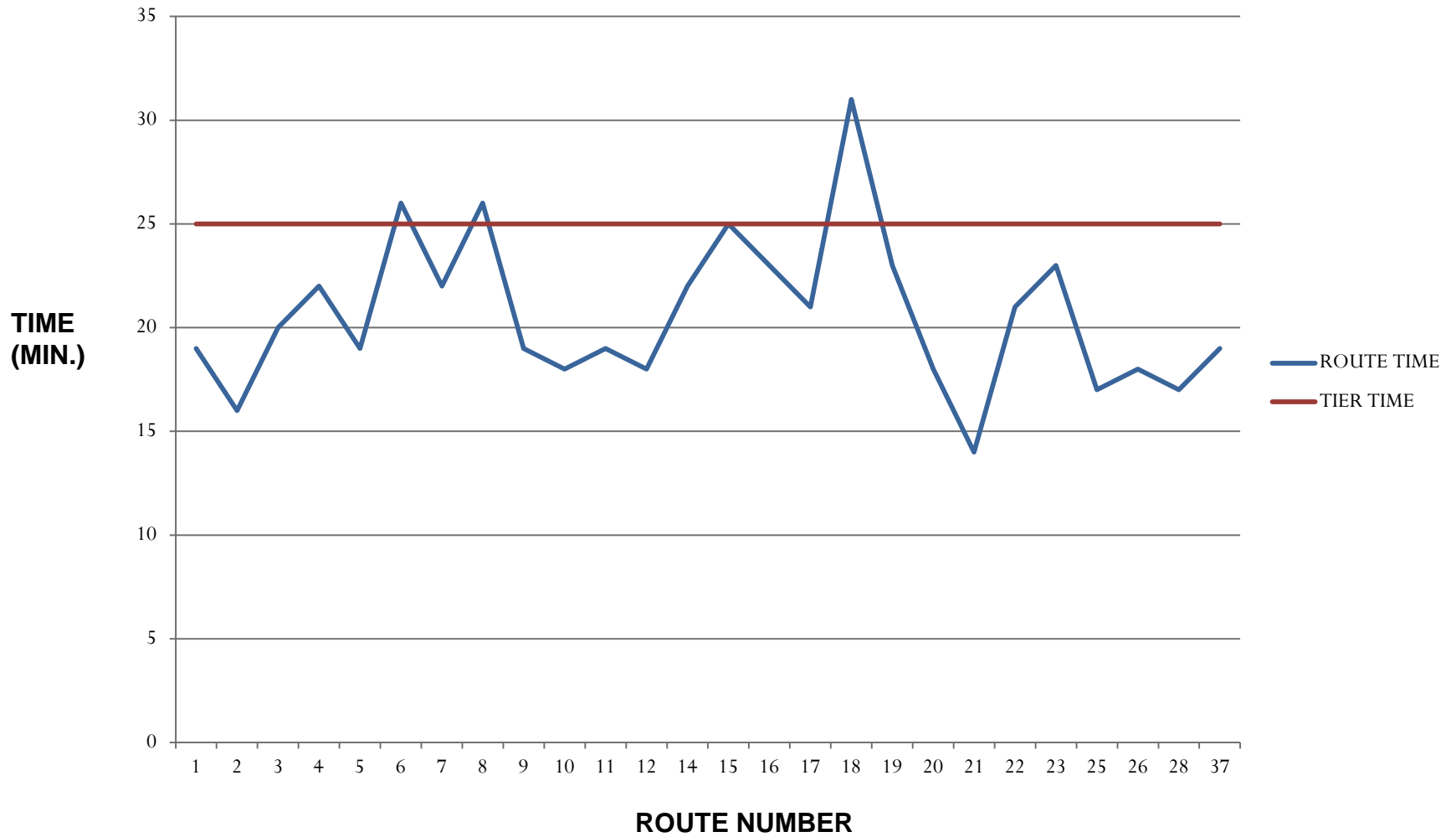
# CURRENT ROUTE INFORMATION

ROUTE #	BUS #	Bus Counts HS	Bus Counts MS	Bus Counts ELEM
1: LHS/Clarke/Harrington	1	45	35	43
2: LHS/Diamond/Fiske	2	42	42	38
3: LHS/Clarke/Bridge	3	35	48	51
4: LHS/Diamond/Estabrook	4	20	40	40
5: LHS/Clarke/Bowman	5	19	39	53
6: LHS/Clarke/Bridge	6	29	50	50
7: LHS/Clarke/Bowman	7	35	50	50
8: LHS/Diamond/Estabrook	8	30	43	41
9: LHS/Diamond/Hastings	9	21	35	40
10: LHS/Diamond/Fiske	10	41	30	46
11: LHS/Clarke/Bowman	11	31	43	36
12: LHS/Diamond/Fiske	12	37	24	33
13: Clarke/Harrington	13	17	45	30
14: LHS/Clarke/Harrington	14	22	48	55
15: LHS/Clarke/Bowman	15	33	30	32
16: LHS/Diamond/Estabrook	16	26	19	52
17: LHS/Clarke/Bowman	17	27	30	30
18: LHS/Diamond/Hastings	18	25	45	52
19: LHS/Diamond/Hastings	19	36	46	40
20: LHS/Clarke	20	33	40	
21: LHS/Clarke/Bowman	21	14	31	40
22: LHS/Clarke/Bridge	22	29	38	30
23: LHS/Clarke/Harrington	23	19	37	44
25: LHS/Clarke/Bowman	25	23	52	42
26: LHS/Hastings	26	27	21	50
27: Estabrook	27	22	20	56
28: LHS/Diamond/Estabrook	28		19	45
29: Diamond/Harrington	29		40	40
30: Clarke/Bowman	30		32	40
31: Diamond/Hastings	31		24	40
32: Diamond/Fiske	32		47	40
33: Diamond/Fiske	33		40	43
34: Bridge	34			43
35: Diamond/Bridge	35			38
36: Estabrook	36			50
37: LHS/Diamond/Estabrook	37			41
38: Bridge	38			47
		738	1183	1541

# HIGH SCHOOL STUDENT LOADING ANALYSIS

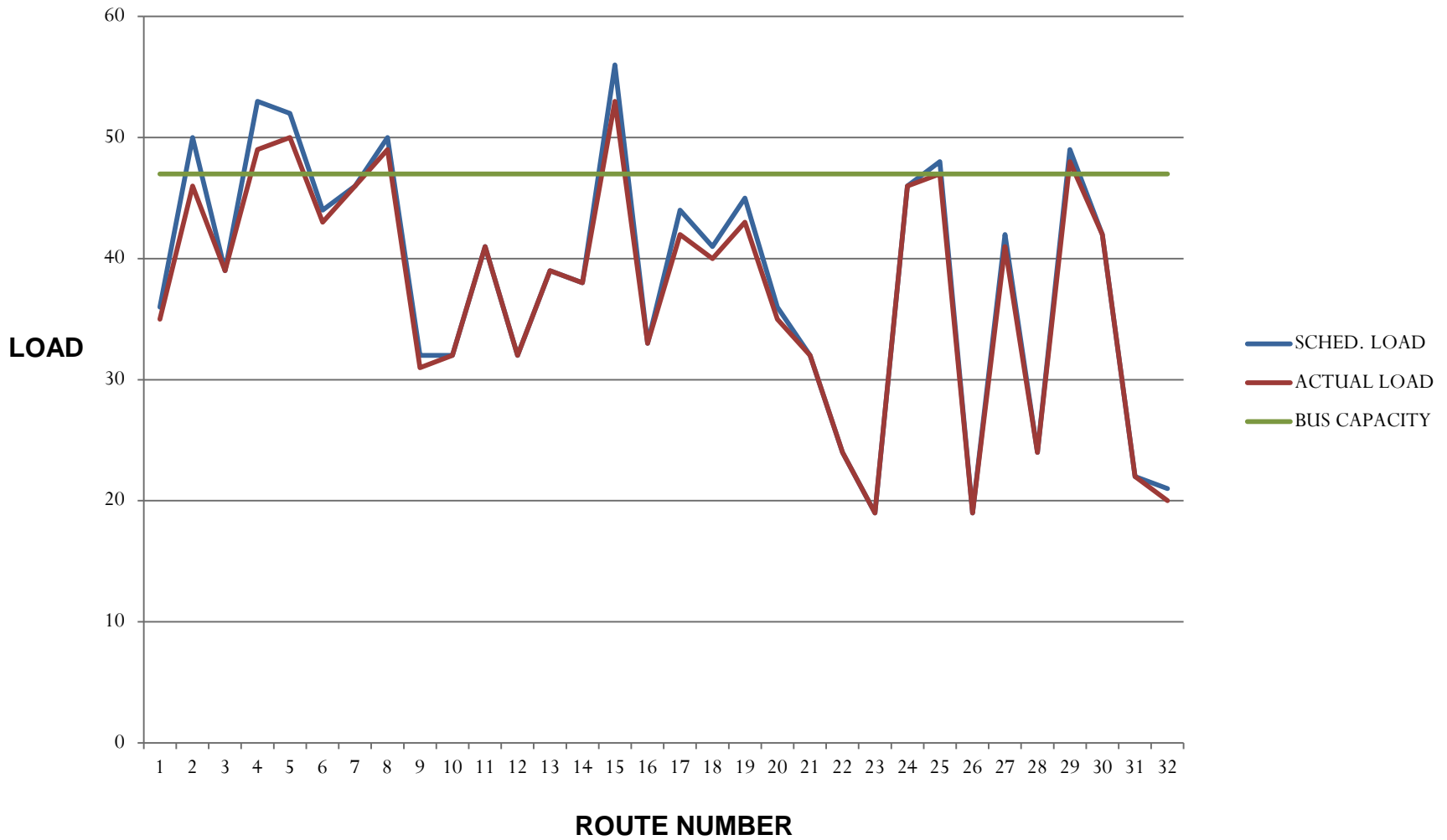


# HIGH SCHOOL ROUTE TIME ANALYSIS



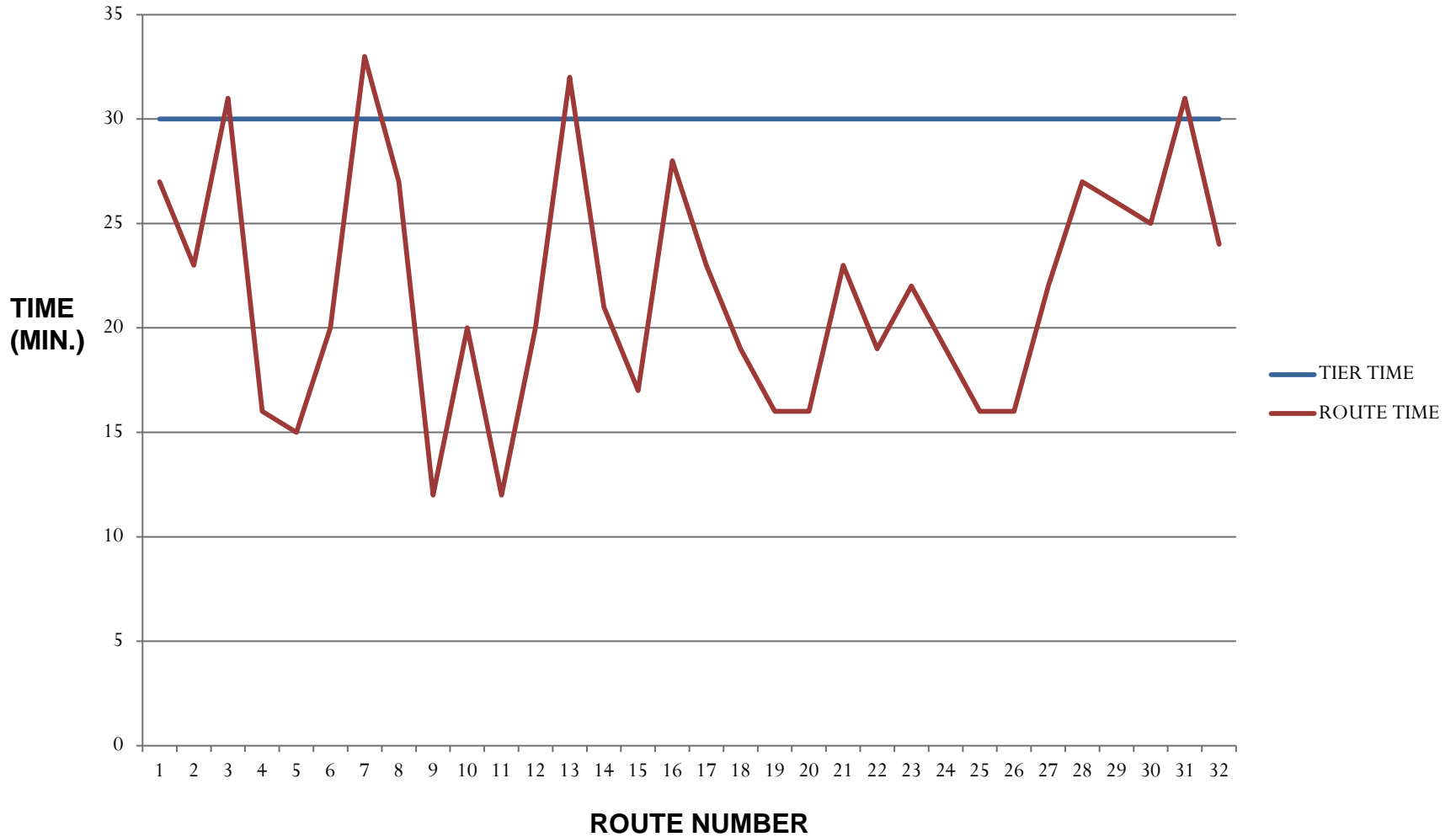
# MIDDLE SCHOOLS

## STUDENT LOADING ANALYSIS



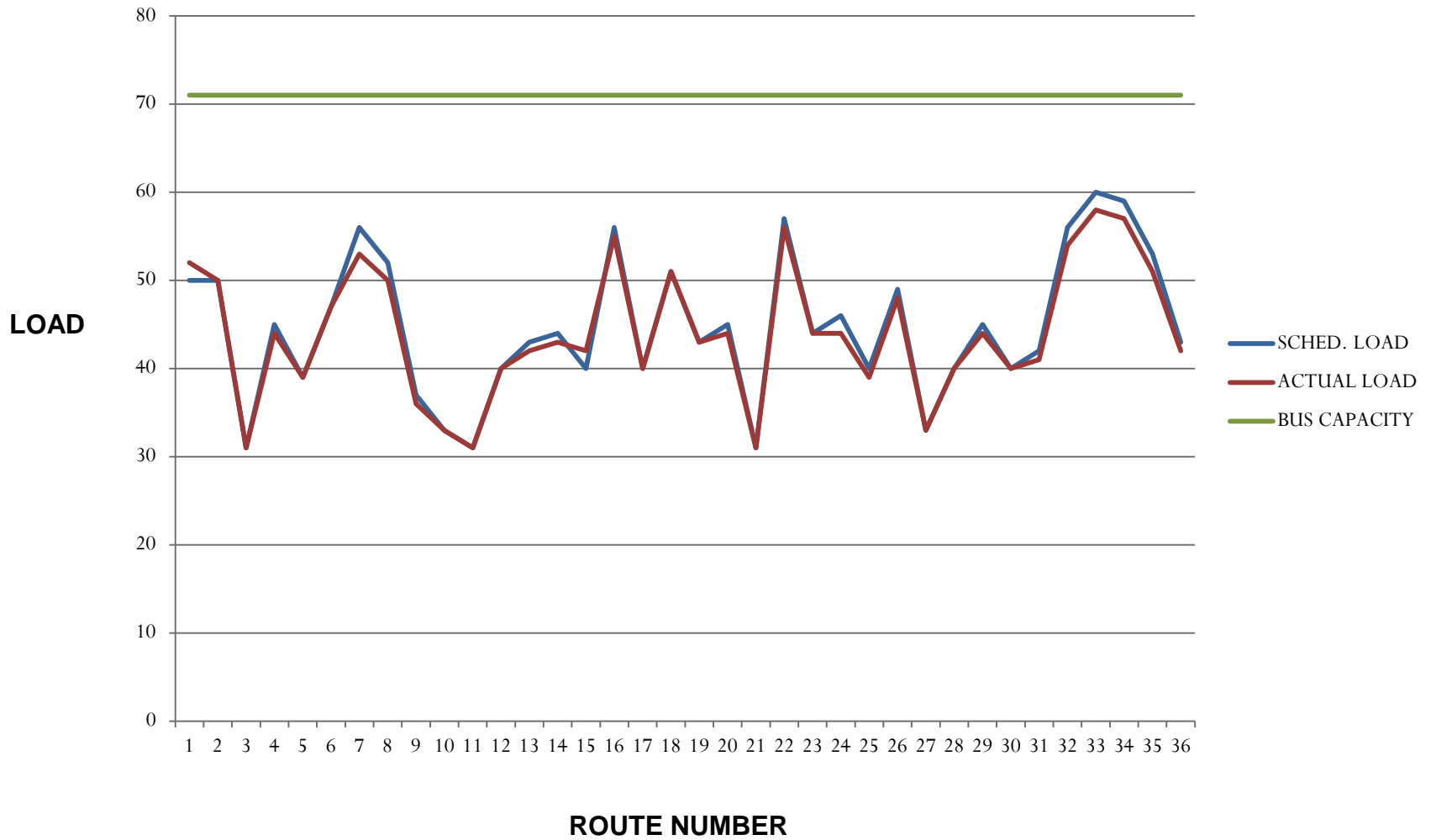
# MIDDLE SCHOOLS

## ROUTE TIME ANALYSIS



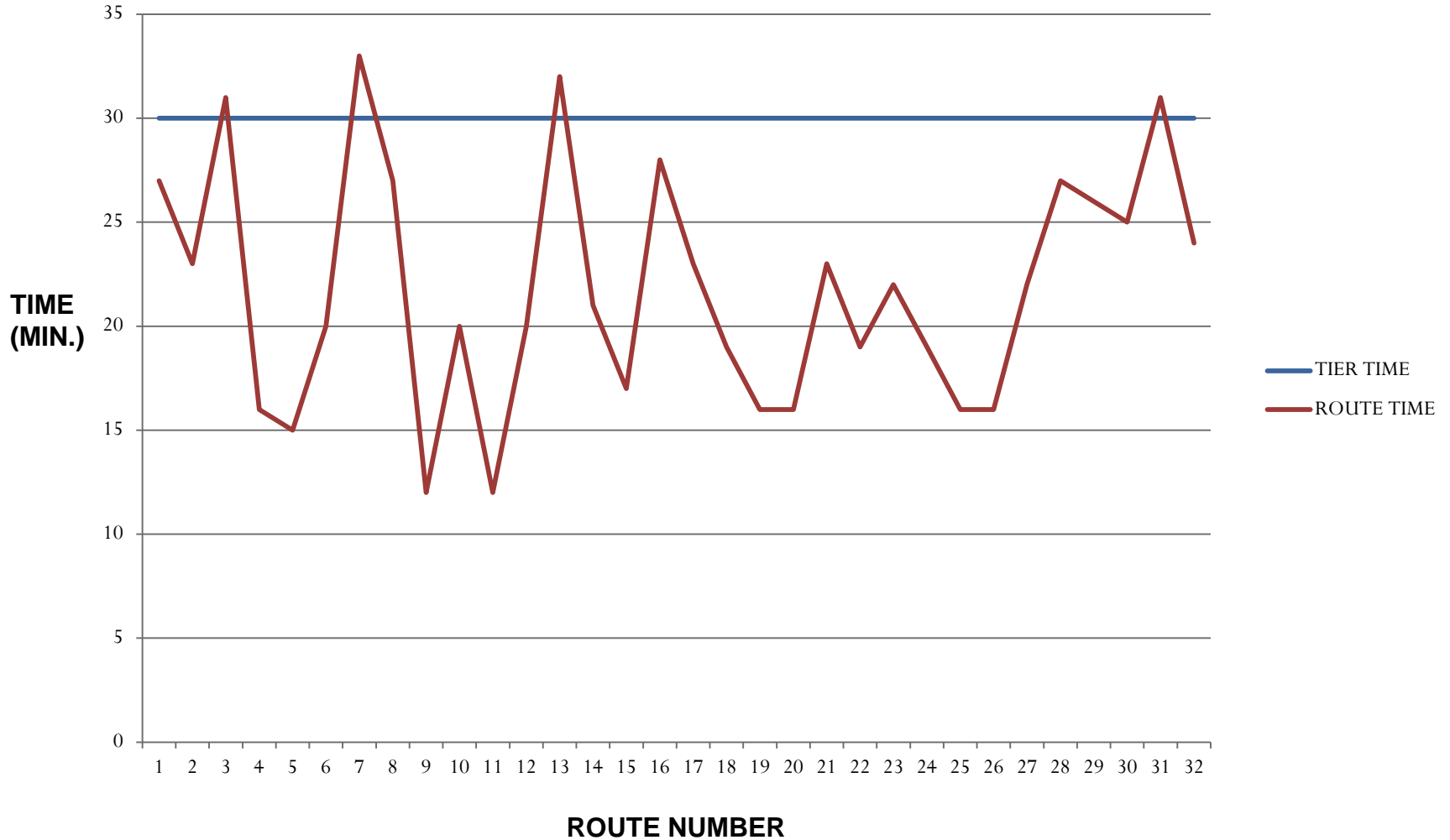
# ELEMENTARY SCHOOLS

## STUDENT LOADING ANALYSIS



# ELEMENTARY SCHOOLS

## ROUTE TIME ANALYSIS





## **ROUTE TIME and LOADING SUMMARY**

**FINDING:** For all schools, the route times are generally less than the available tier time. However afternoon routes times are much tighter than in the morning.

**FINDING:** For all schools, both the scheduled and actual student loads are less than the bus capacity, even with an elementary maximum loading of 55 students.

# OPERATIONAL METRICS

## HIGH SCHOOL ROUTES

METRICS	
No. Buses	26
No. Routes	26
Ave. Rts/Bus	1
Ave. Stops/Rt.	8.7
Ave. Students/Stop	4.6
Ave. Time/Rt.	20.62
Ave. Miles/Rt.	7.16
Ave. Sched. Load/Rt	39.6
Ave. Actual Load/Rt.	28.4
Sched. Load/ Capacity Ratio	84.2%
Actual Load/Capacity Ratio	60.4%

# OPERATIONAL METRICS

## MIDDLE SCHOOLS ROUTES

METRICS	
No. Buses	32
No. Routes	32
Ave. Rts/Bus	1
Ave. Stops/Rt.	10.1
Ave. Students/Stop	3.8
Ave. Time/Rt.	21.8
Ave. Miles/Rt.	7.25
Ave. Sched. Load/Rt	38.3
Ave. Actual Load/Rt.	37.5
Sched. Load/ Capacity Ratio	81.6%
Actual Load/Capacity Ratio	79.8%

# OPERATIONAL METRICS

## ELEMENTARY SCHOOLS ROUTES

METRICS	
No. Buses	36
No. Routes	36
Ave. Rts/Bus	1
Ave. Stops/Rt.	13.8
Ave. Students/Stop	3.3
Ave. Time/Rt.	23.6
Ave. Miles/Rt.	6.54
Ave. Sched. Load/Rt	44.8
Ave. Actual Load/Rt.	44.1
Sched. Load/ Capacity Ratio	63.0%
Actual Load/Capacity Ratio	62.1%

**55 STUDENT MAXIMUM**

Sched. Load/ Capacity Ratio	81.4%
Actual Load/Capacity Ratio	80.2%

## CURRENT SCHOOL SCHEDULES

	TIER 1	TIER 2	TIER 3
SCHOOL	HIGH SCHOOL	MIDDLE SCHOOLS	ELEMENTARY SCHOOLS
START TIME	7:45	8:00	8:45
DROP OFF TIME	7:20	7:50	By 8:30
LENGTH/DAY	6'40"	6'50"	6'30"
END TIME	2:25	2:50	3:15
DEPARTURE TIME	2:35	3:00	3:20-3:25
ROUTE LENGTH	21	22	24
FIRST PICK UP	7:00	7:30	8:00
LAST DROP OFF	2:45	3:07	3:50

## RECOMMENDED SCHOOL SCHEDULES (Utilizing ALL 36 Current Buses)

	TIER 1	TIER 2	TIER 3
SCHOOL	MIDDLE SCHOOLS	HIGH SCHOOL	ELEMENTARY SCHOOLS
START TIME	8:00	8:30	9:00
DROP OFF TIME	7:45	8:20	8:50
LENGTH/DAY	6'50"	6'40"	6'30"
END TIME	2:50	3:10	3:30
DEPARTURE TIME	3:00	3:20	3:35-3:40
ROUTE LENGTH	17	15	24
FIRST PICK UP	7:30	7:50	8:30
LAST DROP OFF	3:17	3:35	4:04

# **PROGRAM IMPLICATIONS**

**HIGH SCHOOL START TIME IS 45 MINUTES LATER: 8:30 A.M.**

**MIDDLE SCHOOL START TIME REMAINS 8:00 A.M.**

**ELEMENTARY SCHOOLS START TIME IS 15 MINUTES LATER: 9:00 A.M.**

**ALL SCHOOLS MAINTAIN THEIR CURRENT LENGTH OF SCHOOL DAY**

**NO STUDENT PICKED UP BEFORE 7:00 A.M.**

**LATEST ELEMENTARY SCHOOL DROP OFF: 4:04 P.M.**

**HIGH SCHOOL STUDENTS ARRIVE HOME BEFORE ELEMENTARY SCHOOL STUDENTS**

# COST IMPLICATIONS

CONTRACT COST: \$ 492 PER BUS PER DAY IN FY'2020		
(Regardless of Number of Tiers)		
CURRENT CREDIT:	\$ 123,760.00	
(Presumably for (5) 1 Tier routes and (6) 2 Tier routes)		
RECOMMENDATION: Move Bus 38 Bridge Route to Bus 20 and Eliminate Bus 38.		
SAVINGS	\$ 87,360.00	
BY UTILIZING ALL 36 BUSES FOR 3 TIERS IN ORDER TO REDUCE THE ROUTE TIMES, THE DISTRICT WOULD LOSE THE CURRENT CREDIT.		
THE NET COST IMPACT WOULD THEREFORE BE APPROXIMATELY:		
	\$ 126,854.00	
	\$ (89,544.00)	
NET COST INCREASE	\$ 37,310.00	

# **SUMMARY**

It is our opinion that by utilizing the available tier times currently unscheduled, route time and distance can be reduced. The District can then achieve a High School start time of 8:30 a.m. while maintaining the current length of school day for each school and maintaining the high quality transportation system which the community expects.

For the Elementary Schools, the program impact is minimal as resolved by the School Committee in August.

For the Middle Schools, maintaining the 8:00 a.m. start time creates a scheduling problem in the afternoon only, which can be resolved in a number of ways.

The cost impact of our recommendation is the loss of the single tier credit which would be partially offset by the reduction of 1 bus. Net impact = + \$ 37,310.

However, we do not recommend changing school bell schedules for school transportation purposes. It is our opinion that school schedules should be set by the District in accordance with their educational requirements and that school transportation is a support service.



**QUESTIONS  
DISCUSSION**