School, Tier, and Grade Level Change Routing Study

Prepared for
Allegheny County Public Schools
Low Moor, VA
September 28, 2016

Submitted by:
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Executive Summary

Transfinder Professional Services was contracted to perform a routing study in the Routefinder Pro routing system to determine potential efficiencies and explore new transportation options for next school year. Professional Services created a new data source based on current routes, and daily ridership numbers to complete the process.

Overview

Allegheny County Public Schools is looking to increase their efficiency by potentially reducing routes and shortening student ride times. They are also considering capping student ride time at 75 minutes and/or creating a K-12 busing scenario.

A summary of the report includes the following:

- A baseline summary of nationally recognized Key Performance Indicators (KPIs), which could be used for future comparisons;
- Suggestions for routing policy enhancements which may create efficiencies, and what to consider in routing policies and parameters to create greater efficiencies;
- Tracking actual vs. assigned riders to increase bus capacity; and
- Suggestions for reviewing routes in order to potentially increase efficiency.

Key Performance Indicators

Key Performance Indicators (KPIs) are nationally recognized measurements of your current transportation operation. KPIs allow you to compare your operational performance year after year. They can also provide a comparison of your own performance in relation to other school districts of similar size, if that information is available. This report provides the baseline for you to use in further comparisons.

School bell times and student ride time form the basis for routing efficiency. The more time the bus has to pick up or deliver students, increases the potential for completely utilizing every bus at every tier. The following charts show both the morning and afternoon trip times without the “dead head time” (the to and from the parking lot or transit between runs) included. The data utilized reflects current trips in the Routefinder Pro. The trips do not show pre-trip times before schools are picked up or the post-trip time at the elementary level when the buses return to the terminal. The buses are shown on the vertical axis and run minutes are shown on the horizontal axis.
As can be seen in the previous charts, several of the current trips are too long to allow creating 2 tiers of service in the district.

The following charts show the ridership counts by trip taken from district records. The recommended efficiency target of actual ridership for elementary service is between 60% and 80% of rated capacity of the bus or 3 riders in no more than ½ of the seats
and 2 riders per bus seat for the rest of the bus. Secondary actual rider percentage is between 60% and 70% or approximately 2 riders per seat. Generally, districts have a maximum of 80% of potential riders that actually utilize bus service. They often have much lower participation. Actual ridership numbers were utilized for this report. However, several of the ridership numbers appear to be inaccurate based on bus capacity. For example, it is highly unlikely that 67 secondary students are actually riding on a 77 passenger capacity bus.
It is apparent that there is significant space on several current trips while some trips appear extremely overcrowded. Low ridership can be caused by district demographics and the number of stops required of each bus but it can typically be improved through applying efficiency routing concepts.

**Efficiency Routing Concepts**

Transfinder Professional Services staff utilized several strategies to review current routing.

The following maps show district 2016-2017 transportation data. The maps show bus trips in unique colors with stops as plus signs, colored dots representing students, and colored areas depicting the walk area assigned to each bus stop.

- Professional Services looked for routes that overlap service areas. Overlapping service areas tend to cause extra time on the routes that decreases efficiency. There were only small overlaps in any service areas in the district.

- Route time length could be addressed with longer runs potentially shortened and shorter runs expanded to reduce longer ride times to more acceptable levels.
We looked for stops that were close enough to consolidate. It appeared that stops were relatively balanced for potential riders. However, there are significant walk to stop differences between stops across the district. It is recommended that the stops be revisited using a consistent district guideline. There may be a possibility to reduce some stops due to actual usage as well as enforcing a consistent walk to stop distance which could streamline some trips.

The following snapshot of Mountain View Elementary morning trips illustrates this issue.
Ridership levels per individual trip serving district general education students could be increased to potentially cut the number of buses needed through efficiency routing. The following chart shows the maximum number of buses that could be eliminated if every bus was loaded to the theoretical target levels.

<table>
<thead>
<tr>
<th>School</th>
<th>Actual Riders</th>
<th>Current Trips</th>
<th>Potential Trips</th>
<th>Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Callaghan</td>
<td>205</td>
<td>6</td>
<td>4</td>
<td>-2</td>
</tr>
<tr>
<td>Mountain View</td>
<td>438</td>
<td>12</td>
<td>9</td>
<td>-3</td>
</tr>
<tr>
<td>Sharon Elem</td>
<td>67</td>
<td>3</td>
<td>2</td>
<td>-1</td>
</tr>
<tr>
<td>Elementary</td>
<td>710</td>
<td>20</td>
<td>14</td>
<td>-6</td>
</tr>
<tr>
<td>Secondary</td>
<td>845</td>
<td>20</td>
<td>18</td>
<td>-2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1555</strong></td>
<td><strong>40</strong></td>
<td><strong>32</strong></td>
<td><strong>-8</strong></td>
</tr>
</tbody>
</table>

Option #1

Option #1 explores capping student ride time at 75 minutes. The afternoon ride times are utilized in this option since they are somewhat longer than the morning ride times. The following charts show there are currently 5 elementary and 11 secondary trips that exceed the proposed limit.

Without actually re-writing all of the longer trips to determine an exact number of additional trips required to implement the ride time cap, it is estimated that at least 8 additional trips could be required to reduce ride time for every student to 75 minutes or less. However, some if not most of the additional buses could be avoided if efficiency routing occurred while implementing this option.
Option #2

The district is also considering adopting a K-12 bus rider pattern for every trip. This would have the elementary schools being dropped off first in the morning and then either shuttling or proceeding directly to the secondary schools. Combining current service into a single tier of service will add extra ride time for secondary students. The estimated additional high school student ride time depending on where they live in the district is shown by elementary campus.

Callaghan Elementary - +35 minutes  
Mountain View Elementary - +17 minutes  
Shannon Elementary - +25 minutes

The previous additional ride times are derived from afternoon load times at both the high school and middle school plus travel time to the elementary schools. There is additional time to load at the elementary schools which was not entered into the estimates. The K-12 scenario will also mandate that school bell times for the elementary schools be modified and the elementary school days lengthened to keep secondary ride times as short as possible.

If a shuttle system is utilized, additional ride time typically occurs on a regular basis since every bus must wait for the last shuttle bus to arrive before anyone can depart the elementary schools.

The following school bell times are utilized today.

<table>
<thead>
<tr>
<th>Current</th>
<th>AM</th>
<th>PM</th>
<th>Instructional Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clifton MS</td>
<td>8:15</td>
<td>3:35</td>
<td>7:20</td>
</tr>
<tr>
<td>Alleghany HS</td>
<td>8:25</td>
<td>3:25</td>
<td>7:00</td>
</tr>
<tr>
<td>Callaghan</td>
<td>8:45</td>
<td>3:05</td>
<td>6:20</td>
</tr>
<tr>
<td>Mountain View</td>
<td>8:15</td>
<td>2:35</td>
<td>6:20</td>
</tr>
<tr>
<td>Sharon</td>
<td>8:45</td>
<td>3:05</td>
<td>6:20</td>
</tr>
</tbody>
</table>

If a K-12 scenario was implemented the bell times could look something like the following:

<table>
<thead>
<tr>
<th>K-12</th>
<th>AM</th>
<th>PM</th>
<th>Instructional Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clifton MS</td>
<td>7:45</td>
<td>3:05</td>
<td>7:20</td>
</tr>
<tr>
<td>Alleghany HS</td>
<td>7:55</td>
<td>2:55</td>
<td>7:00</td>
</tr>
<tr>
<td>Callaghan</td>
<td>8:30</td>
<td>3:40</td>
<td>7:10</td>
</tr>
<tr>
<td>Mountain View</td>
<td>8:15</td>
<td>3:25</td>
<td>7:10</td>
</tr>
<tr>
<td>Sharon</td>
<td>8:30</td>
<td>3:40</td>
<td>7:10</td>
</tr>
</tbody>
</table>
A major disadvantage to this scenario is that the elementary students would need to ride into the secondary schools in the morning or be dropped off at their school very early to make the plan function.

**Summary**

Alleghany County Public Schools is considering increasing efficiency that could affect transportation operations. The analysis indicates that up to 8 buses could be cut from the fleet through efficiency routing. Efficiency routing may also reduce the individual trip times instead of reducing buses if that was a desired outcome.

The district is considering 2 additional options for transportation, capping all ride times at 75 minutes and/or creating a K-12 bus system. Capping ride times at 75 minutes is expected to require 8 additional buses utilizing the current routes. There is a possibility that many of the additional routes could be avoided if efficiency routing occurred at the same time as this option.

Creating a K-12 bus system will require significant changes in bell times and length of instructional days to minimize ride times as much as possible but generally students will be on the buses longer than they are today in this option.

This report has been developed by Transfinder Professional Services.
Professional & Implementation Services Management Team

**Dan Roberts, Director, Professional Services**, is responsible for developing and expanding the company’s professional services for school districts throughout North America. He leads the company’s in-house staff as well as taps into a network of industry experts to provide comprehensive services for the efficient management of student transportation operations. From routing and logistics services to demographic analyses, management training, transportation consolidation, and benchmarking studies, Roberts enables districts to meet new challenges arising from budget shortfalls or growth demands.

Dan is a former Executive Director for Long-range Planning and Business Systems for Round Rock Independent School District in Texas, is recognized for his pioneering efforts in developing computerized routing systems for school districts. He also is called upon by national and state organizations to establish standards and conduct independent management audits of district transportation operations in order to help districts incorporate best practices into their transportation operations. Dan is the author of “Best Practices in Student Transportation” and teaches college courses in pupil transportation management.

**Terrell “T” Doolen, Implementation Services Manager**, is responsible for customized advice, training, and support for clients at their sites on specific projects, including advanced training sessions, project management, accelerated implementation services, or route reduction and efficiency planning. Prior to assuming this role in professional services, Doolen also oversaw the technical support staff at Transfinder for three years. He has over ten years of experience in customer service and technical support, and was influential in reshaping and improving the customer service that Transfinder provides. Prior to joining Transfinder, Doolen worked at Yahoo, Inc. in California. He holds a B.S. in secondary education from the University of Illinois at Urbana-Champaign.
Other Transfinder Professional Services available:

We provide implementation services for the full suite of our solutions, including our fleet maintenance, field trip, and AVL software for seamless GPS integration with our routing system.

ROUTE ANALYSIS FOR GREATER EFFICIENCIES & COST SAVINGS
Increasing routing and scheduling efficiencies has a cumulative and positive impact on your transportation budget. We analyze your data, current routes, and bus runs, and recommend incremental changes that yield significant savings. These may include adjusting bell time windows; student ride times; bus capacity based on actual ridership; walk-to-stop distances and routing parameters, and non-required services.

DEMOGRAPHIC ANALYSIS FOR BOUNDARY PLANNING
When your district experiences growth or consolidation, we help you evaluate your student population demographically and geographically based on available local knowledge and historical data. We also will plot and plan for future growth over the next five years. By analyzing your existing or changing school placements, we will then enable your Administrators and Board Members to make policy shifts that have positive effects on the community now and in the future.

MANAGEMENT TRAINING
Several of our Professional Services staff have managed transportation departments and can provide management training for directors throughout the country. We assess your day-to-day operational challenges and provide customized management training to ensure your success.

TRANSPORTATION CONSOLIDATION STUDIES
Economic challenges are causing school districts to evaluate consolidating services, including transportation. Our Professional Services staff has worked with school districts in several states on opportunities for consolidation that ensure local control, while leveraging centralized routing and scheduling expertise. Our studies enable participating school districts to achieve economies of scale through careful analysis, collaborations, and agreements.