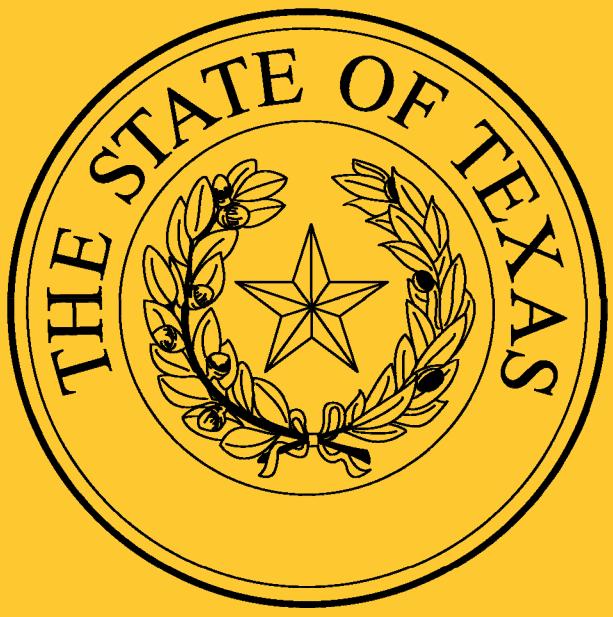


# Brazosport Independent School District

# TRANSPORTATION REVIEW

**Conducted by**
**Management Partnership Services, Inc.**
**for the**
**Legislative Budget Board**

**MARCH 2009**

# LEGISLATIVE BUDGET BOARD

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March 20,2009

Mr. Joe Keith Ripple
Superintendent
Brazosport Independent School District

Dear Mr. Ripple:

The attached report reviews the management and performance of the Brazosport Independent School District's (BISD) transportation operations.

The report's recommendations will help BISD improve its overall performance as it provides transportation services to district students. The report also highlights model practices and programs being provided by BISD's transportation program.

The Legislative Budget Board engaged Management Partnership Services, Inc. to conduct and produce this review, with LBB staff working in a contract oversight role.

The report is available on the LBB website at http://www.lbb.state.tx.us.

Respectfully submitted,

John O'Brien
Director
Legislative Budget Board

cc:

Jay Luce
Joel Welch
Bobby Sharp
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Jay Grable
Ron Damian
Ruth Ann Few

# EXECUTIVE SUMMARY

## OVERALL ASSESSMENT

Brazosport Independent School District's (BISD) transportation department is a professional organization that provides safe and effective transportation services to the district's student population. These services are provided to approximately 2,265 students, or 17 percent of the enrolled population of 13,250 students, at an approximate annual cost of $2.58 million. While service is considered safe and effective, the average annual cost per transported student at $1,139 exceeds current national averages by approximately 50 percent. Furthermore, many students who receive school bus transportation in the district are subject to complex routing practices that provide questionable levels of service quality. Both factors—high cost and relatively low service quality—result from structural impediments facing the department and are not reflective of the quality or professionalism of the transportation staff.

An opportunity exists to lower transportation costs to a level at or below national averages and to improve service quality for student riders. Accomplishing this will require a commitment from district leaders to a multi-year change process, a willingness to consider alterations to the district's school bell time structure, and an up-front investment in technology automation and associated training for the transportation department. District leaders must weigh the potential for annual recurring savings of at least $650,000 against the risk and difficulty inherent in any process of change.

The department is organized into two main divisions. The first, "Transportation Operations," is responsible for the day-to-day delivery of transportation services to the student population. The second, "Fleet Management," is responsible for the upkeep and maintenance of the bus fleet plus all other vehicles and motorized equipment owned by BISD. Each of these divisions is overseen by a supervisory/management position that reports to a single director of transportation. This report is organized based on these two divisions.

## ACCOMPLISHMENTS

- **The organization and operation of the department is effective and professional.** An overall assessment is that the management and administrative functioning of the department is excellent. The professional and motivated workforce has an appropriate focus on the safe and timely transportation of students. The size of the administrative organization is large relative to the number of buses in operation due to a reliance on manual business processes and an overall scarcity of information technology.
- **Despite the majority use of manual processes, BISD staff do an excellent job maintaining the integrity of the manual route data.** During the on-site analysis, the routes documented in *Microsoft Word* templates appeared accurate and reflected the actual routes operating in the district. The seating chart used on the bus serves as a substitute for student rosters on the route sheets. Additional information is gathered and tabulated for state reporting (morning/afternoon counts in October and November, plus mileage), but this process is disconnected from the route sheets and is not used for day-to-day operations or analysis.

## MAJOR FINDINGS

- **BISD's routes are structured on a single tier, with most buses performing just one morning and one afternoon run.** This is a constraint imposed by the placement of all schools on a single bell schedule that has negative cost implications. The most cost-effective use of a bus includes assigning multiple daily bus runs.
- **The district is not maximizing the seating capacity on the regular bus route.** On average, just 47 percent of available seats are filled during regular bus runs. This is lower than industry standards of 60 to 70 percent. There is an inability to effectively analyze system performance and to improve on this result due to a lack of modern route management software and related analytical tools.
- **The district lacks a formal fleet replacement policy for school buses.** The district is faced with a problem in the school bus fleet resulting from a large one-time acquisition of buses in 2004 that will require careful replacement and financial planning now to lessen the burden on future budgets.

## MAJOR RECOMMENDATIONS

- **The district should modify the transportation department's business processes to incorporate information technology and data analysis into the organizational culture.** There are two key components to this recommendation: Plan to fully implement and integrate the *Transfinder* routing software package into departmental operations, and design and implement a regular program of performance measurement, reporting, and analysis.
- **BISD should conduct a comprehensive route analysis to explore methods of reducing transportation costs while increasing service quality throughout the system.** This recommendation should proceed only after completion of the recommendation to modify the department's business processes, and should be informed by the data and systems available through implementation of that recommendation. A key element that must be considered is a rearrangement of school bell times to facilitate a multi-tier route structure.
- **The district should develop a formal fleet replacement plan and funding program.** A formal fleet replacement plan should be developed that establishes specific policies regarding the replacement cycles for school buses, projects the timing for replacement of each bus in the fleet, and establishes a funding plan that ensures appropriate funding will be available to purchase replacement equipment in accordance with the plan.

# TRANSPORTATION OPERATIONS

## ORGANIZATION AND STAFFING

The transportation department of the Brazosport Independent School District (BISD) provides home-to-school transportation to approximately 2,265 of the district's 13,250 enrolled students. It provides these services using a district-owned and operated bus fleet comprised of 64 active route buses, plus 22 spare and activity buses.

There are approximately 84 full- and part-time bus drivers and monitors, a driver clerk (dispatcher), a field trip and routing coordinator, a driver manager, a director secretary, and the director of transportation who support department operations. All staff, except the secretary, report to the driver manager. While the titles are not particularly descriptive of the functions encompassed by each position, the actual breakdown of responsibility within each position is appropriate to the needs of the operation and its existing business model.

The overall operation of the department is professional with safe and effective transportation services provided to the school community. Problems arise primarily in the relative size of the organization, which in turn is reactive to its heavy reliance on manual business processes. An overall scarcity of automation and the historical perpetuation of a manual paper-based approach to providing services is hindering efficiency and adding overhead cost while the quality of service and professionalism of department staff remains high.

### *ADMINISTRATIVE STAFFING AND WORK DISTRIBUTION*

The management and administrative functioning of the department is excellent, with a professional and motivated workforce that has an appropriate focus on the safe and timely transportation of students. However, a lack of automation leads to a shortage of readily available data that is the cornerstone of a modern, quantitative approach to the management of student transportation operations. This absence of analytical focus largely prevents the strategic monitoring of performance or a true recognition of the department's relative cost-effectiveness and service quality. Without this information, it is difficult to plan and execute improvements to the transportation system. The following is a description and assessment of each administrative position in this division:

- **Driver Manager**–The driver manager position is an important function of the department. At the time of on-site review, this position also served as the key liaison to the education community, expending time and effort coordinating special needs transportation requirements and ensuring campus administrators' satisfaction with the services provided. The district has indicated that there have been some changes to the duties of this position since the time of on-site review which include a reduction in the coordination of special needs transportation. Driver performance oversight and management are key aspects of this job. Regular driver evaluations are provided, that includes an on-road evaluative component, although strict adherence to a driver review schedule is not always kept. A strong commitment to driver training is evident throughout the department, with regular in-service training established as part of the department culture and comprehensive basic training of drivers provided by two long-term department employees. Safety is also considered a strong part of the department culture. The department has an active accident review committee. One key concern is an ongoing shortage of qualified bus drivers. There is a regular driver recruitment effort, but a shortage continues to exist.
- **Driver Clerk/Dispatcher**–This position functions as the department dispatcher tasked with handling some of the duties of supervising daily bus operations and on-road communications. This is a critical full-time position in a system of this size and is operated effectively. A split shift allows for full coverage of this function during the critical morning and afternoon bus operations windows, with off-peak coverage provided by the secretary and routing coordinator.

  Communication is provided to drivers via a two-way radio system and to others via the department's telephone. Of particular note in this function is the creation and maintenance of a daily status board, which provides a manual but effective summary of all exception-management issues likely to affect the day's operations. This board is updated continually, with a clean-slate rewrite as the last task performed each day

is completed. Information maintained on this board includes:

- open (uncovered) routes;
- routes being covered by a substitute driver;
- downed buses and the bus number of the assigned spare;
- field trips and buses assigned; and
- inventory of standby substitute drivers and monitors.

The status board is an example of an effective operational tool but is also an example of the basic dichotomy observed in this operation; it is a well-conceived and executed process that is somewhat self-limiting as a strategic management tool due to the lack of automation or analysis. Other examples of this issue that emerge from within the responsibilities of this function include:

- *Pre-trip inspections*–The culture (and policy) of the department demands completion of all required pre-trip inspections on buses. An excellent form and supporting process for verifying completion is in place. The driver clerk expends considerable effort on managing the data and process. It is, however, purely a check-off to ensure completion. Forms are filed and records of completion are maintained, but no attempt is made to capitalize on the data that is made available through these inspections. Even the completion logs created for the director are just that—a paper form in an electronic format and not useful for analysis.
- *Route book*–This is a comprehensive binder containing copies of all active routes, driver directions, and a rider eligibility list by residence street name. All of the key operational data required to maintain the system in working order are available in this book.
- *Dispatch log*–The driver clerk records the actual roll-out time for all buses manually on an electronic form. The structure of this form essentially duplicates a paper form that is printed and the roll-out time is recorded. This method of recordkeeping inhibits easy data analysis, resulting in considerable expenditure of time and effort for a minimal analytical benefit.

- **Routing Coordinator**–This position has two primary roles: special trip management and scheduling and regular route development and management. This responsibility is a joint coordinated task with the driver clerk (dispatcher).

  In the second role, this position is also responsible for coordinating substitute drivers, bus monitors, and field trips.

  Special trip planning and scheduling is a time-consuming responsibility. This is a potential problem unless the route system itself is kept static, which is the case in BISD. Similar to the dispatch function, the processes for management of special trips are commendable, but manual. These include a paper request form initiated by the campus that is requesting service. This form becomes the primary tracking and billing tool for the service. Instructions on the form indicate that it must be submitted to the transportation department at least 10 days prior to the trip. Negotiations and discussions with the campus are undertaken, if needed, to resolve any problems after the form is received in the department.

  Trips are recorded and tracked on a paper calendar, and the forms go into a monthly tickler file. Schools must obtain a charter bus from a private provider if all district manpower and buses have been exhausted. Drivers are assigned to trips based on seniority determined by a "field trip availability" form completed by the driver during in-service training before the school year begins. The assignment protocol is included in the driver handbook. Assignments are made two weeks in advance, if possible. Drivers are notified of assignment by a card placed in their mail box. Assignments are tracked on another electronic form (manual entry in an *Excel* template). The driver completes the bottom of the billing form and returns it after trip completion.

- **Director Secretary**–In addition to general clerical functions, this position is responsible for the financial processes of the department, which includes some duties of payroll processing. This is typically a difficult and involved process for transportation operations due to the unusual nature of the driver's unique role in the school district. A split work day with constantly changing hours that vary considerably from one driver position to the next often creates a difficult

payroll process. BISD has simplified this to some extent by basing driver pay on a flat rate that is predetermined by the driver's assigned trip classification and time. There are no time clocks, only a record of trip completion by day and by person. In addition, overtime hours are tracked and paid separately. While this approach simplifies the payroll process, the impact on actual pay versus time worked is not clear from the data.

### *ADMINISTRATIVE OFFICES AND FACILITIES*

The facilities allocated to the department staff consist of portable buildings set inside the bus parking and operations lot. The administrative staff has limited space available that is barely adequate to the needs of the operation. The available space is organized, particularly in the separation provided for the dispatch, routing, and driver management functions. This provides for an appropriate work flow and separation of these functions from the day-to-day operations of the drivers, while still allowing for suitable access to support effective operations.

Driver facilities are attached to the administrative offices in the same collection of portable buildings and are equally inadequate. A small driver lounge exists, with immediate access from that location to the office of the driver manager and to the dispatcher. Each driver has a mailbox, which is the primary means of communication between the administrative staff and the drivers. The inadequacy results from the size of the space and the associated restroom facilities.

A different issue exists with the adequacy of the bus parking area. Given the current size and composition of the fleet, this area is inadequate for department needs. Evidence of this exists in the relatively large number of minor "yard strike" bus accidents that occur during turning and backing maneuvers in the cramped parking area. However, as discussed later in this report, opportunities may exist to reduce the size of the active and spare fleet which could potentially make this issue self-correcting. If not, other opportunities may exist to modify the existing space in such a way that would partially lessen this concern.

### *ASSESSMENT OF DRIVERS AND OTHER BUS PERSONNEL*

The current cadre of drivers and monitors is typical, in most respects, to similar operations around the country. There is a mix of long-tenured drivers supplemented by a less experienced group. Driver recruitment activities in BISD include participation in job fairs, ads in the local newspaper, and banners on buses. While driver turnover does not appear to be a major problem, the department is faced with a shortage of qualified drivers. The net effect is threefold: mechanic labor is used to cover routes on a daily basis at a higher (less efficient) rate of pay; the system of permanent substitutes breaks down as these positions end up with regular route assignments; and the route network must be modified to accommodate a smaller driver pool, resulting in some doubling of morning and afternoon runs.

Other than this issue, the driver and monitor staff is qualified, professional, and suitable to the demands of the service delivery model in BISD. Turnover is reported to be low, although no data exists to confirm this assessment. Driver compensation levels appear fair and equitable, although there is no solid regional comparison basis available. The system of hiring a small number of drivers as permanent substitutes is an excellent practice. This structure allows for a pool of drivers to be consistently available to cover routes where the normal driver is unavailable. Unfortunately, the benefits of this system degrade when all permanent substitutes are assigned to regular routes as they were in the district at the time of on-site review.

The department's training programs and safety records are excellent. Two experienced drivers and the driver manager are assigned to train all new drivers. A regular program of in-service training is provided for the entire staff with rotating subject matter. A review of the records demonstrates a commitment to training with an annual start-up session and at least two additional in-service training sessions per year. Each of the managers and departmental support staff have a role in providing training. District staff is also used for student management issues. Local law enforcement officers present information along with district staff. Each special needs driver and monitor must attend a Regional Education Service Center IV (Region 4), 16-hour training program specific to the specialized needs of these students. This includes drivers who want to substitute and/or who may want to request a permanent special education route assignment.

### *POLICIES AND PROCEDURES*

While actual operating practices and procedures are effective, documentation of actual policies and procedures is lacking. The majority of policies appear to be derived from wording provided in state law, and there is much commonality among the policy documentation of multiple districts. Areas covered in this policy include: bonds and taxes relative to new bus

purchases, purchasing regulations, transportation funding for eligible students, maintenance of buses, student records, school trip requirements, student conduct, and student fees. In addition, documented administrative procedures include: loading, mechanical breakdowns, backing up, and fieldtrips. The employee handbook also establishes operational procedures including, but not limited to, personnel management and student discipline. The department appears to adhere to the documented policies and procedures. While numerous other policies and procedures should be documented, existing operational practices nevertheless provide for a safe and effective transportation operation. The need for documentation will arise when and if pressure is placed on transportation to change its business practices.

## BUS ROUTING AND SCHEDULING

### *SERVICE DESCRIPTION*

Transportation services are provided to approximately 2,265 students attending programs at 19 school locations on a single time tier. The schools, their grade ranges, and bell times are described in **Figure 1**.

**FIGURE 1**
**SCHOOLS SERVICED, SCHOOL YEAR 2007–08**

| SCHOOL TYPE | SCHOOL | GRADE RANGE | START TIME | END TIME |
|---|---|---|---|---|
| Elementary | AP Beutel | Pre K–4 | 8:00 | 3:30 |
| Elementary | Bess Brannen | Pre K–4 | 8:00 | 3:30 |
| Elementary | Elizabeth Ney | Pre K–4 | 8:00 | 3:30 |
| Elementary | Fleming | Pre K–4 | 8:00 | 3:30 |
| Elementary | Jane Long | Pre K–4 | 8:00 | 3:30 |
| Elementary | Madge Griffith | Pre K–4 | 8:00 | 3:30 |
| Elementary | OM Roberts | Pre K–4 | 8:00 | 3:30 |
| Elementary | Polk | K–5 | 8:00 | 3:30 |
| Elementary | SF Austin | Pre K–6 | 8:00 | 3:30 |
| Elementary | TW Ogg | Pre K–4 | 8:00 | 3:30 |
| Elementary | Velasco | Pre K–4 | 8:00 | 3:30 |
| Middle | Lanier | 5–6 | 8:00 | 3:30 |
| Middle | Rasco | 5–6 | 8:00 | 3:30 |
| Intermediate | Clute | 5–8 | 8:00 | 3:30 |
| Intermediate | Freeport | 7–8 | 8:00 | 3:30 |
| Intermediate | Lake Jackson | 7–8 | 8:00 | 3:30 |
| High | Brazosport | 9–12 | 8:00 | 3:30 |
| High | Brazoswood | 9–12 | 8:00 | 3:30 |
| Special | Lighthouse | 1–12 | 8:00 | 3:30 |

SOURCES: BISD transportation department; Management Partnership Services, Inc. analysis, 2008.

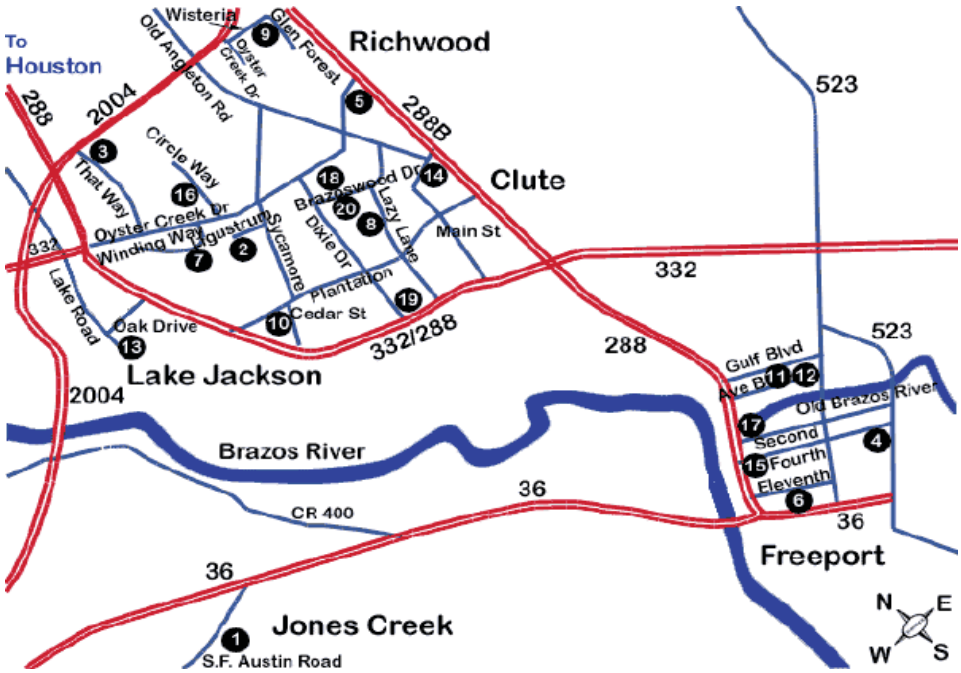
BISD also provides space-available transportation to students living within the two-mile walk radius defined by state reimbursement regulations if those students walk to an established stop outside of the two-mile zone. The number of students transported in this manner is not available given existing data.

Schools in the district are clustered around the more dense, urbanized areas of Clute and Freeport, as illustrated in **Figure 2**, resulting in a high proportion of students being ineligible for transportation per state guidelines. Using school year 2006–07 student count sheet for October (morning only), on average the district transports 2,265 actual bus riders against a total student population of 13,250, or just 17 percent of the total population.

Routes are structured on a single tier, with most buses performing one morning and one afternoon route. This constraint is imposed by the placement of all schools on a single bell schedule. This decision has significant cost implications, which will be discussed later in this report. Exceptions to this one-route approach exist for buses performing double runs as a result of driver shortages and/or intentional design (10 buses in the morning, 3 in the afternoon), plus 19 buses that perform a 2:30 PM kindergarten run in addition to the regular afternoon run. The existing route approach uses an assortment of dedicated runs (one bus transporting a set of students to a single location), combination runs (one bus transporting students to multiple schools, dropping in sequence), and shuttles (transferring students delivered on a dedicated or combination run to a common school location on to their school of attendance) such that many buses touch at multiple schools during their morning or afternoon run.

**Figure 3** describes this structure more fully for the morning set of routes. The first column indicates the point of service (usually a school location). The next several columns indicate the number of buses servicing the location as either the first, second, third, fourth, fifth, or sixth delivery location on the morning route. Thus, there are a total of 71 morning bus runs (from column 1), equating to 61 buses with 10 doing a second (double) run. Bess Brannen Elementary School, for example, is serviced by a total of four bus runs, each of which are delivering students as the first delivery location. Clute Intermediate School is serviced by a total of nine bus runs, six of which have Clute as the first destination, and three which have Clute as the second destination. As can be seen, of the 71 total bus runs, 38 service two delivery locations, 21 service three, and so on.

**FIGURE 2**
**DISTRICT CAMPUS LOCATIONS, SCHOOL YEAR 2007–08**




SOURCE: BISD transportation department.

**FIGURE 3**
**MORNING ROUTE SEQUENCING, SCHOOL YEAR 2007–08**

| SCHOOL/LOCATION | NUMBER OF ROUTES SERVING LOCATION IN ORDER OF DROP SEQUENCE | | | | | | TOTAL ROUTES SERVICING LOCATION |
|---|---|---|---|---|---|---|---|
| | 1ST | 2ND | 3RD | 4TH | 5TH | 6TH | |
| AP Beutel | 2 | | | | | | 2 |
| BCC Daycare | 1 | | | | | | 1 |
| Bess Brannen | 4 | | | | | | 4 |
| Boot Camp | 1 | | | | | | 1 |
| Brazosport | 2 | 4 | 3 | 1 | 2 | | 12 |
| Brazoswood | 10 | 2 | 2 | | | | 14 |
| Clute | 6 | 3 | | | | | 9 |
| Elizabeth Ney | 2 | 1 | | | | | 3 |
| Fleming | 2 | 1 | 3 | 1 | | | 7 |
| Freeport | 2 | 5 | 3 | 2 | | | 12 |
| Jane Long | 3 | 1 | 2 | | | | 6 |
| Lake Jackson | 3 | 10 | | | | | 13 |
| Lanier | 1 | 4 | | 5 | | 1 | 11 |
| Lighthouse | 1 | | | 3 | 1 | 1 | 6 |
| Madge Griffith | 5 | 3 | | | | | 8 |
| OM Roberts | 1 | | 1 | | | | 2 |
| Polk | 5 | | 1 | | | | 6 |
| Rasco | 11 | 3 | 4 | | | | 18 |
| SF Austin | 3 | | | | | | 3 |
| Shiloh | 1 | | | | | | 1 |
| TW Ogg | 1 | 1 | 1 | | | | 3 |
| Velasco | 4 | | 1 | 1 | 2 | | 8 |
| **GRAND TOTAL** | **71** | **38** | **21** | **13** | **5** | **2** | **150** |

SOURCES: BISD transportation department; Management Partnership Services, Inc. analysis, 2008.

The effect of this approach is that many bus runs must deliver their student loads in advance of the scheduled school start time in order to continue to deliver to all of their designated locations before the common start time for all schools. In practice, this creates a "false tier" in both the morning and afternoon whereby large arrival and departure time windows are used in advance of school start and after dismissal. This is further illustrated in **Figure 4** with the scheduled arrival times for all 12 morning bus runs servicing Brazosport High School. In **Figure 3**, these buses deliver students to Brazosport as early as their first and as late as their fifth delivery location (stop sequence) on their morning runs. As a result, the first bus servicing this school is scheduled to arrive at 7:15 AM and the last not until 7:58 AM, or 43 minutes later. The cost and service implications of this routing approach are discussed later in this report.

**FIGURE 4**
**MORNING ARRIVAL TIMES FOR BRAZOSPORT HIGH SCHOOL BUS RUNS, SCHOOL YEAR 2007–08**

| ARRIVAL SEQUENCE | ARRIVAL TIME | TIME BEFORE FIRST BELL |
|---|---|---|
| 1 | 7:15 | 0:45 |
| 2 | 7:20 | 0:40 |
| 3 | 7:22 | 0:38 |
| 4 | 7:33 | 0:27 |
| 5 | 7:35 | 0:25 |
| 6 | 7:35 | 0:25 |
| 7 | 7:40 | 0:20 |
| 8 | 7:45 | 0:15 |
| 9 | 7:47 | 0:13 |
| 10 | 7:51 | 0:09 |
| 11 | 7:55 | 0:05 |
| 12 | 7:58 | 0:02 |

SOURCES: BISD transportation department; Management Partnership Services, Inc. analysis, 2008.

### *ROUTING PROCESSES*

As previously stated, BISD transportation operations are dominated by manual processes and a lack of automation. There was an effort to rectify the absence of routing software in recent years with the acquisition of the *Transfinder* routing software package. Unfortunately, the implementation of this software was not completed, and the organization reverted back to manual processes. Management has expressed a desire to continue the implementation of this routing software; and since the time of on-site review. the district has taken steps to begin using the software no later than school year 2009–10.

Despite the manual processes, BISD staff do an excellent job maintaining the integrity of the manual route data. The routes documented in *Microsoft Word* templates are accurate and reflect the actual routes operating in the district. The routes documented in *Word* templates include most key information required for effective operation of the routes, including driver directions, stop locations, and times. In addition, a seating chart is used on each bus which is a substitute for student rosters on the route sheets. Additional information is gathered and tabulated for state reporting (AM/PM counts in October and November, plus mileage), but this process is disconnected from the route sheets and is not used for day-to-day operations or analysis. No maps are provided or available to visualize routes, except as produced for special purposes and presentations to senior administrators and the Board of Trustees. There is no documented annual planning cycle for routing; however, according to district staff, routes are evaluated throughout the school year. There is also no student database being maintained by the department. Operational processes call for route updates only on an as-needed basis as a result of overloads, driver shortages, etc.

The major problem that arises in this approach is the lack of readily available data and analytical tools. This causes a systemic reluctance to change or challenge the status quo, as any major route reengineering effort must encompass a large investment of time and attention to develop the data necessary to properly evaluate alternatives. This effect tends to perpetuate existing route structures with changes only as required to adapt an existing route or set of routes to changing circumstances. The lack of ongoing performance measurement and monitoring coupled with the inherent difficulty of analyzing potential changes results in a less effective and efficient route network. The performance assessment described in this report provides evidence of this analysis.

### *SYSTEM PERFORMANCE ASSESSMENT*

The BISD transportation system is a high-cost service that is providing a reasonable level of service quality. The overall annual cost per bus is low relative to national averages and is in line with industry practice for comparable districts in Texas. However, a more relevant measure of overall cost-effectiveness—the annual cost per student transported—is high relative to national averages. This problem is the result of the constraints placed on the system by the single-tier structure, in combination with low capacity utilization on individual bus runs. Service is reasonable, and not high, because while student ride times are low and the service

provided is safe and professional, this is offset by the problem of early drop-offs and late departures from school. This is a result of the basic route architecture and bell time structure of the school district. Nevertheless, it is possible to improve both the service quality and cost-effectiveness of this system as described later in this report.

### *SERVICE QUALITY*

The average maximum ride times for students were determined by calculating actual bus run times from the available data. For any given bus run, the time between the first stop where students board the bus and the last stop where students disembark represents the maximum student ride time. The review team calculated averages and other base statistics across all morning and afternoon runs and the time to the first route delivery/pickup and its last. In addition, the review team calculated the amount of time a bus operates without students on board, either traveling to its first stop or from its last stop back to its parking location (termed "deadhead") or while waiting between bus runs (termed "layover"). A review of these statistics, summarized in **Figures 5** and **6**, reveals averages that are within expectations for a district like BISD. The outliers causing the high maximums in these figures are primarily due to the unique requirements of special needs bus runs.

**FIGURE 5**
**MORNING RIDE TIME STATISTICS, SCHOOL YEAR 2007–08**

| | DEADHEAD AND LAYOVER TIME | RUN TIME | RUN TIME TO SCHOOL 1 |
|---|---|---|---|
| Median | 0:20 | 0:42 | 0:35 |
| Average | 0:21 | 0:47 | 0:37 |
| Minimum | 0:05 | 0:15 | 0:15 |
| Maximum | 1:26 | 1:34 | 1:30 |
| Standard Deviation | 0:12 | 0:20 | 0:16 |

SOURCES: BISD transportation department; Management Partnership Services, Inc. analysis, 2008.

**FIGURE 6**
**AFTERNOON RIDE TIME STATISTICS, SCHOOL YEAR 2007–08 (INCLUDING 2:30 PM RUNS)**

| | DEADHEAD AND LAYOVER TIME | RUN TIME | RUN TIME FROM LAST SCHOOL |
|---|---|---|---|
| Median | 0:30 | 0:40 | 0:30 |
| Average | 0:30 | 0:43 | 0:32 |
| Minimum | 0:00 | 0:10 | 0:05 |
| Maximum | 1:15 | 1:35 | 1:30 |
| Standard Deviation | 0:11 | 0:20 | 0:16 |

SOURCES: BISD transportation department; Management Partnership Services, Inc. analysis, 2008.

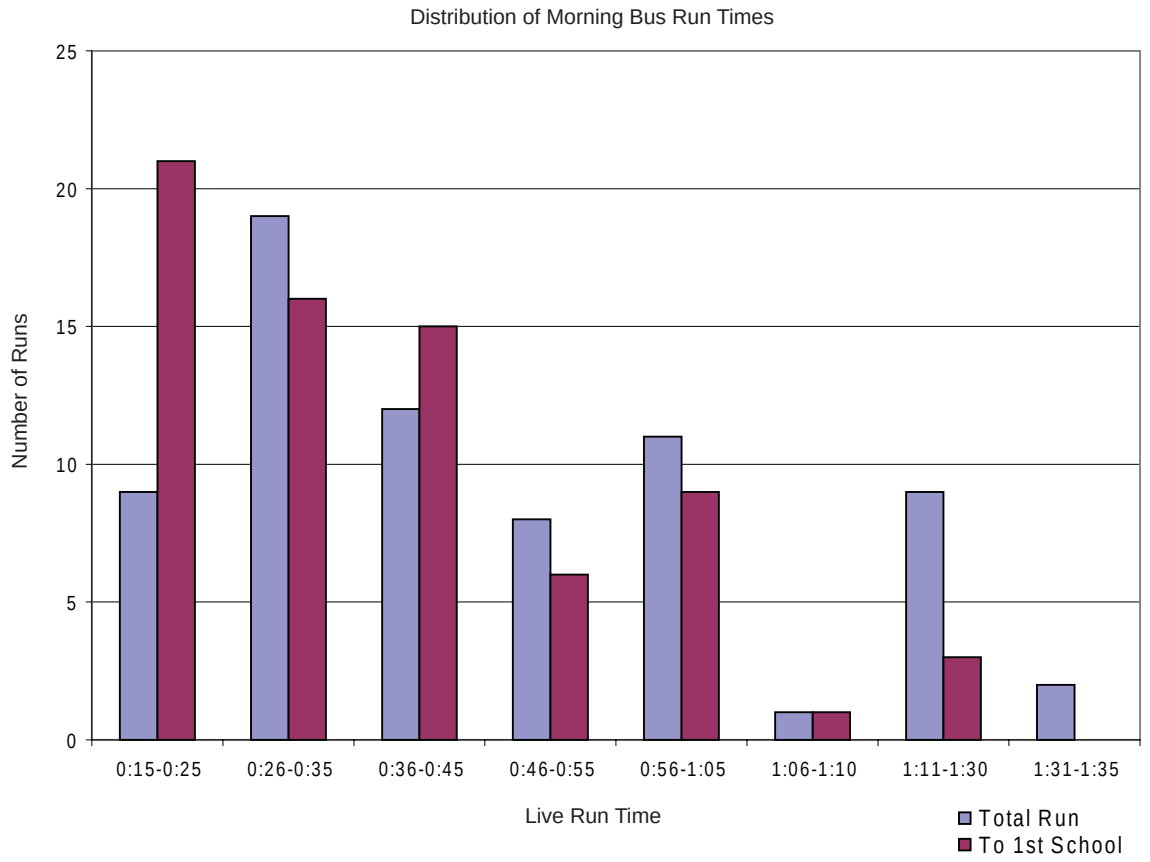
The effect of the "false tier" concept introduced in the description of the route architecture becomes readily apparent in an examination of the data summarized in **Figure 7**. This figure shows the number of morning bus runs that fall within each time range for length of the run and the data for both run time to the first school delivery and run time to the last school delivery (overall run time). Thus, for example, a total of 9 bus runs take between 15 and 25 minutes to complete the entire run, including all school deliveries; and 16 bus runs take between 26 and 35 minutes just to arrive at their first school delivery location in the morning.

**Figure 7** shows that 52 of 71 morning bus runs, or 73 percent of the total, arrive at the first school within 45 minutes of picking up the first student. Considering the total run time, including all school deliveries, this drops to 40 runs, or 56 percent of the total. This difference illustrates the opportunity for BISD if the district were to change the route schedule. For example, increasing the number of dedicated bus runs (those that serve a single school location) has the potential to increase the quality of service delivery by significantly lowering average student ride times.

Other statistics besides student ride time can help assess the level of service quality in an operation. Examples of these include the following:

- *Timeliness of bus arrivals relative to schedule* – A measure of accuracy and effectiveness for the system of bus routes is how close buses arrive and depart schools relative to scheduled times. Measurement requires data collection and record keeping via logs or automated means such as Global Positioning System (GPS) technology.
- *Accident rates* – Tracking accident trends per million miles driven or some other baseline provides a useful measure of overall system safety. While excellent records are maintained by BISD for each chargeable and non-chargeable accident, the data necessary to record and track this measure of performance is not currently captured.
- *Complaint rates and complaint resolution* – Even the best transportation operations receive complaints and/or requests from users. The rate at which these are received and resolved, tracked by type of complaint, provides a useful operational measure of service quality. Such data is not currently captured or tracked by the department.

**FIGURE 7**
**RUN TIME COMPARISON, SCHOOL YEAR 2007–08**




SOURCES: BISD transportation department; Management Partnership Services, Inc. analysis, 2008.

Due to the lack of data, an analysis of these statistics could not be developed within the scope of this project. However, it is equally important to gauge service quality on a more qualitative scale. The observation of loading zone and dispatch operations during the on-site portion of this assessment indicate an overall high level of performance that is reflective of the professionalism and dedication of the BISD transportation staff.

### *COST-EFFECTIVENESS*

The key measures of cost-effectiveness for a student transportation system include the annual cost per transported student and the annual cost per active route bus. A useful comparison is also to convert the annual cost to a daily cost, which is a typical industry standard for pricing of contracted transportation services. A subset of cost metrics that help to explain overall costs include those to maintain and repair the bus fleet. This cost is calculated as the maintenance and repair cost, and cost of spare parts per Vehicle Equivalent Unit (VEU). A VEU provides a standard comparison basis for dissimilar vehicle types by converting resource requirements to the equivalent of one standard sedan. Thus, a typical Class C school bus consumes 3.5 times the resources of a sedan in both labor and parts and receives a VEU of 3.5. Other important explanatory metrics include the number of buses required to transport 100 students and the percentage of available bus seats being filled on each bus run (capacity utilization). All of the inputs that define the service characteristics of a transportation system are shown in the cost performance metrics, which are summarized in **Figures 8** and **9**.

The dual and sometimes conflicting goals of any student transportation operation should be to fill each bus as closely as possible to capacity and to reuse that bus as many times as possible over the course of the day. These goals conflict in that to fill a bus the length of the run must be extended, and by extending the run you reduce the time available to reuse the bus. It is also true that service constraints and the geographical area can work against both of these goals. One

**FIGURE 8**
**KEY MEASURES OF COST-EFFECTIVENESS, SCHOOL YEAR 2006–07**

| | |
|---|---|
| Annual Cost per Student | $1,139 |
| Annual Cost per Bus | $39,701 |
| Daily Cost per Bus | $221 |
| Buses per 100 Students Transported | 2.83 |
| Maintenance and Repair per VEU | $1,761 |
| Parts per VEU | $533 |

SOURCES: BISD transportation department; Management Partnership Services, Inc. analysis, 2008.

**FIGURE 9**
**AVERAGE CAPACITY UTILIZATION BY BUS SIZE**

| (2006 AND 2007 OCTOBER COUNTS, MORNING ONLY) | |
|---|---|
| 71 Passenger | 47% |
| 53–60 Passenger | 9% |
| 13–34 Passenger | 22% |

NOTE: The results in this figure were calculated using documented eligible rider counts from the district.
SOURCES: BISD transportation department; Management Partnership Services, Inc. analysis, 2008.

key constraint is the design of school bell times and how well they support or detract from these efficiency goals. Another key constraint that is partially controllable by the transportation department or district administrators is the density of students and their location relative to their schools of attendance.

Transportation management has two items to work with relative to achieving these goals while meeting the service quality expectations of the community: buses and time. Time is flexible to the extent that school bell times can be altered to support more efficient transportation services. In the absence of sufficient time, the only solution available is to add buses. Even this solution is not feasible in some cases where the time allowed to meet a service requirement is insufficient regardless of how many buses are used.

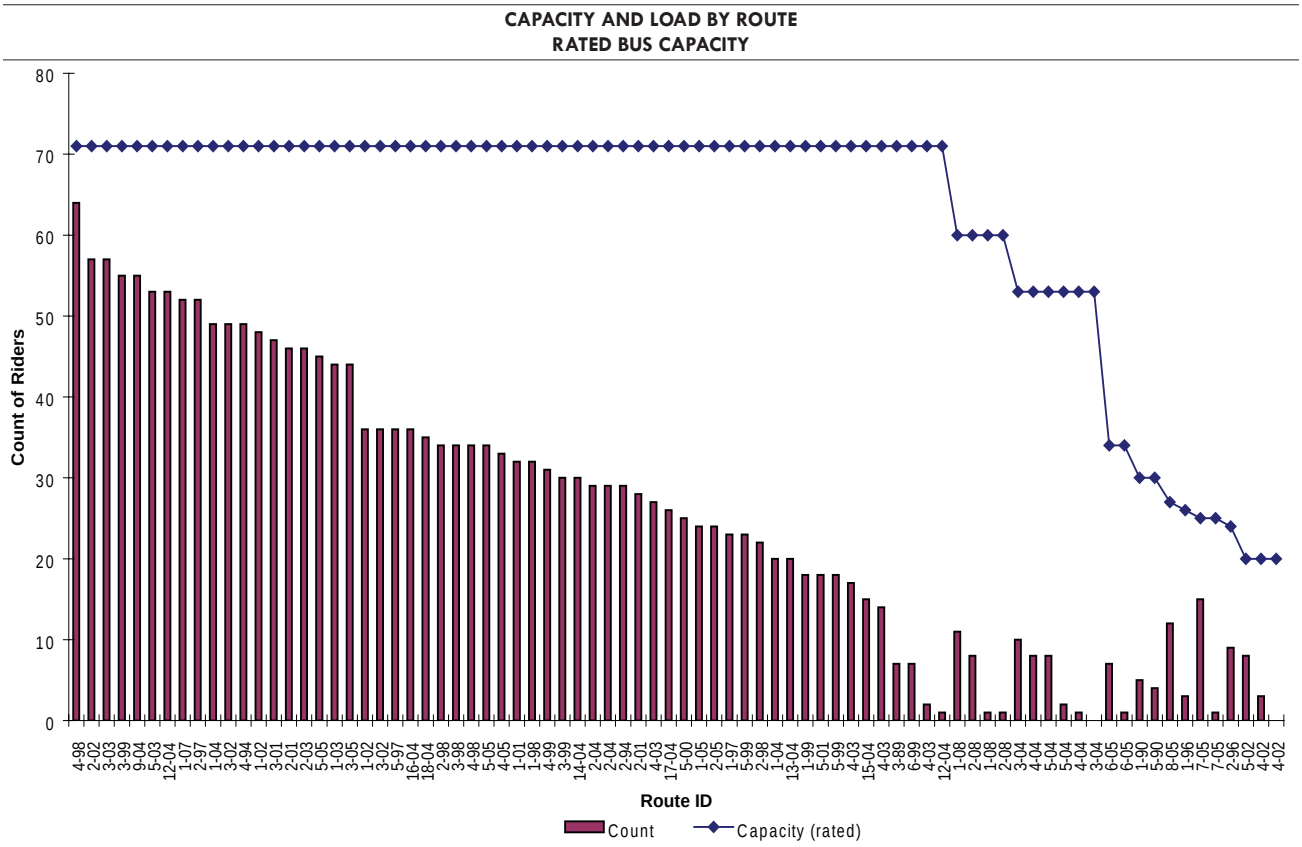
BISD's existing bell time constraints, lack of automation, and lack of regular analysis of bus routes impact the cost-effectiveness of the district's transportation services. While the annual cost to own and operate a route bus (shown in **Figure 8** as the Annual Cost per Bus) are within expectations and below national averages of $41,000 to $64,000, the annual cost per transported student is more than 50 percent higher than current national averages of $685 to $735 per student. This is a result of the route structure and relates to the bell time constraint that limits most buses to a single morning and a single afternoon run. This result also relates to the low level of capacity utilization on individual bus runs, which is controllable to a certain extent by BISD staff and the route planning processes. For this analysis, the review team used the data provided by the district to determine the capacity utilization; however, according to the district this analysis does not account for ineligible students who are allowed to ride buses on a space available basis.

The most relevant explanatory measure to understand the cost results is the number of buses used to transport 100 students. The single greatest impact a system can have on reducing overall transportation cost is to reduce the number of route buses in service. The majority of cost for a route bus is essentially fixed; the capital cost of the asset and the cost of employing the driver will be incurred regardless of how frequently or effectively that bus is used. While it is true that there are incremental costs associated with using the bus for more miles and hours each day, these costs are minor relative to the fixed costs. Thus, by using fewer buses to transport the same number of students, the cost per student goes down. At 2.87 buses per 100 students, BISD transportation is using two times as many buses as would be expected in a comparable multi-tier system. This illustrates that the district is not taking advantage of the "reuse" principle and helps to explain how the cost per bus can be low while the cost per student is high.

A closer examination of capacity utilization also reveals that the district is not benefiting from the "fill the bus" rule. Based on industry standards, capacity utilization is expected to be between 60 to 70 percent of the rated capacity of the bus for regular transportation services in a district such as Brazosport. The industry standard of 60 to 70 percent per rated capacity adjusts for the two to three students per seat. Focusing only on the large 71-capacity buses that are used for this category of service, this represents an average of just 47 percent utilization. For clarification, this result is based on a single October morning count performed during school year 2006–07 because the data had to be tabulated manually. **Figure 10** shows the actual counts for each bus run on which this result was based. The figure is organized in decreasing order by count of seats occupied and capacity of the bus. The larger buses and those with the highest capacity utilization are to the left on the figure. The line indicates the available capacity of the bus, and the bar indicates the count of students on the run. The space between the line and the bar is indicative of the number of empty seats.

The degree to which this available capacity can be used and how many more times the bus can be used over the course of

**FIGURE 10**
**CAPACITY UTILIZATION, SCHOOL YEAR 2006–07**




SOURCES: BISD transportation department; Management Partnership Services, Inc. analysis, 2008.

the day represent the magnitude of the efficiency opportunity open to BISD. Reusing the buses more frequently would require the establishment of a multi-tier routing system and bell time structure. Better use of the available capacity would be dependent on more effective analysis and route planning. Combined, there is a significant opportunity to reduce the overall cost of transportation.

## RECOMMENDATIONS

- **Recommendation 1: Rewrite and document departmental policies and procedures, and adjust driver recruitment efforts to support modified business processes and a reengineered route network.** The precise character and requirements of this recommendation will vary depending on the decisions reached regarding the use of technology and the redesign of the bus routes. For example, the need for recruitment and retention of drivers will vary considerably with the number of route buses in operation. Assuming no change, then a significant effort is required to fill the driver ranks and allow the system to work as designed. Should the number of route buses be reduced, then attrition processes are likely to keep driver ranks full for the foreseeable future without any special effort dedicated to driver recruitment. The district should document all regular operating policies and procedures, realizing that the importance of this recommendation will increase if changes to business processes are made to incorporate automation into this operation. It is important to design and document new policies and procedures before they are implemented. The district should plan to complete this process no later than the start of school year 2010–11. It is assumed that the district could accomplish this recommendation with existing staff but should account for some hours of overtime to complete. The one-time cost of overtime hours is estimated to be no more than $10,000.

- **Recommendation 2: Modify the transportation department's business processes to incorporate information technology and data analysis into**

**the organizational culture.** There are two key components to this recommendation:

- The district should fully implement and integrate the *Transfinder* software package into departmental operations. This is a key technology tool that is a critical element of modern student transportation operations. It provides the data backbone that will support all performance measurement, analytical, and improvement efforts of the administrative and management staff. It will also require an up-front commitment of financial resources and staff time to achieve successfully. The district should plan for an estimated $35,000 initial cost and a six to nine month implementation process. The $35,000 accounts for the cost of software, licensing, and staff time associated with designing new business processes, system coding, and setup. Moreover, since the time of on-site review, the district has taken steps to implement this system that may reduce the estimated cost associated with the implementation of this system. Additional cost for annual system maintenance is estimated at $2,500 beginning with school year 2010–11.

- The district should also design and implement a regular program of performance measurement, reporting, and analysis. An analytical culture will develop only as an outgrowth of measurement and reporting. In the tracking of key performance indicators over time, management will discern trends and target specific areas of the operation for analysis and improvement. The implementation of this part of the recommendation must proceed in parallel with the implementation of routing software, because the setup and use of the software should be informed by knowledge of what data management desires for ongoing analysis. The cost and resources required for implementation of this recommendation will depend on the complexity and extent of the program, but in all cases should be limited to staff time required for design of the appropriate measures, data collection mechanisms, analysis, and reports. To initially incorporate this system with outside professional assistance is estimated to be a one-time cost of $10,000. This recommendation would result in a one-time net cost of $45,000 ($35,000 + $10,000).

- **Recommendation 3: Conduct a comprehensive route analysis to explore methods of reducing transportation costs while increasing service quality throughout the system.** This recommendation should proceed only after completion of the recommendation regarding system implementation, as it will be informed by the data and systems made available through implementation of that recommendation. The district should proceed with a plan of implementation for, at the earliest, school year 2010–11. This route reengineering is the basis behind the potential cost savings and is predicated primarily on one key assumption: that BISD leadership is willing to consider the implementation of a multi-tier bell time structure that takes advantage of the bus arrival and departure windows in use, plus the common length of instructional days at all schools. This would permit a shifting of bell times into two tiers without major school start time changes. In turn, this would accommodate a higher number of run pairings and a concurrent reduction in the number of buses required system-wide. It is estimated that if this recommendation is implemented that the district could realize an annual savings of $650,000 beginning with school year 2010–11. To conduct a route analysis with outside professional assistance is estimated at a one-time cost of $10,000.

# FLEET MANAGEMENT

## ORGANIZATION AND STAFFING

The BISD Fleet Management division provides preventive maintenance (PM) and repair services for all vehicles and motorized equipment owned by the district. This includes 86 school buses, 7 ancillary transportation vehicles (including surburbans used for student transportation) and trailers, 45 facilities and food service vehicles, and 30 pieces of miscellaneous grounds equipment. The division is staffed by a 1.0 full-time equivalent (FTE) shop manager, 1 shop clerk who also drives a morning and evening route, 2.5 FTE mechanics, and 2.0 FTE service vehicle technicians/attendants. All staff assigned to this division are full-time employees of the district. The shop clerk devotes all of her time to administrative tasks. The shop manager estimates that approximately 50 percent of his time is dedicated to supervision and administration, with the remainder of his time spent as a working mechanic or otherwise providing direct assistance on bus maintenance.

The Fleet Management division is providing excellent service to its district customers. These services are being provided at a cost, however, that exceeds industry guidelines. Overall, problems arise primarily in the heavy reliance on manual business processes, the scarcity of information technology and related analyses, and the lack of diagnostic tools (as reported by the district). This manifests in high costs and an oversized fleet and has implications for long-term capital replacement of fleet assets.

### *WORK DISTRIBUTION AND SHOP OPERATIONS*

Work is distributed to shop employees based on the nature of the requirement and the skills of the employee. The vehicle attendant is primarily responsible for the PM procedures on all vehicles, including oil and filter changes and chassis lubrication. The vehicle technician assists with PM procedures, provides other assistance to the division mechanics as required, and is also assigned independent repair work, such as brake replacement jobs. The part-time mechanic is assigned to seat repairs and other minor maintenance along with providing assistance to the lead mechanics. The lead mechanics are responsible for the heavy maintenance procedures performed in the shop. Mechanics' work shifts are staggered to provide coverage for morning vehicle start-up and on-road breakdowns over the course of the entire BISD transportation service day. The shop manager is on call and responds to after hours failures or accidents. A Mobile Repair Unit is equipped with an air compressor, spare tires, miscellaneous parts, filters, and oil to aid in the prompt response to calls for on-road service.

The experience, knowledge, and skills of the mechanical staff vary. There is no coordinated program to encourage or require industry certifications. While the two senior mechanics are both Automotive Service Excellence (ASE) certified for brakes (auto only), and one mechanic holds an additional certification in vehicle air conditioning, there is no broad-based level of professional certification in the shop. There is also no regular program of in-service training. Training sessions that are provided are primarily from vendors and is therefore targeted and focused on brand-specific components and requirements. Examples of such training sessions provided include: brake systems for International brand buses, Thomas/Freightliner service training, and mobility lift maintenance and repair training. This lack of training can lead to issues with proper repair diagnosis and excessive time expended on repairs that may be contributing to the high cost of the operation.

Reporting and tracking of repair requirements is supported by an excellent process that nevertheless parallels the manual, paper-based nature of business processes throughout the department. The drivers use a pre-trip/post-trip form to conduct mandated inspections of their bus. This inspection process is used to identify any emergent repair requirements on the bus. Mechanics are available during morning and afternoon vehicle startup to address any minor items that can be immediately repaired such as "no starts" and bulb replacements. Any other repair requirements are identified on a Vehicle Repair Requisition (VRR) form which serves as a conduit to the shop and a tracking mechanism. The information recorded includes: date of request, description of repairs needed, vehicle number, date work order was opened, date repairs were completed, and the date the vehicle was returned to service. The mechanic responsible for the work is required to complete and sign the form. The majority of information on the VRR form is later entered into a *Microsoft Excel* workbook where an ongoing repair record is maintained. All vehicle maintenance is recorded in this manner with a separate *Excel* record for each vehicle. The

process is excellent and is clearly functional and working well for the department, but it has implications from an information management and analytical standpoint.

The district has an established and functional PM program. Inspections and service are performed on each vehicle on a 5,000 mile schedule. This includes oil and filter change, lubrication, a visual brake inspection, and an overall inspection of the bus. Conformance to this schedule is ensured by data on bus mileage captured by the automated fuel management system. The objective of a PM program is to minimize equipment failure by the regular monitoring of equipment condition and correcting defects before they result in bus failure, route delays, or additional costs. The program reviewed for this analysis is largely effective in achieving this objective but would benefit from an expansion and redistribution of effort that would have a positive impact on the overall cost of maintenance and repairs for the fleet.

The use of information technology and analysis in managing and administering the maintenance shop is more advanced than comparable use in the Transportation Operations division. However, while it is obvious that much thought and planning went into the development of a workable and functional maintenance information system, inputting this information into an *Excel* spreadsheet is time-consuming and incomplete. The current format does not provide a ready means of data extraction for reporting and analysis. An example is found in the difficulty in determining the work performance of mechanical staff. While the VRR form captures the date of the work order, date repairs were completed, and the date the vehicle was returned to duty, only the date when the work is completed is entered into the *Excel* spreadsheet. This method of data collection does not allow the district to conduct an analysis of time spent per mechanic by each type of repair or service, which is a key performance indicator. This information could be useful for measuring mechanic productivity, planning of work assignments, providing data for employee evaluations, and identifying where additional training may be beneficial.

### *MAINTENANCE PERFORMANCE ASSESSMENT*

The key measures of cost-effectiveness for a fleet maintenance and repair operation include total cost per Vehicle Equivalent Unit (VEU), parts costs per VEU, mechanic staffing ratios, age of the fleet, spare bus ratios, and mechanic productivity. Of these, only mechanic productivity could not be calculated as part of this analysis due to limitations on the availability of suitable data. The results of the calculations for these measures of performance are summarized in **Figure 11** and indicate costs that are somewhat above expected ranges. Based on industry guidelines and practice, the total maintenance and repair costs are expected to be between $1,200 and $1,600 per VEU. The calculated result for BISD is $1,761, or 10 percent higher than the upper end of this range.

**FIGURE 11**
**KEY MEASURES OF FLEET COST-EFFECTIVENESS, SCHOOL YEAR 2006–07**

| | |
|---|---|
| Maintenance and Repair Cost per VEU | $1,761 |
| Parts Issued per VEU | $533 |
| Fleet Technicians per VEU | 103–118 |
| Spare Vehicle Ratio | 34% |
| Average Vehicle Age | 10 years |

SOURCES: BISD transportation department; Management Partnership Services, Inc. analysis, 2008.

A key measure used to assess the sufficiency of mechanical staffing is the ratio of mechanics to VEU, a concept described previously in this report. Either a shortage or over-abundance of mechanical labor can often help to explain cost results. A ratio of 1.0 FTE mechanic per 100 to 125 VEU is an acceptable standard based on industry guidelines and practice. BISD has a combined bus and maintenance fleet of 441 VEU. In calculating mechanic capacity, it was considered that the shop manager performs mechanical work for an average of 50 percent of his work day, or the equivalent of 0.5 FTE of additional mechanical capacity. This is offset, however, by the equivalent of 0.5 FTE lost to the use of mechanic labor as substitute bus drivers as previously discussed. This results in the availability of 5.0 FTE mechanical positions. A final adjustment required before calculating the mechanic to VEU ratio is to recognize that not all paid time for these positions is available for productive mechanical labor. A certain percentage of time is lost to administrative duties, meetings, in-service training, and other activities such as the sourcing and acquisition of spare parts. While a detailed allocation of time was not conducted as part of this analysis and actual mechanic productivity could not be calculated per the available data, industry practice indicates that a reasonable range for available productive time would be 75 to 85 percent, given the range of duties assigned to the BISD mechanic staff. Accounting for these factors results in a range of 103 to 118 VEU per FTE mechanic, which is within the guideline range and does not lead to any concern regarding the appropriateness of the mechanical staff.

Maintenance and repair (M&R) costs are also impacted by employee overhead, including the salary, benefit burden, and the number of actual administrative employees. For example, eliminating the shop clerk position would reduce M&R expenditures by approximately $50,000 (this estimate accounts for salary and benefits), resulting in a cost reduction of $113 per VEU and lowering total expenditures to almost within expected guidelines. The overall result is also at least partially explained by the high cost of parts on a VEU basis. Here industry guidelines expect annual costs to be between $300 and $450, and BISD has a calculated result of $533, or 18 percent higher than the upper end of the guideline range. Parts and supplies costs are impacted by several factors including the number of spares. Based on the reviewed route data, a total of 64 buses are used on a daily basis leaving 22 buses as spares. The district indicated that 6 of the 22 spare buses are used as permanent buses for the athletic activities at specific campuses. Applying an industry standard of 15 percent spare ratio per fleet would reduce the fleet to 74 buses, leaving 12 spares. The district should consider reducing the number of spare buses.

### *MAINTENANCE FACILITIES*

The maintenance facility is an adequately sized and functional full-service shop with four full work bays, an additional oil change/preventive maintenance bay with a service pit, and one external bay for bus washing. The mechanics are responsible for providing all of their own hand tools. The district provides heavy duty air impact wrenches, bus diagnostic, and personal protection equipment. Tools are secured on a nightly basis to prevent loss and theft. Parts are neatly organized in a locked parts room with the majority of parts assigned with a unique number for ease of identification. The cost of each part is recorded on the repair record for each vehicle. Tires and additional parts are stored in a portable building. Each mechanic has access to the parts rooms and is jointly responsible for maintaining the inventory. While there is no designated parts room attendant, the shop clerk maintains overall responsibility for inventory monitoring and parts procurement. Given the size of the operation, this is an appropriate division of responsibility.

### *FUEL MANAGEMENT*

The fueling infrastructure of the department is excellent. The transportation facility houses two in-ground fuel tanks holding 10,000 gallons each of diesel fuel and gasoline. Each of the tanks is equipped with required tank monitoring and leak detection systems and are reported to be fully Environmental Protection Agency (EPA) compliant. Bus drivers and other district employees are issued a unique fuel card for tracking of usage by employee and vehicle. Three bids are obtained from local vendors prior to each drop of fuel. The district has not implemented the use of alternative fuels such as propane or natural gas but has visited other districts that do and have not received favorable feedback. The district does, however, use low sulfur fuel to reduce emissions and received a grant to retrofit 14 buses to increase efficiency in the areas of fuel and emissions.

The use of technology and automation in fuel management stands as an excellent example of how this approach can serve to improve overall operations of the department. Bus drivers are responsible for fueling their buses, and must enter the odometer reading each time they fuel. A driver receives a warning from the system when the bus is within 100 miles of needing service. In the event that the driver does not schedule PM service, the fuel system prevents fueling of the bus until the bus is serviced and the fuel meter is reset by a service technician. All completed PM work is entered onto the form used by the mechanics showing the work completed, the number of hours per repair or service, and parts or supplies issued. As with repairs, this is subsequently recorded in the *Excel*-based maintenance records.

At the time of the review, no substantial changes to operations were occurring as a result of fluctuations in fuel prices during school year 2007–08. Administrators were clearly aware of the need to regularly monitor the impact of fuel costs on operations, and it is expected that future changes to operations may be required.

### *FLEET REPLACEMENT PLANNING*

There is no formal fleet replacement policy in place for school buses. However, past practices have become routine and continue to guide the planning for replacement of school buses. In summary, this includes the replacement of all buses older than 15 years, rotation of assignments such that older buses serve primarily as spares, and the goal of acquiring at least 2 regular and 2 special needs buses per year. The transportation director and shop manager meet annually to evaluate specific units for replacement. While rational, this rate of replacement only facilitates full replacement of the fleet every 21.5 years (86 buses at 4 buses per year) and does not constitute a viable replacement plan when the age of the buses in the fleet is not evenly distributed.

This practice is a particular issue for BISD given that the district received 27 buses as a gift through the Clean School

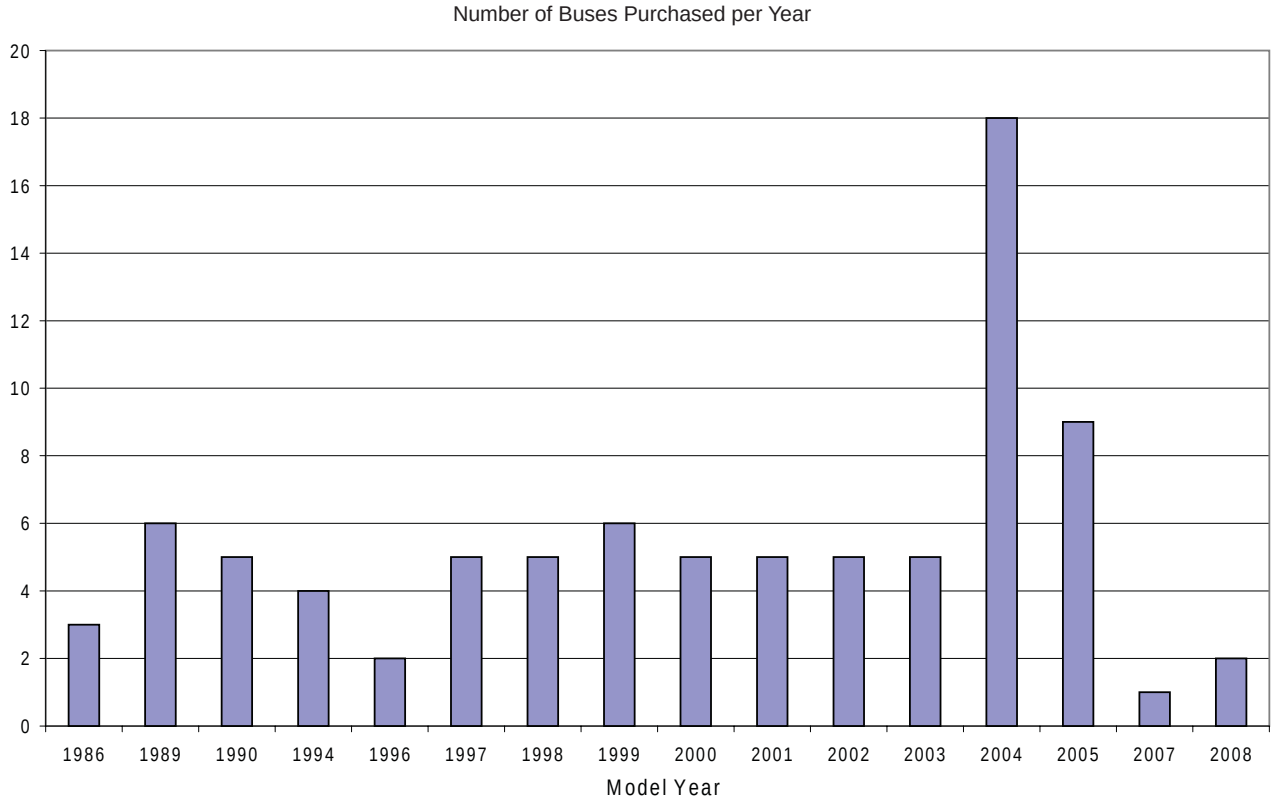
Air grant. **Figure 12** displays the distribution of buses by age. This figure demonstrates the potential impact of the gift in the 2004 and 2005 model years, as well as the overall rate of replacement that results in buses as old as 22 years being retained in the fleet. The average age of the bus fleet is 10 years, also supporting the contention that the fleet is not actually being replaced on a 15-year cycle.

The gift of buses in 2004 and 2005 will have a critical impact on the timing of future bus purchases, with 42 percent of the active fleet coming due for replacement at the same time. As a result, the fleet requires careful replacement and financial planning now to mitigate the burden on future budgets. An additional factor to be considered is the possibility of cost associated with the implementation of seat belts. Only BISD's special needs buses are equipped with seat belts, and no funding presently exists, or is planned by the district, for the procurement and installation of seat belts on older buses or newly acquired buses. All past purchases of buses have been on a cash basis from current-year budgets, which places an additional burden on plans for replacement of the fleet.

## RECOMMENDATIONS

- **Recommendation 4: Expand the department's PM program to have as its foundation a documented, regular, multi-echelon inspection program.** While the district has instituted a workable PM program, a multi-level PM program based on progressively more comprehensive maintenance checks at stated intervals should be considered for implementation. This PM approach is an industry standard that helps to ensure all components of a bus are checked on a regular schedule while controlling the cost of maintenance. An effective and well-designed PM program minimizes unscheduled repairs by identifying most maintenance and repair activities during scheduled inspections. An effective PM program pays dividends not only in improved equipment safety and reliability, but also financially by extending the life of equipment and minimizing the high cost of breakdowns. The recommended service cycles are as follows:
  - "A" Level: Perform a basic check and lubrication every 2 months or 3,000 miles;

**FIGURE 12**
**AGE DISTRIBUTION OF THE BUS FLEET, SCHOOL YEAR 2007–08**




SOURCES: BISD transportation department; Management Partnership Services, Inc. analysis, 2008

- "B" Level: Perform a basic check and lubrication plus an oil change every 4 months or 6,000 miles;
- "C" Level: Annual (summer) complete unit service including "A" and "B" level services.

A PM program should incorporate detailed checklists that conform to the vehicle and engine original equipment manufacture (OEM) prescribed maintenance procedures and service cycles. The use of a checklist helps to ensure that all components are inspected each time a bus is presented for inspection. BISD is using the same form for PM as it uses for general maintenance. The use of a customized checklist would help to ensure that generic maintenance procedures that are common to school bus operations are examined and checked.

This process is consistent with the best standards used in the industry for PM programs and has contributed to the high level of mechanical reliability within fleets where it is implemented. An excellent beginning resource to develop a comprehensive PM program is available at: http://www.schoolbusfleet.com. There is no specific investment for implementing such a program at BISD, but a commitment of staff time and resources would be required to research and design the specific program and to integrate this with overall shop operations. To expand the department's PM program with staff overtime or outside professional assistance (depending on staff expertise and availability) is estimated at a one-time cost of $10,000.

- **Recommendation 5: Capitalize on the existing technology used by the facilities department to track the transportation department's maintenance work requests.** The BISD facilities department uses an information system supplied by *SchoolDude* to track maintenance work requests. BISD should invest the time and minimal financial resources to incorporate the use of the *SchoolDude* system into the transportation operations as an alternative to the current *Excel* system of capturing information. The need for improving the use of information technology in fleet management parallels that for the department as a whole. While this system is not specifically marketed as a fleet maintenance system, it has modules that have been successfully implemented for the tracking of bus fleet maintenance in other school districts. As a web-based software product, the infrastructure costs for implementing this system in the fleet maintenance shop would be negligible. Additional licensing costs may apply, and an investment in analyzing setup requirements and training shop users would be necessary. The benefits to derive from the use of this system would include reporting tools and analytical data for managers to track employee productivity, true costs for all repairs, historical repair history, and parts cost trends per bus. These capabilities would far outweigh the upfront investment and time required for implementation. It is estimated to cost the district an additional $15,000 in licensing and training to implement this system into the fleet maintenance operations.

- **Recommendation 6: Develop a formal fleet replacement plan and funding program.** The bus fleet is facing a problem with the potential of a large number of buses needing replacing simultaneously. In addition, past investment has not kept pace with the district goal of maintaining a 15-year replacement cycle for the fleet. A formal fleet replacement plan should be adopted to deal systematically and methodically with this pending capital replacement funding deficit. The plan should establish specific policies regarding the replacement cycles for school buses, project the timing for replacement of each specific bus in the fleet, and establish a funding method that ensures appropriate funding will be available to purchase replacement equipment in accordance with the plan.

  The recommendation is to develop a formalized, documented approach to fleet replacement planning. There is no specific cost implication associated with the development of such a plan, and it is not until the plan is developed that the capital cost implications for future years can be adequately considered and understood. Indeed, it is the analysis itself that will provide the information and data required to assess and make sound business case judgments as to how to address this concern.

  The process for developing a fleet replacement plan begins with establishing replacement criteria. The criteria can include any combination of age, accumulated mileage, or vehicle maintenance expenses among other options. Once specific criteria are established, each bus in the fleet should be compared

to the criteria to establish a projected replacement date. Following the determination of a replacement date, the projected cost of the asset can be determined based on current cost plus some inflation factor and expected equipment requirements. **Figure 13** is an example using a three-bus fleet and age as the replacement criteria. In addition, provisions are made for expected cost increases due to changes in engine requirements.

Once projected replacement costs have been determined, it is possible to evaluate alternatives to cash financing of replacement purchases. These alternatives include leasing, establishment of a sinking or reserve fund, or some combination of these options. To initially develop this plan with outside professional assistance is estimated to be a one-time cost of $10,000.

**FIGURE 13**
**EXAMPLE OF A BUS REPLACEMENT PLAN**

| UNIT ID | CURRENT AGE | REPLACEMENT CRITERIA | EXPECTED REPLACEMENT YEAR | CURRENT COST | INFLATION FACTOR | EQUIPMENT REQUIREMENTS | PROJECTED COSTS |
|---|---|---|---|---|---|---|---|
| Bus 1 | 14 | 15 years | 2010 | $75,000 | | $0 | $75,000 |
| Bus 2 | 13 | 15 years | 2011 | $75,000 | 5% | $5,000 | $83,750 |
| Bus 3 | 12 | 15 years | 2012 | $75,000 | 5% | $5,000 | $87,688 |

SOURCE: Management Partnership Services, Inc. analysis, 2008.

## FISCAL IMPACT

| RECOMMENDATION | 2009–10 | 2010–11 | 2011–12 | 2012–13 | 2013–14 | 5–YEAR (COSTS) OR SAVINGS | ONE-TIME (COSTS) OR SAVINGS |
|---|---|---|---|---|---|---|---|
| 1. Rewrite and document departmental policies and procedures, and adjust driver recruitment efforts to support modified business processes and a reengineered route network. | $0 | $0 | $0 | $0 | $0 | $0 | ($10,000) |
| 2. Modify the transportation department's business processes to incorporate information technology and data analysis into the organizational culture. | $0 | ($2,500) | ($2,500) | ($2,500) | ($2,500) | ($10,000) | ($45,000) |
| 3. Conduct a comprehensive route analysis to explore methods of reducing transportation costs while increasing service quality throughout the system. | $0 | $650,000 | $650,000 | $650,000 | $650,000 | $2,600,000 | ($10,000) |
| 4. Expand the current PM program to have as its foundation a documented, regular, multi-echelon inspection program. | $0 | $0 | $0 | $0 | $0 | $0 | ($10,000) |
| 5. Capitalize on the existing technology used by the facilities department to track the transportation department's maintenance work requests. | $0 | $0 | $0 | $0 | $0 | $0 | ($15,000) |
| 6. Develop a formal fleet replacement plan and funding program. | $0 | $0 | $0 | $0 | $0 | $0 | ($10,000) |
| **TOTAL** | **$0** | **$647,500** | **$647,500** | **$647,500** | **$647,500** | **$2,590,000** | **($100,000)** |