

DRAFT

Preliminary Staff Report

INTRODUCTION

The EVS Department was asked to do a cost comparison analysis of the different types of voting methods and report on the results. The report is not intended to offer opinions or preferences of either the staff or the Commissioners of the Board of Elections in the City of New York, nor does it draw conclusions, make recommendations, or offer an endorsement of one voting method or another. The report is intended simply to present a discussion of various procurement and operational areas in which costs are incurred as related to different voting methods.

It's important to note that at this time the report has limited value as a reliable projection of *actual* costs. The report is useful, however, in identifying cost areas, estimating costs, and furthering our understanding of the many variables involved. More detailed analysis can be done as more information becomes known. Actual cost projections can be done when products and prices are finalized.

There are several factors impacting why the report has limited value for projecting actual costs, and these factors are significant to keep in mind for the discussion: Several products under consideration are either in the development or prototype stage. Available prices are only approximations. Even with known products, unit prices will likely change when volumes are established. Moreover, because for some products, actual use in other election districts is limited or non-existent, actual costs have not yet been experienced.

In addition, the timeframe available to us to compile the report allowed for only minimal data gathering and elementary analysis. For products already in use, we didn't have time to get information from other jurisdictions that are already using them. Further work would be needed to confirm cost experiences, and to do a more comprehensive analysis.

Nevertheless, the material is useful for estimating gross costs. We took the following approach. First, we determined the areas in which costs are incurred, both initial and operating costs. Next, we identified four types of voting methods. Then, we obtained as much pricing data as we could from vendors. We presented price estimates and other information within each cost area. Finally, we applied the prices to equipment and services required to meet the voting needs of New York City. When only limited information was available, or wide price ranges were obtained, we used what we believed to be reasonably representative figures.

FOUR TYPES OF VOTING METHODS

There are different ways to categorize voting methods, and there are many variations on a theme. There is also varying terminology that is used. We've chosen to use generic terminology and present the methods in the following four groupings:

1. Full-face Machine with a Printed Ballot Face
2. Full-face Machine with an Electronically Displayed Ballot Face
3. Paging Machine with an Electronically Displayed Ballot Face
4. Paper Ballots Optically Scanned at the Pollsites

1. Full-face Machine with a Printed Paper Ballot Face

This type of machine stands on legs with wheels and weighs a few hundred pounds. The voter approaches the machine at relative eye-level. Some type of panel or curtain provides privacy. To vote, the voter depresses a spot on the face of the ballot next to the candidate selected, and a light appears indicating the vote. Over-voting is prevented, and contests that were missed are indicated to the voter with a light so that, if so desired, the voter can go back and vote for that contest. A paper printout of the voter's choices is displayed behind a window so that the voter can verify his or her choices before casting the ballot.

Ballot information for a given election is entered into each machine via a portable memory device like a cartridge, card or disk. The election's results are carried from the machine at the close of Election Day via the same type of portable memory device. The results are then accumulated into the vendor's proprietary computer system, from which in turn they are moved to the Board's election computer system.

The ballot on the face of the machine is an actual *printed* ballot on paper. Like our lever machines, a ballot is mounted on each machine. Each machine can be used for only one ballot. That ballot must contain all of the information needed for the election district on its one surface.

2. Full-face Machine with an Electronically Displayed Ballot Face

Like the full-face machine above, this type of machine also stands on legs with wheels and weighs a few hundred pounds. The voter approaches the machine at relative eye-level. Some type of panel or curtain provides privacy.

The machine is prepared and election results are retrieved as described above – a portable memory device is used.

In this case, however, there is no printed paper ballot on the face of the machine. Instead, the ballot is *electronically displayed* on the face. To vote, the voter touches a spot on the face of the ballot next to the candidate selected, and the voted candidate box is highlighted. Over-voting is prevented, and contests that were missed are highlighted for the voter so that, if so desired, the voter can go back and vote for that contest. A paper printout of the voter's choices is displayed behind a window so that the voter can verify his or her choices before casting the ballot.

Since the ballot is electronically displayed, ballot information can be changed as needed. This means that the ballots of many election districts can be displayed on the same machine. It also means that each political party's primary election ballot can be displayed separately, or ballots in different languages can be displayed separately.

3. Paging Machine with an Electronically Displayed Ballot Face

This type of machine is a small piece of equipment that can sit on a table or in some cases even be held on a seated voter's lap. It might also be encased in a container that would hold a long-lasting battery or serve as a carrying case or a booth for privacy. If the machine is placed on a table, a small screen placed on the table provides privacy. The machine itself is usually less than twenty pounds.

The ballot is *electronically displayed*, but since the ballot face is small, usually only one contest appears on the display surface. The voter *pages through the ballot*, making selections for each contest on successive pages. Generally, to vote, the voter touches a spot on the face of the ballot next to the candidate selected, and the voted candidate box is highlighted. For some products, the voter might use a button, keyboard or other device to make his/her selection, and the selection is highlighted. As with the full-face machines, over-voting is prevented, and contests that were missed are highlighted for the voter so that, if so desired, the voter can go back and vote for that contest. A final page of the voter's total choices can be displayed on that one page, and a paper printout of the voter's choices is displayed behind a window so that the voter can verify his or her choices before casting the ballot.

The machine is prepared and election results are retrieved as described above – a portable memory device is used.

As with the full-face machines, since the ballot is electronically displayed, ballot information can be changed as needed. This means that the ballots of many election districts can be displayed on the same machine. It also means that each political party's primary election ballot can be displayed separately, or ballots in different languages can be displayed separately.

In New York State, there is a requirement for a full-face ballot. At the current time, the paging machines are not considered to fulfill this requirement.

4. Paper Ballots Optically Scanned at the Pollsites

With this voting method, voters are given a *paper ballot* on which they indicate their votes by filling in ovals printed next to the candidates' names. The voter usually sits at a table and marks the votes with a pen. A small screen placed on the table provides privacy. After marking the ballot, the voter inserts his/her ballot into an optical scanner that tabulates the ballots. The scanner will alert the voter if overvoting or undervoting occurred, and the voter can request another ballot to make corrections.

The scanner is prepared for the election and election results are retrieved in the same manner as described above for voting machines – a portable memory device is used.

Scanners used at pollsites generally differ from the ones we currently use for our standby and absentee paper ballots in that they are not intended for high volume scanning in a centralized location after the election is over. Rather, individual ballots are placed one at a time on the scanner by each voter throughout the day.

As noted above, in New York State, there is a requirement for a full-face ballot. Our current central-location scanners handle full-face paper ballots. However, to-date we've found only one scanner (used at pollsites) that can handle full-face ballots. The rest handle just ballots with only two to four columns. This means that more than one page is needed to contain a ballot's entire contents. This multi-page ballot would apparently not satisfy New York State's requirement for a full-face ballot.

COST AREAS

We've identified a number of areas in which costs will be incurred, either at the time of procurement or as an expense for each election. There is some discussion for each area. However, only the first ten areas mentioned are used in the cost estimate charts that appear at the end of the report. This is not meant to imply that the remaining areas should not also be used in a more comprehensive analysis.

VOTING MACHINES

There are three full-face machines with a printed paper ballot face that we've seen. The price ranges from \$6,000 to \$8,000 each. We've seen two full-face machines with an electronically displayed ballot face. The price ranges from \$7,500 to \$8,500 each. There are a number of options when it comes to the paging machines. The price ranges generally from \$2,500 to \$4,000 each plus about \$300 or \$400 for a printer for each machine, and sometimes about \$2,000 to \$3,000 for one control unit per pollsites. Tables and chairs are usually needed for the voters' use when small paging machines are used.

In the determination of realistic costs, the quantity of machines must be known. And in the determination of realistic quantity, voting time must be factored into the analysis.

Not taking into account the voter-verifiable paper printout, we believe that with a full-face machine with a printed ballot face, the time for a voter to vote may be a little longer during the initial years of implementation but eventually it's likely to return to the same time that it is with the lever machines. Therefore, we would replace our lever machines on a one-to-one basis. Each lever machine would be replaced with one new machine.

With a full-face machine with an electronically displayed ballot, however, more flexibility is possible. With an electronically displayed ballot, the ballots for all of the EDs in a pollsite can be available on every machine in the site. This means that the logistics of the pollsite can change. A snake line like those common in banks or ticket offices can be used, whereby the person that reaches the front of the line goes to the first available bank teller or ticket window. At the pollsite, each voter can use the first available machine. A delay at one machine won't cause a line to develop for a specific election district – the next voter will simply move to the next machine. A one-for-one replacement ratio may not be necessary. Perhaps a full-face electronic display machine can replace our lever machines at a two-for-three ratio. This means that where practical at a given pollsite, every three lever machines would be replaced with only two new machines.

With the paging machines, the common presumption is that the time for a voter to complete the ballot is longer. Therefore, we would likely replace our lever machines on at least a two-for-one basis. This means that each lever machine would be replaced with at least two new machines. However, since the paging machines have an electronically displayed ballot, the snake line logistic applies and in some pollsites, a two-for-one replacement value may not be necessary.

When we take the voter-verifiable paper printout into consideration, additional voting time is needed for any type of machine. Whether or not voter time would actually double, and require the replacement ratio to double, is an unanswered question because we have no experience with this facility, and we haven't obtained any solid studies on it. However, we can reasonably presume that voting time will increase. (Phased implementation would be very helpful in this regard. During the first phase, we can purchase more machines than we need for the initial borough of implementation and actually deploy two-for-one at the pollsites. If we see that we don't need a two-for-one replacement, the extra machines will be assigned to the next borough of implementation the following year. However, this approach doesn't allow us to project citywide quantity upfront.)

Regarding voter assistance equipment, information obtained from demonstrations to voters with disabilities tells us that the voting time is significantly increased. The snake line concept would be useful in this case because the next voter in line would simply proceed to the next available machine. Further discussion of voter assistance equipment appears below.

POLLSITE SCANNERS

We've received price estimates for pollsite scanners at about \$5,000 to \$5,500 each. These scanners handle paper ballots that have only three columns on each side. We're told that scanners that will be able to handle a full-face ballot probably can be developed and be priced at slightly more – \$6,000 to \$6,500 each. One scanner that can currently handle up to eight columns was priced at approximately \$6,000.

Tables, chairs and privacy screens are needed for the voters' use when marking their ballots. Pens must be provided. Cans of pressurized air to keep the scanners free of paper-dust during the day will be required.

Voter assistance equipment would be needed for voters with disabilities to mark the ballots. In most pollsites, only one voter assistance unit would be needed for the whole pollsite. Some pollsites will require more units. One price estimate we received for voter assistance equipment is \$5,500 per unit.

As with voting machines, in the determination of realistic costs for scanners, the quantity of scanners must be known. And in the determination of realistic quantity, the time to place the ballots on the scanners must be factored into the analysis.

Although at this time we haven't yet obtained data from jurisdictions that use pollsite scanners, we've estimated that average time needed for each voter to scan his/her ballot is thirty seconds. We've based this on an estimate that voters who complete the whole ballot and have not overvoted in any contest will require about fifteen seconds; and voters who are alerted at the scanner that they've overvoted or skipped some contests will need about forty-five seconds. We believe that about half of voters will require the forty-five seconds.

So we've estimated that, assuming a steady flow of voters throughout the day, and an average of thirty seconds per voter, one scanner should accommodate 1,800 voters in a 900 minute day. Because the flow is not steady and because some voters will need assistance and more time, and because 30% of pollsites have two or fewer EDs, we're projecting that we'll need about one scanner for every two election districts (assuming an average of 600 voters per ED.) Clearly this is an area that needs further analysis and data from jurisdictions already using pollsite scanners.

Voter assistance equipment for voters with disabilities doesn't impact the time needed for scanning the ballots. The assistance units will be used at the table(s) where the ballots are being marked.

DEMONSTRATOR/TRAINING UNITS

Some number of machines designed to facilitate training and demonstrations are needed. These machines allow for repeated opening and closing of the polls and

repeated activation of the machine without hindrance from features that normally impact such activities in an actual election.

If we have a demonstration at each pollsite, we'll use one full-face machine per site, or one scanner per site, or possibly two paging machines per site.

For pollworker training classes, we'd like the student-machine ratio to be about five students per machine to ensure that all the students have direct hands-on training. For a full-face machine, we would require about 250 training machines; for scanners, about 250 training scanners; and for a paging machine, 400 training machines (to reduce the student-machine ratio for this smaller size unit).

For demonstrations to organizations, community groups, and in public spaces, we're estimating about 75 full-face demonstrator machines, or 75 scanners, or 150 paging machines.

PORTABLE MEMORY DEVICES

All four of the voting methods require portable memory devices (cartridges, cards, or disks). These devices are used to ready the machine for a given election and to collect the votes when the election is over. One portable memory device is generally included within the price of each machine.

Extra memory devices for testing will also be needed at about 1 per 4 machines. Depending upon the voting method chosen, and the type of portable memory device, prices vary. Cartridges range from about \$190 to \$250 each. Cards can be about \$60 each and disks about \$1 each.

Generally, a read/write unit is needed to write ballot data onto the portable memory devices and to read vote totals from it. We have one price estimate for read/writers. That estimate is \$5,000 each. For machines, about 50 read/writers are needed. For scanners, about 25 read/writers are needed.

EQUIPMENT/COMPONENTS FOR VOTERS WITH DISABILITIES

Voter assistance equipment for voters with disabilities is attached to the voting machine, whether it is a full-face machine, with or without a paper face, or a paging machine. The unit is either considered standard with the machine and included with the price, or it's considered optional and priced separately. We received price estimates from \$400 to \$1,000 each.

When paper ballots and pollsite scanners are used, a separate voter assistance unit is used to assist voters with disabilities as they mark the ballot. In most pollsites, only one voter assistance unit will be needed for the whole pollsite. Some pollsites will require more units. We've received price estimates at \$5,500 to \$6,000 per unit.

PRINTED BALLOTS

A full-face machine with a printed paper ballot face requires a ballot that is priced at about \$50 for each machine for each election. An electronic display machine, whether full-face or paging does not require a printed ballot.

If paper ballots and pollsite scanners are used, a sufficient number of paper ballots must be printed and made available at the pollsites. Number of registered voters, expected turnout, allowance for extra ballots for voters to correct mistakes, and the logistical considerations of supplying varying amounts of ballots to different EDs all are part of the determination of the sufficient number.

A simple approach to the calculation is to take 110% of registered voters. This would accommodate a 100% turnout and a 10% rate of voter do-overs. But it also assumes that varying amounts of ballots will be sent to each ED because the number of registered voters varies from ED to ED. (Using current figures: 110% of four million registered voters would supply about 650 ballots for each ED. But some EDs have over 1,000 registered voters.)

With standby ballots at pollsites, our current practice is to send a uniform number of ballots to each ED. The demand for standby ballots (whether emergency or affidavit) is not consistent and therefore not easily projected at amounts tailored to EDs. The number of ballots that we provide is large enough to anticipate needs at the EDs with the largest registrations and largest turnout. Also, a presumption that one might make is that the logistics of sending varying amounts of ballots to different EDs is prone to error and costly to control.

Ballot volume projection is an area that needs more analysis.

We've received price estimates for ballots ranging from \$.25 to \$1.00 per ballot.

CONSUMABLES

Rolls of thermal paper for the zero-proof and tally reports will be used for each election and for testing for all types of voting methods. One paper roll per voting machine or scanner will be needed for each election.

Using current designs of the verifiable ballot printouts, two to three paper rolls will be needed for each election for voting machines. Pollsite scanners will not require these paper rolls. Price estimates for paper rolls have ranged from \$4 to \$20.

If paper ballots are used, pens for ballot marking is the recommended writing tool. We would need about ten pens at each ED.

The scanners will need to be cleaned with canned air throughout the day. Two cans per ED will be needed. We have price estimates from \$3 to \$5 per can.

TABLES & CHAIRS & PRIVACY SCREENS

Tables and chairs over and above the numbers we currently use at the pollsites are needed if either the small paging machines or paper ballots are used. Voters will sit at a table with a privacy screen. Pollsite space and management and control factors determine how many voters in each ED can be expected to be voting at once – either marking their paper ballots or using a small table-top machine. We believe that two voters can use the opposite ends of one table, each station having a privacy screen. Therefore each ED will require one extra table, two extra chairs and two privacy screens.

One estimate we've received for privacy screens is \$1.50 each screen. One estimate we've received for renting tables and chairs is \$14 per table and \$2 per chair.

TRANSPORT CARTS for BALLOTS and/or SUPPLIES

Currently, our pollsite supplies and standby ballots are placed in the storage space in the back of the lever machines and are therefore shipped to the pollsites within the machines.

With the full-face voting machines, because of their size, there will likely be storage space as part of the machine. We would then continue to transport our pollsite supplies and standby ballots the way we do now.

With the paging machines, however, separate lockable transport carts will be needed for getting the pollsite supplies and standby ballots out to the pollsites.

If voting is done on paper ballots, transport carts are needed for the supplies and for the ballots themselves. A lockable container will also be needed to transport the voted (and unused) ballots back to the Board's offices. Depending upon the method and size of the vehicle used by the NYPD to carry the ballots back to us, the same or other container will be used.

We've identified one reasonably sized and secure metal cart at \$750 each.

TESTING OF VOTING SYSTEM

Just as we test our optical scanning system for standby and absentee ballots for every election, the new voting methods will also have to be tested for each election. Testing will also take place throughout the year.

Test scripts, containing the pattern and number of votes per lot, are developed. For voting machines, these tests are performed directly on the machines using test portable memory devices. These devices will be procured as part of the initial purchase of the machines. For paper ballots, test ballots – the test deck – are prepared. A new test

deck must be prepared for each election. New York State Board of Elections Rules & Regulations prescribe the vote patterns and number of votes per ballot lot that a test must include.

Our experience with our standby and absentee ballots is that the number of test ballots per lot has ranged from 60 to 120 ballots, the number primarily determined by the number of contests that are a vote-for-more-than-one, and the number of candidates in each of those contests. The largest number of ballots in one borough's test deck in our experience to-date was 20,000 absentee ballots (and an equal number of stand-by ballots). The number of lots varies. Presumably, rotation of candidate names in a Primary Election will be required for each ED, thereby requiring the number of ballot lots to equal the number of EDs. In short, projecting a standard number of test ballots that will be needed for each election's test is not really possible. For this report, we've tried to develop a reasonable number that does not understate the potentially very high numbers. More significant, perhaps, than cost projections in this area are *time* projections. Our staffs have to mark all of these test ballots before the election. Ballots that are pre-printed with the test votes presumably are possible, but at a greater price.

As noted above, the following cost areas have been identified and a small discussion is included for each area. However, the cost estimate charts at the end of the report do not include the costs from any of the following cost areas.

STOCK OF SPARE PARTS

A stock of spare parts, such as circuit boards, monitors, switches, internal cartridge readers, power cords, panels, wheels, light bulbs, optical read heads, belts, rollers, etc., will be maintained. However, different items are needed for different kinds of machines and for scanners. Replacement rates are unknown at this time.

A small stock of portable memory devices (eg., cartridges, cards, disks) will be maintained for use as needed for replacement for any of the four different methods of voting.

Spare printers, for the voter verifiable ballot printout on the voting machines, and for the zero-proof and tally reports on the voting machines or scanners, will be needed. Replacement rate is unknown at this time.

Because of the reluctance to rely on electric power at pollsites, battery power is required. Some number of spare batteries will be kept on hand. There is a presumption that the full-face electronic display machine will require more power than the full-face printed ballot machine: more frequent battery replacement will be needed and it's likely to be a more costly battery. Likewise, motorized mechanisms in the pollsite scanner will draw on the battery and increase the frequency of battery replacement. Cost for battery replacement is unknown at this time.

MACHINE REPAIR

We haven't obtained repair records for existing machines or for pollsite scanners, and repair records for the full-face electronic display machines do not exist because this type of machine is not yet in use.

A common presumption is that the electronic display machines are/will be more costly to repair because of the LCD and touch-screen technology.

Scanners may also be subject to more frequent repairs because of the sensitive optical technology and moving parts.

It's thought that the smaller size of paging machines may make them more subject to loss or theft, thus increasing replacement costs.

MACHINE REPLACEMENT & EXPECTED LIFE SPAN

Currently the Board replaces a number of lever machines each year because of handling mishaps during shipping to and from the pollsites. The trucking companies cover the costs of replacement. The presumption is that trucking costs will increase when the replacement cost of a machine increases.

We didn't obtain the lifespans for the equipment for any of the four voting methods. Presumably the lifespans will be different for each kind of equipment. We may be able to get lifespan projections from the vendors and do some analysis at that time.

CANVASS

Converting from lever machines to electronic machines for accumulating votes eliminates two steps of the vote collection process. These two steps are labor-intensive and subject to human error. The first step is the copying of the votes from the face of the lever machine onto the Return of Canvass Sheets. This step takes place at the pollsites at the end of Election Day after the polls are closed. Our pollworkers must read the vote total that is revealed next to each candidate's name for each contest, and hand-write each vote total on the sheet. The second step occurs after the Return of Canvass Sheets are carried by the New York City Police Department to police precincts. At the precincts, NYPD personnel key-enter each vote total into the NYPD's system from which in turn the vote totals are transmitted to our election computer system.

The elimination of these two steps is a major streamlining of the canvass process, and it occurs no matter which of the four voting methods is adopted. *Whether voters vote on a machine or on a paper that is scanned by a machine, the votes are electronically*

accumulated. They are retrieved from the machine via a portable memory device. This device (cartridge, card, disk) is removed from the machine by our pollworkers at the pollsites, carried to Board offices by the NYPD, and simply read into the voting machine computer system from which in turn the results are moved into our election computer system.

As far as Board of Elections personnel resources (back at the office) are concerned, there will be a shift from a small group of staff at the general office receiving a transmission from the NYPD system, to a team of personnel at each borough office who (working with general office staff) will receive, organize and track the portable memory devices, load them into the voting machine computer system, and then store them in a pre-determined, secure and retrievable manner.

The costs for this Election Night vote collection process (staff resources and facilities) will be an on-going operating expense regardless of the voting method chosen.

Some differences, however, in process are noted here. There will be related cost differences.

If voters are voting on paper ballots, the paper ballots will also be delivered on Election Night to the borough offices by the NYPD. Another process – parallel to the process for the memory devices – must also take place at each borough office for the ballots themselves. The ballots must be received, organized, tracked and stored in a pre-determined, secure and retrievable manner.

If voters are voting on machines, the voter-verified paper printouts will be removed by the borough voting machine technicians (presumably not on Election Night but at some later point in time) and will be stored. In addition, the voter verified printouts from a small percentage of the machines will also be canvassed by borough staff and compared against the machine results as a random integrity test.

Likewise, presumably, a small percentage of the optical scanners will also have their results compared against a canvass (done by hand) of the voter-marked ballots as a random integrity test. Or perhaps the test deck of ballots will be run through all of the scanners after the canvass (as we do now with our central scanners) to confirm the accurate operation of the scanners.

RE-CANVASS

The process for re-canvassing the results obtained from either a new voting machine or a pollsite optically scanned paper ballot has not been established. Currently, we re-canvass our lever machines by looking at the vote totals revealed on the face of each machine and making corrections to our computer files and our results reports as needed. When called for by the Board's re-canvass policy, we re-canvass our paper ballots by counting them by hand and making corrections to our computer files and results reports as needed.

The costs for re-canvassing new voting machines may be similar to the costs for re-canvassing our current machines.

The costs for re-canvassing paper ballots would depend on the size of the re-canvass required (eg., local contest vs. a city-wide) and the method of re-canvass (re-scan, manual count, etc.), and may turn out to be a more time-consuming and costly process.

ELECTION RESULTS ARCHIVING

The cost for archiving election results depends on the voting method chosen.

If voting machines are used, we expect that the voter verified paper printouts will need to be archived. If paper ballots are chosen, the paper ballots, both voted and unused, will need to be archived.

Because of the difference in size and volume of these two items, facility space will vary. More space for archiving paper ballots may be needed.

MACHINE VENDOR COMPUTER SYSTEM PURCHASE

Each of the four methods of voting will entail the use of a computer system that serves the machines or scanners. This computer system will be the vendor's system that is designed to work with the equipment. Before the election, this system will receive and process all of the data necessary to generate the ballot definitions for the given election, and will be used for writing the portable memory devices or for configuring the scanners. After the election, this computer system will receive the vote totals from the portable memory devices, accumulate them appropriately and produce reports. It will also be used for functions such as testing, tracking, security features, etc.

Licenses for the use of the system will be part of the procurement and will have a cost associated with them. Prices for these systems vary from vendor to vendor.

MACHINE VENDOR COMPUTER SYSTEM MODIFICATIONS

Modifying the vendor's system to meet the specific needs of New York City is likely inevitable and will have a cost associated with the work. In addition to the tailoring that will be needed to make the system reflect the City's processes, modifications will likely be needed to integrate the system with the Board's existing computer systems. The vendor's system must be able to receive data from the Board's systems to set up the election, and it must be able to send vote tallies and other data to the Board's systems after the election.

The price or the scope of this effort is not known at this time, but the cost will be incurred at the earliest stages of the procurement. The type of voting method chosen

will not impact the need for this item. There may be a set fee for this item, a not-to-exceed fee, or a time-and-materials type of pricing structure.

MACHINE VENDOR COMPUTER SYSTEM MAINTENANCE and UPGRADES

The vendor's system will have to be changed as needed over time to meet changing legal mandates and business practices. Shortcomings, if any, will also have to be corrected. This ongoing operating cost is a factor regardless of the type of voting method chosen.

A set yearly maintenance fee may be charged or a time-and-materials type of pricing structure may be established.

MODIFICATIONS TO BOARD COMPUTER SYSTEMS

Functionality in the Board's computer systems, primarily the election system, will be expanded or modified to accomplish the integration with the vendor's system. For integrity and consistency reasons, it's essential that there be only a single point of human data entry for all initial information for an election, and a single point of collection and reporting of results. Those processing start and end points will be in the Board's computer system, and they must link with the vendor's system.

The effort to modify the board's systems will be needed regardless of the type of voting method chosen. The bulk of the effort will take place as part of the start-up and will be accomplished with expanded technical staff and in-house developers, with related costs. As with the vendor's system, maintenance will continue for changing business and legal requirements over time.

DOCUMENTATION OF PROCEDURES

Our Borough Guidelines Manual will need to be revised. Extensive changes in the borough procedures leading up to an election will occur. Likewise, the borough procedures on election night will change. As noted above, canvass and re-canvass procedures will change.

Warehouse procedures will need to be developed and documented.

These procedures will include descriptive information about the Board's processes, task instructions for our staffs, documentation of legal basis and mandates, and how-to procedures for using the new voting machines and system.

Cost will be incurred for staff resources and production of the manual. The cost vendor's contribution to this effort may also be incurred.

STAFF RESOURCES

Because there will be extensive changes in the tasks performed by the borough office staffs, an analysis of staffing requirements during specified time periods is needed. After procedures are developed and laid out in a detailed manner, it will become possible to identify the numbers of persons needed to staff the operation. The cost for the staff resources can then be estimated.

The voting method chosen will impact the procedures to be performed so it is likely that there may be an impact on the cost.

STAFF TRAINING

Training will be provided to the Board's staff in both the new procedures and in the use of the new computer system and machines. This training program must be developed in a manner that integrates the training provided by the vendor into the larger presentation that includes board procedures and policies, and step-by-step instructions.

The price of the vendor's training program will be part of the original procurement package. The vendor's segment will probably be priced by class size, class duration, or number of students, and will be part of the original procurement cost. Refresher training may be required in subsequent years.

TECHNICIAN TRAINING

We expect that our technicians will be trained to perform all levels of machine setup and maintenance over a period of several years. Each level of training will require a technician be become certified for that level by the vendor. At the beginning, the technicians will perform only the first level of tasks. During this time the vendor will provide support at the higher levels. After a certified technician has gained experience at the certified level, s/he will begin training for the next level.

The price of the vendor's training and certification program is not known at this time. The cost of initial training will be part of the initial procurement package, and over the next several years, training cost will be incurred as the technicians progress to higher levels of expertise.

WAREHOUSING

Regardless of the type of voting method chosen, the Board's warehouses will need to be upgraded to house the new equipment. Each borough's warehouse will need different upgrades, but generally speaking all of the borough's warehouses will require improvements to climate control and electrical service.

A temporary warehouse will be needed as a staging area for both the receipt and acceptance testing of the new machines or scanners, and storage of the old machines

for some period of time. This warehouse can also provide space for demonstrator machines if they don't fit in our current warehouses.

TRUCKING

We have received one estimate that the cost of trucking the new machines or scanners will be 1.5 to 2 times the current cost of trucking our lever machines. The computerized components of the new equipment, whether full-face or paging machines, or optical scanners, require more careful handling by the truckers. In addition, the higher cost of replacement or repair that will be billed back to the trucker in the event of a mishap during shipping will increase the overall cost of the trucking contacts.

Although trucking costs will increase regardless of the voting equipment chosen, there will likely be differences due to differences in the quantity of voting machines or scanners and the need for additional equipment for some of the voting methods.

PROCEDURAL and TECHNICAL SUPPORT

During election setup in the vendor's computer system, the writing of the portable memory devices, the testing and setup of the machines, and the receipt and reading of the portable memory devices after the election, the vendor will be providing support. This support will likely be extensive during the early years, but it will continue at a reduced level for some number of subsequent years.

Support will likely be priced at an hourly or daily rate.

POLLWORKER TEAM

The composition of the pollworker team that staffs the pollsite may change. One new team member may be a machine demonstrator. The demonstrator will be stationed near the entrance to the polling room along with a demonstrator machine. The demonstrator will encourage voters to try out the new machine, answer their questions, and in general alleviate any anxieties that the voters may have. Another new member of the team may be a person responsible for providing technical assistance to our pollworkers and coordinators. Both the demonstrator and the technical support person position will be temporary – only needed during the initial year(s).

Depending upon the voting method chosen, there may be additional poll clerks to perform different tasks. As an example, if optical scanners are used, we would likely want a poll clerk to be stationed at the scanner to oversee and assist voters as they place their ballots on the scanner.

The compensation for the additional members of the pollworker team needs to be determined. The pollworker payroll will be increased accordingly and this increase will be part of an increase in operating expanses.

POLLWORKER TRAINING

Our pollworker training program will need to be revised. Training provided by the vendor specifically for the machine or scanner will be incorporated into the program. The vendor segment of the training will be priced as part of the initial procurement package. The size of the pollworker force and the number and duration of the classes will play a role in the pricing schedule. Vendor involvement in the training program will likely last for a few years.

POLLSITE PROCEDURES

New pollsite procedures will need to be developed and a new pollworker manual produced. It's likely that the scope of the effort will be inversely proportional to how similar the new voting method is to our current method. It seems that a full-face voting machine will call for fewer changes in pollsite procedures, and voting on paper ballots might call for the most extensive changes.

Cost will be incurred for staff resources and production of the manual. The cost of the vendor's contributions to this effort may also be incurred.

POLLSITE TECHNICAL SUPPORT

Technical support from the vendor will be required at the pollsite during the early years of implementation. The level of this support is yet to be determined. We may decide that we need a support person at each pollsite, or we may need a support person to cover a group of neighboring pollsites.

Pricing for support will probably be at an hourly or daily rate, and will vary by vendor but probably not by the voting method chosen. Support will be included as an item in the procurement package, and varying levels of support will be needed over the years as pollworker expertise increases with experience.

PUBLIC EDUCATION

An extensive public education program is needed to introduce the new voting method to the public regardless of the voting method chosen. A cost estimate (based on the voting method chosen) for the entire program has not been established, but our current estimations place it at a very significant figure. While the figure might change slightly depending upon the voting method chosen, the difference may not be significant.

COST ESTIMATION CHARTS

1 – Full-face machine with printed paper ballot face using a one-for-one machine replacement ratio	
Initial Costs	Per Election Costs
<p><u>Machines</u></p> <p>7,800 machines x \$8,000 each (includes voter verification unit and voter assistance unit)</p> <p>\$62,400,000</p>	<p><u>Paper Rolls</u> (one per machine for reports and three per machine for the verifiable printout)</p> <p>7,800 machines x 4 = 31,200 rolls 31,200 x \$10</p> <p>\$312,000</p>
<p><u>Portable Memory Devices</u></p> <p>2,350 devices x \$250 each (1,950 test devices + 400 spares in stock)</p> <p>\$587,500</p>	<p><u>Paper Ballot Face</u></p> <p>7,800 machines x \$50</p> <p>\$390,000</p>
<p><u>Memory Device Read/Writers</u></p> <p>50 x \$5,000 each</p> <p>\$250,000</p>	<p><u>Affidavit/Emergency Ballots</u></p> <p>500 ballots x 6,100 EDs = 3,050,000 3,050,000 x \$.60 each = \$1,830,000</p>
<p><u>Demonstration Machines</u></p> <p>1,400 pollsites x \$8,000</p> <p>\$11,200,000</p>	
<p>Total Initial Cost: \$74,437,500</p>	<p>Total Per Election Cost: \$2,532,000</p>

2 – Full-face machine with electronically displayed ballot face with a one-for-one replacement ratio	
<u>Initial Costs</u>	<u>Per Election Costs</u>
<u>Machines</u> 7,800 machines x \$8,500 each (includes voter verification unit and voter assistance unit) \$66,300,000	<u>Paper Rolls</u> (one per machine for reports and three per machine for the verifiable printout) 7,800 machines x 4 = 31,200 rolls 31,200 x \$10 \$312,000
<u>Portable Memory Devices</u> 2,350 devices x \$200 each (1,950 test devices + 400 spares in stock) \$470,000	<u>Affidavit/Emergency Ballots</u> 500 ballots x 6,100 EDs = 3,050,000 3,050,000 x \$.60 each = \$1,830,000
<u>Memory Device Read/Writers</u> 50 x \$5,000 each \$250,000	
<u>Demonstration Machines</u> 1,400 pollsites x \$8,500 \$11,900,000	
Total Initial Cost: \$78,920,000	Total Per Election Cost: \$2,142,000

3 – Full-face machine with electronically displayed ballot face with a two-for-three replacement ratio	
<u>Initial Costs</u>	<u>Per Election Costs</u>
<p><u>Machines</u></p> <p>5,700 machines x \$8,500 each (includes voter verification unit and voter assistance unit)</p> <p>\$48,450,000</p>	<p><u>Paper Rolls</u> (one per machine for reports and three per machine for the verifiable printout)</p> <p>5,700 machines x 4 = 22,800 rolls 22,800 x \$10</p> <p>\$228,000</p>
<p><u>Portable Memory Devices</u></p> <p>1,710 devices x \$200 each (1,425 test devices + 285 spares in stock)</p> <p>\$342,000</p>	<p><u>Affidavit/Emergency Ballots</u></p> <p>500 ballots x 6,100 EDs = 3,050,000</p> <p>3,050,000 x \$.60 each = \$1,830,000</p>
<p><u>Memory Device Read/Writers</u></p> <p>35 x \$5,000 each</p> <p>\$175,000</p>	
<p><u>Demonstration Machines</u></p> <p>1,400 pollsites x \$8,500</p> <p>\$11,900,000</p>	
<p>Total Initial Cost: \$60,867,000</p>	<p>Total Per Election Cost: \$2,058,000</p>

4 – Paging machine with electronically displayed ballot face – no controller unit needed with a two-for-one replacement ratio	
<u>Initial Costs</u>	<u>Per Election Costs</u>
<p><u>Machines</u></p> <p>15,600 machines x \$3,500 each (includes voter verification unit, voter assistance unit and controller function)</p> <p>\$54,600,000</p>	<p><u>Paper Rolls</u> (one per machine for reports and one per machine for the verifiable printout)</p> <p>15,600 machines x 2 = 31,200 rolls 31,200 x \$10</p> <p>\$312,000</p>
<p><u>Portable Memory Devices</u></p> <p>4,700 devices x \$200 each (3,900 test devices + 800 spares in stock)</p> <p>\$940,000</p>	<p><u>Affidavit/Emergency Ballots</u></p> <p>500 ballots x 6,100 EDs = 3,050,000 3,050,000 x \$.60 each = \$1,830,000</p>
<p><u>Memory Device Read/Writers</u></p> <p>100 x \$5,000 each</p> <p>\$500,000</p>	<p><u>Tables, Chairs & Privacy Screens</u></p> <p>7,800 tables + 15,600 chairs + 15,600 privacy screens</p> <p>\$163,800</p>
<p><u>Demonstration Machines</u></p> <p>1,400 pollsites x 2 x \$3,500</p> <p>\$9,800,000</p>	
<p><u>Supply Cabinets</u></p> <p>3450 (approx. 1 cabinet for 2 EDs)</p> <p>3450 x \$750 = \$2,587,500</p>	
<p>Total Initial Cost: \$68,427,500</p>	<p>Total Per Election Cost: \$2,305,800</p>

<u>5 – Paging machine with electronically displayed ballot face – controller unit needed – with a two-for-one replacement ratio</u>	
<u>Initial Costs</u>	<u>Per Election Costs</u>
<u>Machines</u> 15,600 machines x \$2,500 each (includes voter verification unit and voter assistance unit) \$39,000,000	<u>Paper Rolls</u> (one per machine for the verifiable printout and two per controller for reports) 15,600 machines x 1 = 15,600 rolls + 1,700 controllers x 2 = 3,400 rolls 19,000 x \$10 \$190,000
<u>Controller</u> 1700 Controllers x \$3,000 each \$5,100,000	<u>Affidavit/Emergency Ballots</u> 500 ballots x 6,100 EDs = 3,050,000 3,050,000 x \$.60 each = \$1,830,000
<u>Portable Memory Devices</u> 510 devices x \$200 each (425 test devices + 85 spares in stock) \$102,000	<u>Tables, Chairs & Privacy Screens</u> 7,800 tables + 15,600 chairs + 15,600 privacy screens \$163,800
<u>Memory Device Read/Writers</u> 20 x \$5,000 each \$100,000	
<u>Demonstration Machines</u> 1,400 pollsites x 2 x \$2,500 \$7,000,000	
<u>Supply Cabinets</u> 3450 (approx. 1cabinet for 2 EDs) 3450 x \$750 = \$2,587,500	
Total Initial Cost: \$53,889,550	Total Per Election Cost: \$2,183,800

6 – Paper Ballots Optically Scanned at the Pollsite at a one-for-two replacement ratio	
<u>Initial Costs</u>	<u>Per Election Costs</u>
<u>Scanners</u> 4,200 scanners x \$6,000 each \$25,200,000	<u>Paper Rolls</u> (two per scanner for reports) 4,200 scanners x 2 = 8,400 rolls 8,400 x \$10 \$84,000
<u>Portable Memory Devices</u> 1,260 devices x \$250 each (1050 test devices + 210 spares in stock) \$315,000	<u>Ballots</u> Estimated 4,500,000 ballots 4,500,000 x \$.75 = \$3,375,000
<u>Memory Device Read/Writers</u> 25 x \$5,000 each \$125,000	<u>Affidavit Ballots</u> 250 ballots x 6,100 EDs = 1,525,000 1,525,000 x \$.60 each = \$915,000
<u>Demonstration Scanners</u> 1,400 pollsites x \$6,000 \$8,400,000	<u>Tables, Chairs & Privacy Screens</u> 6,100 tables + 12,200 chairs + 12,200 privacy screens \$128,100
<u>Voter Verification Unit</u> 1540 x \$5,500 each \$8,470,000	<u>Test Ballots</u> Estimated 450,000 ballots x \$.60 \$270,000
<u>Supply Cabinets</u> 3450 (approx. 1cabinet for 2 EDs) 3450 x \$750 = \$2,587,500	<u>Pens and Canned Air</u> 8,400 canned air + 61,000 pens \$38,550
Total Initial Cost: \$45,097,500	Total Per Election Cost: \$4,810,650