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SAN MATEO – FOSTER CITY SCHOOL DISTRICT

HVAC & AIR FILTRATION IMPLEMENTATION STUDY

BOARD OF TRUSTEES REVIEW
JANUARY 21, 2021

aedis architects

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PART I

IMPLEMENTATION STUDY OVERVIEW

1. INTRODUCTION

This Report contains recommendations based on the recently adopted SMFCSD Facilities Master Plan for the New Decade (FMP) to add air-conditioning at all sites where it does not currently exist, upgrade and/or replace existing HVAC equipment at all sites with grade levels 6 to 8 and sites with a pod configuration and improve air filtration at the existing HVAC equipment. The study begins with an investigation of the conditions of the existing heating, ventilating and where applicable, air-conditioning equipment and systems at the District's campuses, as listed below, and calculates the estimated total costs for the recommended options appropriate for each condition.

The sites and other facilities covered in this study are:

Abbott Middle School
Audubon Elementary School
Bayside Academy
Baywood Elementary School
Beresford Elementary School
Borel Middle School
Brewer Island Elementary School
College Park Elementary School
Fiesta Gardens International School
Foster City Elementary School
George Hall Elementary School
Highland Elementary School
Laurel Elementary School
LEAD Elementary School
Meadow Heights Elementary School
North Shoreview Montessori School
Parkside Montessori School
San Mateo Park Elementary School
Sunnybrae Elementary School
Turnbull Children's Center
District Office
M&O Warehouse

Bowditch Middle School is scheduled to be modernized and/or rebuilt in the next few years. We anticipate that the HVAC system replacement will be an integrated part of modernization/rebuild planning efforts and therefore, have excluded the school from this study.

2. TEAM

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3. BACKGROUND

In early 2020, the SMFCSD commissioned a facilities masterplan called the **"Facilities Master Plan for the New Decade" (FMP)**. As the title implies, this report identifies the facility needs of the District for the next 10 years, among which is the need to add air conditioning, upgrade or replace existing HVAC equipment that is obsolete or challenging to maintain, and improve air filtration where needed. The report also identifies the need to upgrade electrical service at many of the sites to support the addition of air-conditioning and other systems and equipment such as hot water at classroom sinks (adding hot water itself is not part of this study). The FMP report was completed and adopted by the Board of Trustees on July 30, 2020.

The process of preparing the FMP began when COVID-19 was not yet a significant concern in California. The recommendations to improve the HVAC system in the FMP initially focused on alleviating high indoor temperature that has continued to increase due to climate change. In recent years, wildfires have become more frequent and the resulting smoke has exacerbated this problem when teachers are forced to close windows and exterior doors to protect their students, raising indoor temperature even more. Adding air-conditioning and improving air filtration for classrooms and other spaces at all District sites became an urgent priority before the onset of the COVID-19 pandemic.

In March 2020, the global COVID-19 pandemic became a significant health threat in the United States. Like many areas across the nation, the State of California and San Mateo County shut down school campuses and instituted shelter-in-place across the County in March. School instruction switched immediately to a virtual mode, with students remaining in their homes. How and when to reopen schools safely became the top priority of all educational systems, including the SMFCSD.

In November 2020, voters in the SMFCSD passed Measure T to authorize the issuance of bonds of up to $409 million to fund District facility improvements identified in the FMP as Immediate Priorities. These priorities include adding air filtration and air conditioning, upgrading existing HVAC equipment at schools with grades 6-8 and schools with a pod configuration.

After the adoption of the FMP, the District commissioned this study to investigate more deeply how to improve HVAC systems including air filtration across the District's sites, including costs, technical considerations, and physical and logistical constraints and to lay the foundation for implementation. This HVAC Implementation Study provides a road map on how the District can best implement these high-priority improvements as quickly and efficiently as possible, within the projected budget in the FMP for HVAC, air filtration and electrical service upgrades.

PART II

SUMMARY OF RECOMMENDATIONS & COSTS

4. SUMMARY OVERVIEW

This summary provides readers with an overview of the analyses that formed the basis for the recommendations on HVAC, air filtration and electrical systems and costs. The Mechanical and Electrical reports in the appendices provide more detailed information.

We evaluated a range of available HVAC and air filtration options and narrowed them down to two (2) HVAC options for more detailed study, and one (1) air filtration option. We selected these final options based on their effectiveness in providing good thermal comfort and ventilation, ease of installation and maintenance, energy efficiency, noise level and reasonable cost. We considered their impact on preventing the spread of contagious diseases including COVID-19, which we will discuss in a separate section of this Report.

Each of the options below focuses on the predominant conditions in the District, which are classrooms with indoor furnace units inside an enclosure. All sites contain other conditions other than the predominant ones.

- **Option 1:**
    - Sub-option 1A: For existing in-classroom furnace units, replace with **new in-classroom furnaces with A/C coil**, inside site-built enclosures, using mixed-fuel equipment (gas for heating, electric for cooling). A separate A/C condenser will be installed on the roof.
    - Sub-option 1B: For existing in-classroom furnace units, replace with **new in-classroom heat pumps with heating and A/C modes**, inside site-built enclosures, using **electricity only**.
    - For buildings with existing rooftop packaged HVAC equipment, replace with new **all-electric** rooftop HVAC equipment with A/C in the same location.
    - For administration buildings without A/C or with packaged rooftop units, replace with **new all-electric VRF** (Variable Refrigerant Flow) **equipment** in the same location.
    - For portables, replace with **similar** new wall-mounted **all-electric** HVAC units.
    - Upgrade electrical services and/or distribution system as required to support the addition of A/C, as needed. See Appendix 2, Electrical Report for additional information.

- **Option 2:**
    - Sub-option 2A: For existing in-classroom furnace units, replace **with new rooftop packaged units**, using **mixed-fuel** equipment (gas for heating, electric for cooling).
    - Sub-option 2B: For existing in-classroom furnace units, replace with **new rooftop packaged heat pumps with heating and A/C mode**s, using **electricity only**.
    - For buildings with existing rooftop packaged HVAC equipment, replace with new **all-electric** rooftop HVAC equipment with A/C in the same location.
    - For administration buildings without A/C or with packaged rooftop units, replace with **new all-electric VRF** (Variable Refrigerant Flow) **equipment** in the same location.
    - For portables, replace with similar new wall-mounted **all-electric** HVAC units.
    - Upgrade electrical services and/or distribution system as required to support the addition of A/C, as needed. See Appendix 2, Electrical Report for additional information.

In summary, the key difference between Options 1 and 2 above involve classrooms with existing in-classroom furnace units, without air conditioning. Options 1 (including sub-options 1A and 1B) recommend replacing these units with new, upgraded units with air conditioning in the same locations. Options 2 (including sub-options 2A and 2B) recommend replacing these units with new rooftop units. The attributes, advantages, and disadvantages of each type of equipment are described in the Mechanical Report in Section 6 of this study.

Our evaluation shows that of the above, Sub-option 1B (all-electric equipment) is the choice that meets the District's needs the best. This Sub-option replaces the in-classroom furnace units that currently exist in most of the District's classrooms with upgraded equipment with air-conditioning capability, re-using many of the existing utility connections to save both cost and time. We recommend replacing each of the sheet metal housing enclosures with a site-built, framed enclosure and a conventional door to improve sound isolation and make maintenance more convenient (current enclosures require a special key, rather than a conventional lockset that can be master-keyed).

Furthermore, we recommend adding an exposed, painted spiral duct within each classroom for better air distribution and better acoustics in the classrooms. The key disadvantages of this option are that maintenance personnel will need to enter the classrooms to service the units and that they continue to require the use of classroom floor space. However, we feel that the advantages of this option far outweigh its disadvantages.

Sub-option 1B calls for all-electric equipment (heat pump) which aligns with the direction in California to switch all buildings to electricity and the eventual elimination of any fossil fuel that emits CO2 into the atmosphere and worsens our climate change crisis. An all-electric option is also consistent with the Board of Trustee's long-term goal of achieving Zero-Net-Energy, especially when a solar energy system is added in the future. We recommend that the District install a solar photo-voltaic system wherever possible to offset the increased utility costs that result from the switch from gas to electricity. The District is working on a parallel and separate study to evaluate the installation of solar systems.

For conditions that do not have an existing in-classroom furnace unit, including classrooms with rooftop units, portables, libraries, LGI's, administrative offices and multi-purpose rooms, there are specific recommendations for each condition in the Mechanical Report as part of this Report. Generally, we recommend replacing existing units with similar but more updated and all-electric equipment to take advantage of the infrastructure already in place.

With respect to air filtration, MERV-13 level filters are recommended by ASHRAE (American Society of Heating, Refrigeration, and Air-Conditioning Engineers) and required by the 2019 Code for schools. Going forward, our recommendation is to specify MERV-13 filters for all new HVAC equipment as well as existing equipment after testing to determine if existing units are capable of accommodating MERV-13 filters. When it is not possible to use MERV-13 (the District's current standard is MERV-11), we recommend adding a bipolarization system to existing HVAC equipment. This system uses an electronic charge to create reactive ions which travel through the airstream to mix smaller particles to form larger particles which can be filtered (See Appendix 1, Mechanical Report, HVAC Filtration Options). Additionally, the District's recent addition of stand-alone HEPA air purifiers further ensures that greater quantity of air enters the filtration system, and more particles are filtered.

5. COST OVERVIEW

Based on our recommendation above, the total CONSTRUCTION cost to implement HVAC and air filtration upgrading, including electrical service upgrades where applicable for all District sites included in our study for all our recommendations –- is **$69,335,188.** Soft costs are NOT included in this figure. The FMP has estimated district-wide soft costs for all projects to be 35% of construction cost, or **$24,267,316,** to result in a TOTAL PROJECT cost of $93,602,503.

The above figures fall within the cost projections in the FMP for HVAC, air filtration and electrical service upgrades, which are $95,142,900 (Construction cost) and $128,442,915 (Total Project Cost). As in any construction work, the actual costs will undoubtedly vary when more information is known as the projects proceed to design and construction.

Please see the complete cost breakdown per site in section 12 – Cost Estimate for All Sites for additional information.

PART III

IMPLEMENTATION STUDY CONSIDERATIONS

6. MECHANICAL STUDY

This part of the Report has been prepared by the mechanical engineering team and evaluates the mechanical equipment in the San Mateo-Foster City School District (SMFCSD) to recommend the most appropriate approach to add air conditioning, upgrade and/or replace existing HVAC equipment and improve air filtration based on the FMP. The data in this study are based on information gathered from field visits and consultations with the Architect, Electrical Engineer and District representative. Site visits were done on multiple days, stretched over several weeks. Based on this information, the mechanical engineering team completed an assessment of the system along with recommended design options for replacement.

The goal of this Report is to create the conceptual framework to implement HVAC and air filtration upgrades for the sites covered herein. The Report will help the District make decisions on the types of equipment and system, project packaging and scheduling prior to engaging consultant teams to carry out full architectural and engineering design services for the work.

We found the following types of spaces and accompanying HV and/or HVAC equipment at the District's sites:

Wing-style Classrooms: These classrooms typically have furnaces without cooling coils. Each furnace is in a sheet metal enclosure with sheet metal access panels with special key lock, except Foster City Elementary School, which have a site-built, framed enclosure. The furnaces have a return plenum underneath, with code-required ventilation (outside air) provided by exterior louvers ducted to the return plenums.

Pod Buildings, LGI Buildings and Classrooms in Flat-roof Buildings: These spaces typically have Packaged Rooftop Units (Gas Heating and Electric Cooling). A packaged rooftop unit is fully self-contained and consists of a supply fan, direct expansion cooling coil, filters, compressors, condenser coils and condenser fans. Supply and return air ducts connect at the bottom (vertical discharge) or on the side (horizontal discharge) of the unit. Units are typically mounted on roof curbs.

Portable Classrooms: These spaces typically have a wall-mounted heat pump attached to an exterior wall. This system is commonly found in most portable classrooms in California.

There are other types of HVAC systems; however, there are much fewer of them than the types mentioned above. These include:

1. Rooftop Packaged Heat Pumps
2. Inside Classroom Heat Pumps (Airdale and Bard units)
3. VRF (Variable Refrigerant Flow) Heat Pumps (in some of the newer Admin Buildings)
4. Split-System Heat Pumps

For the predominant existing condition, which are the wing-style classrooms with in-room furnaces, we recommend replacing them with all-electric split-system heat pumps in the same locations (Option 1B), with several improvements. We recommend upgrading the existing sheet-metal enclosures to site built framed enclosures, which increase sound

isolation and make maintenance easier, as the accompanying conventional doors can be master-keyed (existing enclosures require a special key).

Furthermore, we recommend adding an exposed, painted spiral duct within each classroom for better air distribution and better acoustics in the classrooms.

Where rooftop HVAC units currently exist, we recommend replacing them with newer rooftop units. A like-for-like replacement is the simplest and least expensive option as all the support infrastructure for the new units is already in place.

In cases where the unit is serving multiple offices (Administration Buildings), we recommend a central VRF (Variable Refrigerant Flow) exterior system with separate indoor units with dedicated outside Air Supply (DOAS) for ventilation. This option will make sure that each space has its own comfort controls and code-required ventilation air at all time. These systems are already in use in the administration buildings at Foster City ES, Fiesta Gardens International School and Parkside Montessori School in the District.

We recommend replacing all existing filters with MERV 13. This will bring filtration standards to code-required level and in line with ASHRAE recommendations. This may not be possible at some existing units because it may degrade the system's performance. Testing these units is advised to determine whether they can accommodate the higher-level filters. Where Merv-13 is not available for the filtration option for existing equipment, other technologies such as bipolarization are available to use on MERV-8 to MERV-11 filters to improve filtration capabilities. Product manufacturers state that with the addition of these systems, lower-level filters can perform at a level equivalent to MERV -13. We recommend adding the bipolarization technology (HVAC Filtration Option 4, Mechanical Report) when the equipment cannot accommodate MERV-13 filters.

All new equipment should be designed with MERV 13 filters as a minimum requirement. New equipment can also be selected with factory antimicrobial coatings such as Carrier Agion.

We also recommend portable air cleaning devices (HVAC Filtration Option 5, Mechanical Report) like the HEPA units the District has already installed, to be placed in classrooms when occupied. This option can be deployed quickly and provides the District with the greatest flexibility as it does not require any modifications to the buildings. The portable units can be easily moved to where needed. Some rooms may require multiple units to ensure proper coverage.

7. ELECTRICAL SUMMARY

The electrical engineering team prepared this part of the Report based on the assessment of the capacity of the existing electrical services, electrical distribution and fire alarm systems to accommodate the HVAC upgrades proposed for the District's sites. The team's objective was to determine if the existing electrical service, main switchboard, distribution feeders, electrical panels and fire alarm systems are adequately sized for the additional HVAC loads or if the equipment will need to be upgraded and replaced.

Existing Conditions - Electrical System

Many of the sites have a main switchboard ranging in size from 1200A to 2500A at 208/120V, while a few sites have 1200 to 2000A at 480/277V service. All the existing main switchboards are between 20 and 30 years of age. In general, they are in good condition except for Audubon ES, which is at the end of its service life (50+ years) and is failing due to rust and corrosion. The electrical distribution at all the sites except for Audubon has been upgraded in the late 1990's and early 2000's or later. The distribution equipment installed indoors is in good working condition. The distribution upgrades at these sites were not sized to accommodate added HVAC cooling loads and do not have the space available for new breakers to serve the HVAC units.

Existing Conditions - Fire Alarm System

All the District sites have a Notifier panel, the District's standard manufacturer. Most sites have either the NFS2-320, NFS2-640 or NFS2-3030 systems. Several sites have an older AFP-200 or AFP-300 installed. Most of the existing sites are manual fire alarm systems with horn/strobe notification. Several sites have fully automatic fire alarm systems with horn/strobe notification. The new multi-purpose buildings currently under construction or recently completed have fully automatic fire alarm systems with voice evacuation notification. The AFP-200 system cannot support carbon monoxide detection or voice evacuation notification. The NFS2-320 and the NFS2-640 systems can support carbon monoxide detection but lacks voice evacuation. We recommend NFS2-3030, which can support both carbon monoxide detection and voice evacuation.

Study Process

The team reviewed the as-built drawings and performed a site visit at each school, noting the sizes and condition of the existing equipment. During sites visits, we received input from the District's maintenance and facilities staff on the condition of the equipment and issues that they have experienced with the electrical systems. After determining the existing conditions, we coordinated the project scope with the architect and mechanical engineers to determine the new loads and types of systems that the HVAC projects will require

and how the electrical distribution systems will be impacted. For the electrical service evaluation and recommendations, the team also reviewed the District's sustainability goals and needs to ensure that any new systems will meet those goals. Other things that were considered for our recommendations are the sites' future needs and the Multi-Purpose buildings currently in design, construction, or planning stages. Load calculations were performed based on the existing loads, the planned HVAC loads, in classroom water heater loads and the future multi-purpose building loads and are the basis of our recommendations.

Recommendations - Electrical Service and Distribution

The existing electrical services for most of the schools were not originally sized for air conditioning. The sites that do have air conditioning were not sized to accommodate all-electric HVAC systems. Adding multi-purpose or similarly sized buildings to some of the sites which are included in the FMP, increases electrical loads that will need to be accommodated by the electrical services. Many of the existing electrical services that are located outdoors also need to be replaced. Due to the size of the existing services and distribution facilities, future building needs and the condition of the existing switchboards, it is recommended to upgrade most of the electrical services in the District. (See Electrical Report in Appendices for individual site analyses). The electrical distribution to each building will also need to be upgraded to accommodate the individual building loads. Due to the high amount of corrosion that we have seen across the District sites, it is also recommended that the District consider stainless steel enclosures for any new switchboards mounted outdoors.

Recommendations - Fire Alarm Systems

When gas-fired mechanical systems are required in the buildings or classrooms, carbon monoxide detection systems will be required. The fire alarm systems are typically used to provide this functionality. The Notifier NFS2-320, NFS2-640 and NFS2-3030 are all capable of performing carbon monoxide detection. The AFP-200 and AFP-300 panels cannot perform carbon monoxide detection and will be required to be upgraded to the NFS2-3030 panel. Carbon Monoxide detection will not be required if all-electric HVAC systems are selected. DSA (Division of the State Architect) informed us that these HVAC projects should not trigger a requirement to upgrade the existing manual fire alarm systems, with horn/strobe notification, to fully automatic fire alarm detection or voice evacuation systems. New buildings or other future projects at these sites may trigger a requirement to upgrade the sites to a NFS2-3030 panel. The current code requires fully automatic fire alarm detection and voice evacuation.

A summary of the existing conditions and recommendations on electrical and fire alarm upgrades at all District sites is on the next page.

Summary of Electrical Service and Fire Alarm Conditions and Recommended Upgrades

	Electrical Service						Fire Alarm Control Panel (FACP[1])	
Site	Existing Service Size	Service Voltage	Service Upgrade Needed	New Service Size	New Voltage	New/Future MPR[2]/Gym	Existing FACP	FACP upgrade for CO[3]
Abbott MS	(2) 2000A	208/120V	No			Yes	NFS2-3030	No
Audubon ES	1200A	480/277V	Yes	2500A	480/277V	No	NFS2-640	No
Bayside Academy	2500A	208/120V	Yes	4000A	480/277V	Yes	NFS2-640	No
Baywood ES	1600A	208/120V	Yes	2500A	480/277V	No	NFS2-640	No
Beresford ES	1600A	208/120V	No			No	NFS2-640	No
Borel MS	2500A	208/120V	Yes	3000A	480/277V	Yes	NFS2-3030	No
Brewer Island ES	2000A	480/277V	No			No	NFS2-320	No
College Park ES	2000A	208/120V	Yes	2500A	480/277V	No	NFS2-3030	No
Fiesta Gardens International School	2000A	208/120V	No			No	NFS2-640	No
Foster City ES	1200A	480/277V	Yes	2500A	480/277V	No	NFS2-3030	No
George Hall ES	1200A	208/120V	Yes	2500A	480/277V	Yes	AFP-200	Yes
Highlands ES	1600A	208/120V	Yes	2500A	480/277V	Yes	AFP-200	Yes
Laurel ES	1600A	208/120V	Yes	2000A	480/277V	No	NFS2-640	No
LEAD ES	1600A	208/120V	Yes	2500A	480/277V	Yes	AFP-200	Yes
Meadow Heights ES	1600A	208/120V	Yes	2000A	480/277V	Yes	NFS2-3030	No
North Shoreview Montessori School	1600A	208/120V	Yes	2000A	480/277V	No	AFP-200	Yes
Parkside Montessori School	1200A	208/120V	Yes	2000A	480/277V	Yes	NFS2-640	No
San Mateo Park ES	1600A	208/120V	Yes	2000A	480/277V	No	NFS2-640	No
Sunnybrae ES	2500A	208/120V	No			Yes	AFP-200	Yes
Turnbull Children's Ctr	1600A	208/120V	No			No	NFS2-3030	No

[1] FACP: Fire Alarm Control Panel
[2] MPR: Multi-purpose Room
[3] CO: Carbon Monoxide

8. Impact of Climate Change, Wildfire Smoke and COVID-19

In preparing this Report, we consulted several research papers, white papers and studies about the role of building mechanical systems (HVAC) and air filtration in the spread of contagious diseases, in particular COVID-19. Our team members are not health experts or virologists; we rely on the research done by others to understand the impacts of building systems on controlling COVID-19 or similar viruses. It must be recognized that this is a relatively new issue; much remains unclear to scientists, who continue to publish new findings. Therefore, the analysis herein reflects only the current scientific and community knowledge; future discoveries may change this understanding.

In general, the most effective methods to contain the spread of COVID-19 remain wearing facial coverings, maintaining social distance, cleaning surfaces on a regular basis and bringing in outside air by opening windows and exterior doors whenever possible. The mechanical ventilation system in buildings plays a smaller role but improving its air filtration capability helps minimize airborne viruses transmitted through the system.

The District has implemented an ongoing program to replace the existing MERV-8 air filters in the building mechanical systems with MERV-11 filters. This replacement represents a meaningful improvement in air filtration capability. As discussed previously, we recommend upgrading wherever possible to MERV-13, which is the ASHRAE-recommended filtration level and is required by Code for new HVAC equipment. Many existing units, especially the in-classroom furnaces, may not accommodate MERV-13 filters without causing an unacceptable drop in air pressure. We recommend testing these units to determine the level of pressure drop before upgrading the filters. All new equipment to replace existing should be specified with MERV-13 air filters, as well as a factory-installed antimicrobial coating such as Carrier Agion. Adding a bipolarization system to existing MERV-11 air filters further enhances filtration capability.

The District has installed stand-alone air purifiers with HEPA filters to supplement the built-in air filtration in the mechanical ventilation system. These portable purifiers can be placed in different locations within a space to increase the amount of air being circulated through and the number of contaminated particles being caught by the filters. The combination of built-in air filtration and portable air purifiers improves the effectiveness in reducing the transmission of airborne diseases.

In California, wildfires increasingly create unhealthy and dangerous air quality. While filtration systems can help improve indoor air quality, smoke from wildfires contain very small particles in the 0.3 to 0.5 um range, and even MERV 13 filters are relatively inefficient in stopping these articles. The District-owned air purifiers with HEPA filters supplement the filtration capacity of built-in HVAC equipment.

Sources:
1. Taylor Engineering, COVID-19 White Paper, updated June 2, 2020
2. ASHRAE Epidemic Task Force, Schools and Universities, updated July 17, 2020
3. ASHRAE Epidemic Task Force, Schools and Universities, updated October 17, 2020
4. National Energy Management Institute / UC Davis Energy and Efficiency Institute, White Paper – Proposed Ventilation/Repair Program for School Reopening, June 4, 2020
5. California's Coalition for Adequate School Housing (CASH) Webinar

9. Process of Preparing Study

To complete this study, the team carried out the following steps:

1. Reviewed available documents from the District, specifically mechanical and electrical as-built plans and other records.

2. Visited each site included in this study to confirm the information shown on as-built plans and other District documents and to understand the physical constraints for implementing air filtration, addition of A/C and HVAC improvements. These visits took place during the pandemic when schools were all shut down. The team took all necessary health and safety precautions, including wearing facial coverings, maintaining social distance and having body temperature checked prior to entering each site.

3. Investigated the adequacy of electrical service and distribution at each site covered in the study to determine whether the current system has the capacity to support air-conditioning and other needs, including adding hot water to classroom sinks, which was also identified as an Immediate Priority in the FMP.

4. Identified and evaluated available options for adding air-conditioning, air filtration and upgrading and/or replacing HVAC equipment, as called for in the FMP. The team narrowed down the list to two (2) recommended types of HVAC systems and one (1) recommended type of filtration, including the advantages and disadvantages of each, for the District's consideration.

5. Prepared cost estimates for each of the recommended options, considering architectural and structural impacts, Building Code requirements, industry best practices and the appropriate markup and contingency factors. The estimates are based on 2021 dollars.

6. Engaged an independent cost consultant to carry out a peer review of the engineering team's cost estimates. The cost consultant provided its opinion on the engineering team's cost data. In cases where there were significant differences of opinion, the engineering team and cost consultant reviewed their respective data and assumptions and collectively arrived at a mutually-agreed-upon final set of cost estimates.

7. Contacted DSA (Division of the State Architect), the State agency charged with approving public school construction in California, to determine if the recommended work may trigger any major unanticipated and not directly related scope, such as upgrading the fire alarm system. We confirmed with DSA representatives that this will not likely be the case, except some minor instances that fall well within the contingency allowance of these projects.

8. Met and reviewed with District representatives regularly the design options and costs, timeline, and logistic challenges. The Aedis team presented its recommendations, which were reviewed for clarity by District representatives prior to submission to the Board of Trustees for final review and a decision on next steps.

10. A Future of Energy-positive and Fossil Fuel-free District Facilities

The Board of Trustees has included in the FMP a goal of transforming the District into exemplary sustainable and zero-net- energy facilities. This objective is consistent with the overall efforts in California and the Bay Area to transform to all-electric building systems. In preparing this study, we are mindful of this long-term objective. As such, when presenting options for HVAC, we list both a gas-electric (currently the predominant condition in the District) and an all-electric choice whenever this is available. Our final recommendation for the predominant conditions in the District is an all-electric system.

The cost of purchasing and installing the same type of HVAC systems is very similar between equipment that use a combination of gas and electricity and electricity only. However, all-electric units do consume more power and, in some cases, may trigger the need to upgrade the main electrical service while equivalent gas/electric units can be supported by the existing service. The cost of a new electrical service can be considerable, not to mention the lengthy time it takes to navigate the PG&E process to obtain equipment and service. In such cases, changing to an all-electric campus may be significantly more costly; however, it may still make sense especially when it is combined with the addition of a solar system.

Ongoing utility costs are also a significant consideration. It is much less expensive to operate equipment with gas or gas/electricity than with electricity alone. The cost of electricity, especially at peak demand which is when the District sites are in use, is expected to remain high. As such, it would make the most sense to couple the switching to an all-electric campus with the installation of an onsite photo-voltaic solar power system. We understand that the District is beginning a parallel study to determine where best to add solar, which would work well with our recommendations in this Report.

PART IV

IMPLEMENTATION

11. Recommended Implementation Plan

We recognize that implementing the program of adding, upgrading and/or replacing HVAC and air filtration at most of the District's sites is a complex, large-scale and challenging endeavor. The District will be spending nearly $100 million in total project cost over a relatively short duration. Almost every project management task is multiplied many times, from managing design teams, contractors and subcontractors; coordinating site visits and inspections; attending meetings; making decisions as owners; executing the public bidding and contract process; liaising with site staff; reviewing, approving and processing payments; orchestrating the move-out/move-in process; providing temporary housing for displaced students and teachers (if necessary); handling post-construction issues such as punch lists, warranty and commissioning, and others.

Early strategic decisions have significant impacts on the ultimate success of the program. To ensure that this work is executed as quickly, efficiently, and effectively as possible, we respectfully submit the following approaches as the backbone of a program implementation plan.

A. Expanding the District's Project Management Capacity

This large, fast-moving, and complex construction program will require a team dedicated to managing it on a full-time basis. The District's current facilities staff likely have limited capacity to take on a significant amount of additional responsibility. While the District could attempt to hire additional inhouse staff, it may be difficult to find enough qualified personnel in a short timeframe.

We recommend that the District consider hiring a construction management or construction firm with the capacity to manage a program of this size. Hiring such an entity is undoubtedly costly; however, the additional costs, quality control problems and possibly litigation that may result if the District lacks the resources to execute the project well and in a timely manner may outweigh such expenditure.

B. Select the Optimal Project Delivery Method(s)

The District has a choice of available alternatives to implement construction projects – called Project Delivery Methods – for the most effective approach that meets the unique requirements of this work. Choosing project delivery methods is always a balancing act between cost, risk allocation, available pool of contractors, timeline, and unique characteristics. These alternatives are:

- **Design-Bid-Build, single project:** The Owner contracts separately with a Design Team, typically led by an architect, and a Construction company for a single site or campus. After design documents are complete, the Owner advertises the project to solicit bids and awards the construction project to a single Contractor.

  This method is the simplest and most familiar in the public sector, but it is not without challenges. It does not allow for collaboration between the design and construction teams, which can lead to an adversarial

relationship and greater conflicts. The Owner is required to award to the bidder with the lowest responsive bid and thus has little control over who wins the job.

- **Design-Bid-Build, bundled project:** This is similar to above, except that multiple projects are bundled into a single contract, for the purpose of gaining an economy of scale with a larger total construction volume. A higher dollar figure makes the work more attractive to larger contractors; on the other hand, it also has the effect of eliminating or discouraging smaller builders.

- **Design-Build:** The Owner contracts with a single entity that includes the builder and the architect-of-record, to assume responsibility for both design and construction. The key advantages of this method are a single point of responsibility for the Owner and the collaborative nature and reduction or elimination of conflicts between a design team and a construction team since both are working as one entity. In public works, there are legal requirements to ensure competitiveness in the selection of a Design-Build team. A clear definition of scope, also called 'bridging documents,' is required to provide competitors a basis to submit pricing information. On the other hand, the selection process tends to be more time consuming and costly for both the Owner and the competing Design-build entities. A significant amount of risk is shifted from the Owner to the Design-Build entity; hence the Owner may be expected to pay a higher price.

- **CM (Construction Manager):** The Owner engages a Construction Manager (CM) to assist in the management of the construction program. The exact responsibilities of the CM vary depending on the Owner's preference. They can be limited to specific tasks or projects, or for a short-term duration.

- **CM Multiple-prime:** The Owner engages a Construction Manager (CM) to replace the traditional General Contractor by breaking the project into sub-trades and bidding each trade separately. The Owner, through the CM, has better control of sub-contractors as it holds contracts directly with them. This method can work well when the construction schedule is tight, by a more aggressive coordination of sub-contractors. On the other hand, it increases communication responsibility and paperwork, as the Owner must manage multiple contracts. A CM could be charged with this contract management responsibility.

- **CM-at-risk:** This is like CM Multiple-prime, except that the Owner holds a single contract with the CM as an at-risk entity, who in turn holds contracts with all subcontractors. The CM-at-risk entity replaces the General Contractor, with the difference that it is hired during the design process and may have a role in assisting the design team with phasing, scheduling, constructability and cost control. Under a CM-at-risk model, the Owner also has a single point of accountability, but may gain increased control of sub-contractors. There may also be more collaboration between the design team and the construction team, depending on how it is structured.

- **Lease Leaseback:** This method was once popular in California, because it allows a public owner to select a Lease Leaseback (LLB) entity without a competitive bidding process. This approach was challenged in court and has since been revised with stricter competitive and other requirements. School districts today tend to be more careful in using this approach, given the legal concerns.

Given the need to implement this program quickly and its large scale, we recommend that the District pursues any one of the CM methods above for at least some portions of the work recommended in this Report. Which of the CM methods is most appropriate is subject to further discussion and consideration of project constraints and the District's comfort level, as well as consultation with the District's legal counsel. A CM approach allows the District to expand its project management capacity, provides the necessary staffing and expertise to manage the large scope and gains greater control over sub-contractors to improve the potential of completing the work on time and with a minimum of disruption to school operations.

C. Combining, Bundling and Packaging Projects

Considering the conditions of each of the District's sites, the capacity of design and construction teams, lead time for PG&E and ordering equipment, DSA approval and the economy of scale of bundling projects together, we recommend that sites are grouped or bundled together for contracting purpose. Grouping sites based on the similarities in the types of mechanical and electrical systems and site conditions will make it easier for a design team and a construction team to handle these sites at the same time, while taking advantage of the economy of scale of a larger project. The recommended four (4) groupings of sites are below.

Note that these groupings, other than Group 1, do NOT indicate an order of implementation. They can be implemented in any order based on the District's preference. However, we do recommend that the implementation of each group not occur simultaneously. The groups should be staggered by about 3 months to avoid over-taxing the capacity of District staff, design teams and construction teams.

GROUP 1 - Filtration Replacement Program, All Sites

The District has been implementing an air filter replacement program by replacing MERV-8 filters that had been prevalent throughout the District with MERV-11, which represents a significant improvement in the ability to filter particles in the air.

Going forward, as filters need to be replaced on a regular basis, wherever possible the District should switch to MERV-13, which is the current ASHRAE-recommended air filtration for classrooms and a 2019 Code requirement for new equipment. Some of the existing equipment, such as in-classroom furnaces, may need to be tested prior to implementation to determine if MERV-13 negatively impacts the system's performance with an unacceptable air pressure drop. We expect that rooftop HVAC units can readily support the new MERV-13 filters. As existing HVAC units are replaced, new equipment should be specified with MERV-13.

GROUP 2 - Sites with a "Finger Plan" Configuration and In-classroom Furnace Units:

These sites have classrooms laid out in a linear wing fashion, typically referred to as "finger plan", along a single or double-loaded corridor. Furnaces are located inside classrooms, with flat or low-sloped roofs where new air conditioning condensers could be placed.

- College Park ES
- George Hall ES
- Laurel ES
- Meadow Heights ES
- North Shoreview Montessori School

GROUP 3 - Sites with a "Pod" Configuration and Rooftop Furnaces or HVAC Units, and Larger Sites:

These sites either have classrooms laid out in a "pod" configuration, typically circular or polygonal, with an interior hallway, limited exterior windows and mechanical units on the roof; and/or are larger sites with larger scope of HVAC and electrical work. They are grouped together because the combined scope is approximately equivalent with other groups.

- Audubon ES
- San Mateo Park ES
- Borel MS
- Abbott MS

GROUP 4 - Sites with Hybrid Systems and/or with Special Conditions:

These sites do not fall into the above groups because they have special conditions and/or they have a mix of systems.

- Bayside Academy
- Baywood ES

- Foster City ES
- LEAD ES
- Parkside Montessori School
- Beresford ES

The following sites are not listed in the above groups but are included in the air filtration replacement, as described under GROUP 1 work. GROUP 1 also includes all the sites listed under Groups 2 through 4.

- Bayside Theater
- Brewer Island ES
- Fiesta Gardens International School
- Highlands ES
- Sunnybrae ES
- Turnbull Children Center
- District Office
- M&O Warehouse

D. Recommended Implementation Phases and Schedule

A typical project to add, upgrade or replace HVAC equipment may contain the following phases. Unique conditions of sites may impact this estimated schedule.

- Project Planning and Definition: Underway in this effort
- Submit PG&E Application and pay deposit: Month 1
- PG&E intakes project(s) for cost estimating: Month 2
- Selection of CM (Construction Manager): Month 2 to 3
- Engineering and Architectural Design: Months 2 to 4
- DSA submittal: Month 5
- Bidding and contract for site electrical (to meet PG&E lead time): Month 5 to 6
- Procurement and Construction of Switchgear Equipment (3 to 4-month lead time): Month 5
- Procurement of HVAC equipment: Month 5
- DSA Review and Approval: Month 5 to 9
- Receive PG&E Design Documents: Month 6
- Construction of Underground Substructures, Switchboard and Transformer Pads: Month 5 to 7
- Pass PG&E inspection; PG&E construction (3-8 weeks) Month 8
- Bidding and Contract of HVAC work: Month 9 to 10
- HVAC Installation: Month 10 to 11
- PG&E Construction and Final Connection: Month 12

Of the above phases, two processes are particularly time-consuming and unpredictable; their duration is outside of the District's control.

PG&E: Where electrical service upgrade is included in the scope of work, the District is required to submit an application and pay a deposit to PG&E, then wait for PG&E to prepare an engineering design before PG&E installs its new service. Because this is a lengthy and unpredictable process, we recommend that the District begin the application and deposit process as soon as possible, ahead of the other processes to gain a head start. What is presented above is the average time it has taken for a typical electrical service upgrade project.

DSA: DSA (Division of the State Architect) is the State agency charged with approving all design and construction of public schools in California to ensure structural and fire safety and disabled access compliance. The length of time for DSA plan review is lengthy and unpredictable. What is presented above is the average time it has taken for a project of similar size, scope and complexity.

E. Pre-procurement of Equipment

The District enjoys a potential advantage in that adding air conditioning and filtration and upgrading and replacing existing HVAC equipment as recommended in this Report is considered a project of a substantial size. The District may be able to take advantage of this economy of scale through the direct purchase of equipment. By purchasing equipment in bulk directly, the District may be able to negotiate better pricing and avoid contractor markup on the costs of the equipment.

If this approach is used, the following should be taken into consideration:

- The District needs to negotiate to make sure that the warranty period begins when the equipment is put in operation and not on the date of purchase.
- The District needs to make sure that the construction contract includes a clause to require the Contractor and/or CM to install District-purchased equipment and be responsible for their performance.
- The District needs to identify adequate facilities that can store and protect the equipment before they are installed.

PART V

COST ESTIMATE

12. Cost Estimate for All Sites

A key goal of this Report is to estimate the costs of the work recommended herein, using more detailed analysis than could be done in the FMP, whose focus was not on implementation. At the same time, the estimates in this Report remain at a conceptual study level. While they reflect the specific conditions at each site, they assume for example, that all classrooms of a certain type and at a particular site are the same. Minor differences between the same type of space and equipment did not make a significant difference in cost at this stage of study.

We use two different methods of cost estimating for this Report.

a. For mechanical and architectural work, we calculated them per space. For example, we calculated the costs for replacing or upgrading HVAC equipment and air filtration for each classroom of the same type. Then we multiplied this cost per space to the number of same spaces at the same site.
b. For electrical work, we calculated per site, as the work usually applied to the entire site and not individual buildings or spaces.

The costs that we calculated using the above two methods formed the sub-contractor costs. From these figures, we applied the following mark-up factors to arrive at construction costs.

'Construction Cost' is an industry-standard term to refer to the cost an owner pays to a general contractor, without 'Soft Costs'. Soft Costs include architectural and engineering fees, surveys and reports, DSA and other agency fees, inspection and construction contingencies. The sum of Construction Cost and Soft Costs is Total Project Cost.

Construction Costs in this study include the following mark-up factors:

a. A General Contractor mark-up of 22.5%, which includes general conditions, bonds and insurance and contractor overhead and profit. This is the industry's prevailing mark-up rate.
b. A Design Contingency of 20%, to cover scope items that are naturally missed at this early stage of study. During the design phase, the required scope in our recommendations may have impacts that trigger some amount of additional work. This Design Contingency is intended to account for work that cannot be anticipated at this time.

We have not applied Soft Costs to individual sites. Soft Costs, as a percentage of Construction Costs, may vary considerably from project to project, depending on project size and other factors. In terms of the entire HVAC/Air Filtration program however, the District has a good record of Soft Costs in its history of managing construction programs, which average 35% of Construction Costs.

Cost figures are in 2021 dollars. We have not factored in escalation (inflation), as we anticipate that these projects will be designed, approved by DSA and bid in 2021 or early 2022.

The cost breakdown for all sites included in this study are on subsequent pages.

Description	Fuel Source	No. of Units	Cost per Unit					Mech+Arch Cost (Campus-wide)	Electrical Cost (Campus-wide)	Sub-contractor Cost	General Contractor Mark-up (22.5%)	Design Contingency	Total Construction Cost			
			HVAC Unit	Ductwork	Control	Architectural	Total per unit				22.50%	20.00%	Option 1A	**Option 1B**	Option 2A	Option 2B
Abbott Middle School																
A/C Addition (currently no A/C)																
In-classroom furnace with A/C coil	Gas/Elec	23	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,454,750	$ 1,032,500	$ 2,487,250	$ 559,631	$ 497,450	$ 3,544,331			
In-classroom heat pump	Electric	23	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,454,750	$ 978,750	$ 2,433,500	$ 547,538	$ 486,700		$ 3,467,738		
Rooftop packaged HVAC unit	Gas/Elec	23	$ 60,000	$ 11,250	$ 9,000	$ 50,500	$130,750	$ 3,007,250	$ 1,032,500	$ 4,039,750	$ 908,944	$ 807,950			$ 5,756,644	
Rooftop packaged HVAC unit	Electric	23	$ 56,250	$ 11,250	$ 9,000	$ 50,500	$127,000	$ 2,921,000	$ 978,750	$ 3,899,750	$ 877,444	$ 779,950				$ 5,557,144
HVAC Replacement																
Replace Rooftop Units		4	$ 35,000	$ -	$ 2,500	$ 2,500	$ 40,000	$ 160,000	$ 12,000	$ 172,000	$ 38,700	$ 34,400	$ 257,100	$ 257,100	$ 257,100	$ 257,100
Replace HV units with AC		1	$120,000	$ -	$ 2,500	$ 2,500	$125,000	$ 125,000	$ 3,000	$ 128,000	$ 28,800	$ 25,600	$ 185,400	$ 185,400	$ 185,400	$ 185,400
Replace Bard Units		14	$ 20,000	$ -	$ 2,500	$ 1,500	$ 24,000	$ 336,000	$ 42,000	$ 378,000	$ 85,050	$ 75,600	$ 580,650	$ 580,650	$ 580,650	$ 580,650
Filtration		42	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 105,000	$ -	$ 105,000	$ 23,625	$ 21,000	$ 149,625	$ 149,625	$ 149,625	$ 149,625
TOTAL ABBOTT MIDDLE SCHOOL													**$ 4,717,106**	**$ 4,640,513**	**$ 6,929,419**	**$ 6,729,919**
Audubon Elementary School																
HVAC Replacement																
Replace Rooftop Units (Re-zoned)		21	$ 35,000	$ -	$ 2,500	$ 2,500	$ 40,000	$ 840,000	$ 1,420,000	$ 2,260,000	$ 508,500	$ 452,000	$ 4,640,500	$ 4,640,500	$ 4,640,500	$ 4,640,500
Replace Heat Pump Units		3	$ 35,000	$ -	$ 2,500	$ 2,500	$ 40,000	$ 120,000	$ 9,000	$ 129,000	$ 29,025	$ 25,800	$ 192,825	$ 192,825	$ 192,825	$ 192,825
Replace Airdale Units (2-story buildings)		10	$ 20,000	$ -	$ 2,500	$ 2,500	$ 25,000	$ 250,000	$ 30,000	$ 280,000	$ 63,000	$ 56,000	$ 429,000	$ 429,000	$ 429,000	$ 429,000
Replace Bard Units (portables)		9	$ 20,000	$ -	$ 2,500	$ 1,500	$ 24,000	$ 216,000	$ 27,000	$ 243,000	$ 54,675	$ 48,600	$ 373,275	$ 373,275	$ 373,275	$ 373,275
Filtration		43	**$ 2,500**					$ 107,500		$ 107,500	$ 24,188	$ 21,500	$ 153,188	$ 153,188	$ 153,188	$ 153,188
TOTAL AUDUBON ELEMENTARY SCHOOL													**$ 5,788,788**	**$ 5,788,788**	**$ 5,788,788**	**$ 5,788,788**
Borel Middle School																
A/C Addition (currently no A/C)																
In-classroom furnace with A/C coil	Gas/Elec	24	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,518,000	$ 1,912,500	$ 3,430,500	$ 771,863	$ 686,100	$ 4,888,463			
In-classroom heat pump	Electric	24	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,518,000	$ 1,773,750	$ 3,291,750	$ 740,644	$ 658,350		$ 4,690,744		
Rooftop packaged HVAC unit	Gas/Elec	24	$ 60,000	$ 11,250	$ 9,000	$ 50,500	$130,750	$ 3,138,000	$ 1,912,500	$ 5,050,500	$ 1,136,363	$ 1,010,100			$ 7,196,963	
Rooftop packaged HVAC unit	Electric	24	$ 56,250	$ 11,250	$ 9,000	$ 50,500	$127,000	$ 3,048,000	$ 1,773,750	$ 4,821,750	$ 1,084,894	$ 964,350				$ 6,870,994
HVAC Replacement																
Replace Rooftop Units		20	$ 35,000	$ -	$ 2,500	$ 2,500	$ 40,000	$ 800,000	$ 60,000	$ 860,000	$ 193,500	$ 172,000	$ 1,285,500	$ 1,285,500	$ 1,285,500	$ 1,285,500
Replace HV units with AC	MP Room	3	$ 90,000	$ -	$ 2,500	$ 2,500	$ 95,000	$ 285,000	$ 9,000	$ 294,000	$ 66,150	$ 58,800	$ 427,950	$ 427,950	$ 427,950	$ 427,950
Replace Split System Heat Pumps		4	$ 25,000	$ -	$ 2,500	$ 2,500	$ 30,000	$ 120,000	$ 12,000	$ 132,000	$ 29,700	$ 26,400	$ 200,100	$ 200,100	$ 200,100	$ 200,100
Filtration		51	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 127,500	$ -	$ 127,500	$ 28,688	$ 25,500	$ 181,688	$ 181,688	$ 181,688	$ 181,688
TOTAL BOREL MIDDLE SCHOOL													**$ 6,983,700**	**$ 6,785,981**	**$ 9,292,200**	**$ 8,966,231**

Description	Fuel Source	No. of Units	Cost per Unit					Mech+Arch Cost (Campus-wide)	Electrical Cost (Campus-wide)	Sub-contractor Cost	General Contractor Mark-up (22.5%)	Design Contingency	Total Construction Cost			
			HVAC Unit	Ductwork	Control	Architectural	Total per unit				22.50%	20.00%	Option 1A	**Option 1B**	Option 2A	Option 2B
Bayside STEM Academy																
A/C Addition (currently no A/C)																
In-classroom furnace with A/C coil	Gas/Elec	35	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 2,213,750	$ 2,426,250	$ 4,640,000	$ 1,044,000	$ 928,000	$ 6,612,000			
In-classroom heat pump	Electric	35	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 2,213,750	$ 2,297,500	$ 4,511,250	$ 1,015,031	$ 902,250		$ 6,428,531		
Rooftop packaged HVAC unit	Gas/Elec	35	$ 60,000	$ 11,250	$ 9,000	$ 50,500	$130,750	$ 4,576,250	$ 2,426,250	$ 7,002,500	$ 1,575,563	$ 1,400,500			$ 9,978,563	
Rooftop packaged HVAC unit	Electric	35	$ 56,250	$ 11,250	$ 9,000	$ 50,500	$127,000	$ 4,445,000	$ 2,297,500	$ 6,742,500	$ 1,517,063	$ 1,348,500				$ 9,608,063
HVAC Replacement																
Replace Rooftop Units		13	$ 35,000	$ -	$ 2,500	$ 2,500	$ 40,000	$ 520,000	$ 39,000	$ 559,000	$ 125,775	$ 111,800	$ 835,575	$ 835,575	$ 835,575	$ 835,575
Replace Admin Units		3	$ 25,000	$ -	$ 2,500	$ 2,500	$ 30,000	$ 90,000	$ 9,000	$ 99,000	$ 22,275	$ 19,800	$ 150,075	$ 150,075	$ 150,075	$ 150,075
Old MP recently renovated			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Replace Bard Units		4	$ 20,000	$ -	$ 2,500	$ 1,500	$ 24,000	$ 96,000	$ 12,000	$ 108,000	$ 24,300	$ 21,600	$ 165,900	$ 165,900	$ 165,900	$ 165,900
Filtration		55	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 137,500	$ -	$ 137,500	$ 30,938	$ 27,500	$ 195,938	$ 195,938	$ 195,938	$ 195,938
TOTAL BAYSIDE STEM ACADEMY													**$ 7,959,488**	**$ 7,776,019**	#########	#########
Bayside Theater	Campus has A/C throughout but equipment is AGED															
Filtration		5	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 12,500	$ -	$ 12,500	$ 2,813	$ 2,500	$ 17,813	$ 17,813	$ 17,813	$ 17,813
TOTAL BAYSIDE THEATER													**$ 17,813**	**$ 17,813**	**$ 17,813**	**$ 17,813**
Baywood Elementary School																
A/C Addition (currently no A/C)																
In-classroom furnace with A/C coil	Gas/Elec	29	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,834,250	$ 1,372,500	$ 3,206,750	$ 721,519	$ 641,350	$ 4,569,619			
In-classroom heat pump	Electric	29	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,834,250	$ 1,293,750	$ 3,128,000	$ 703,800	$ 625,600		$ 4,457,400		
Rooftop packaged HVAC unit	Gas/Elec	29	$ 60,000	$ 11,250	$ 9,000	$ 50,500	$130,750	$ 3,791,750	$ 1,372,500	$ 5,164,250	$ 1,161,956	$ 1,032,850			$ 7,359,056	
Rooftop packaged HVAC unit	Electric	29	$ 56,250	$ 11,250	$ 9,000	$ 50,500	$127,000	$ 3,683,000	$ 1,293,750	$ 4,976,750	$ 1,119,769	$ 995,350				$ 7,091,869
Filtration		45	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 112,500	$ -	$ 112,500	$ 25,313	$ 22,500	$ 160,313	$ 160,313	$ 160,313	$ 160,313
TOTAL BAYWOOD ELEMENTARY													**$ 4,729,931**	**$ 4,617,713**	**$ 7,519,369**	**$ 7,252,181**
Beresford Elementary School	Campus has A/C throughout but equipment is AGED															
Replace H/V unit with AC		2	$ 90,000	$ -	$ 9,000	$ 2,500	$101,500	$ 203,000	$ 117,000	$ 320,000	$ 72,000	$ 64,000	$ 573,000	$ 573,000	$ 573,000	$ 573,000
Filtration		21	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 52,500	$ -	$ 52,500	$ 11,813	$ 10,500	$ 74,813	$ 74,813	$ 74,813	$ 74,813
TOTAL BERESFORD ELEMENTARY													**$ 647,813**	**$ 647,813**	**$ 647,813**	**$ 647,813**

Description	Fuel Source	No. of Units	Cost per Unit					Mech+Arch Cost (Campus-wide)	Electrical Cost (Campus-wide)	Sub-contractor Cost	General Contractor Mark-up (22.5%)	Design Contingency	Total Construction Cost			
			HVAC Unit	Ductwork	Control	Architectural	Total per unit				22.50%	20.00%	Option 1A	**Option 1B**	Option 2A	Option 2B
Brewer Island Elementary School																
Filtration		43	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 107,500	$ -	$ 107,500	$ 24,188	$ 21,500	$ 153,188	$ 153,188	$ 153,188	$ 153,188
														$ 153,188	**$ 153,188**	**$ 153,188**	**$ 153,188**
College Park Elementary School																
A/C Addition (currently no A/C)																
In-classroom furnace with A/C coil	Gas/Elec	20	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,265,000	$ 1,580,000	$ 2,845,000	$ 640,125	$ 569,000	$ 4,054,125			
In-classroom heat pump	Electric	20	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,265,000	$ 1,495,000	$ 2,760,000	$ 621,000	$ 552,000		$ 3,933,000		
Rooftop packaged HVAC unit	Gas/Elec	20	$ 60,000	$ 11,250	$ 9,000	$ 50,500	$130,750	$ 2,615,000	$ 1,580,000	$ 4,195,000	$ 943,875	$ 839,000			$ 5,977,875	
Rooftop packaged HVAC unit	Electric	20	$ 56,250	$ 11,250	$ 9,000	$ 50,500	$127,000	$ 2,540,000	$ 1,495,000	$ 4,035,000	$ 907,875	$ 807,000				$ 5,749,875
Filtration		28	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 70,000	$ -	$ 70,000	$ 15,750	$ 14,000	$ 99,750	$ 99,750	$ 99,750	$ 99,750
	VRF	1	$ 30,000	$ -	$ -	$ -	$ 30,000	$ 30,000	$ -	$ 30,000	$ 6,750	$ 6,000	$ 42,750	$ 42,750	$ 42,750	$ 42,750
TOTAL COLLEGE PARK ELEMENTARY													**$ 4,196,625**	**$ 4,075,500**	**$ 6,120,375**	**$ 5,892,375**
Fiesta Gardens School Campus is all air-conditioned																
Filtration		27	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 67,500	$ -	$ 67,500	$ 15,188	$ 13,500	$ 96,188	$ 96,188	$ 96,188	$ 96,188
	VRF	1	$ 30,000	$ -	$ 9,000	$ -	$ 39,000	$ 39,000	$ -	$ 39,000	$ 8,775	$ 7,800	$ 55,575	$ 55,575	$ 55,575	$ 55,575
TOTAL FIESTA GARDENS ELEMENTARY													**$ 151,763**	**$ 151,763**	**$ 151,763**	**$ 151,763**
Foster City Elementary School (No Budget in FMP for adding AC on this site)																
A/C Addition (currently no A/C)																
In-classroom furnace with A/C coil	Gas/Elec	30	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,897,500	$ 1,720,000	$ 3,617,500	$ 813,938	$ 723,500	$ 5,154,938			
In-classroom heat pump	Electric	30	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,897,500	$ 1,675,000	$ 3,572,500	$ 803,813	$ 714,500		$ 5,090,813		
Rooftop packaged HVAC unit	Gas/Elec	NOT APPLICABLE. FLAT ROOF AREAS ARE LIMITED, WITHOUT ENOUGH SPACE FOR ROOFTOP HVAC PACKAGED UNITS													$ -	
Rooftop packaged HVAC unit	Electric															$ -
In-classroom VRF (Variable Refrigerant Flow) unit	Electric	30	$ 36,375	$ 15,000	$ 5,000	$ 13,500	$ 69,875	$ 2,096,250	$ 1,675,000	$ 3,771,250	$ 848,531	$ 754,250			$ 5,374,031	$ 5,374,031
												$ -				
Filtration		42	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 105,000	$ -	$ 105,000	$ 23,625	$ 21,000	$ 149,625	$ 149,625		
	VRF	1	$ 30,000	$ -	$ 9,000	$ -	$ 39,000	$ 39,000	$ -	$ 39,000	$ 8,775	$ 7,800	$ 55,575	$ 55,575		
TOTAL FOSTER CITY ELEMENTARY													**$ 5,360,138**	**$ 5,296,013**	**n/a**	**n/a**

Description	Fuel Source	No. of Units	Cost per Unit					Mech+Arch Cost (Campus-wide)	Electrical Cost (Campus-wide)	Sub-contractor Cost	General Contractor Mark-up (22.5%)	Design Contingency	Total Construction Cost			
			HVAC Unit	Ductwork	Control	Architectural	Total per unit				22.50%	20.00%	Option 1A	**Option 1B**	Option 2A	Option 2B
George Hall Elementary School New MPR is being planned																
A/C Addition (currently no A/C)																
In-classroom furnace with A/C coil	Gas/Elec	25	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,581,250	$ 1,468,750	$ 3,050,000	$ 686,250	$ 610,000	$ 4,346,250			
In-classroom heat pump	Electric	25	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,581,250	$ 1,401,250	$ 2,982,500	$ 671,063	$ 596,500		$ 4,250,063		
Rooftop packaged HVAC unit	Gas/Elec	25	$ 60,000	$ 11,250	$ 9,000	$ 50,500	$130,750	$ 3,268,750	$ 1,468,750	$ 4,737,500	$ 1,065,938	$ 947,500			$ 6,750,938	
Rooftop packaged HVAC unit	Electric	25	$ 56,250	$ 11,250	$ 9,000	$ 50,500	$127,000	$ 3,175,000	$ 1,401,250	$ 4,576,250	$ 1,029,656	$ 915,250				$ 6,521,156
In-classroom heat pump	Electric	25	$ 27,500	$ 2,500		$ 13,500	$ 43,500	$ 1,087,500	$ 1,401,250	$ 2,488,750	$ 559,969	$ 497,750				
Filtration		40	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 100,000	$ -	$ 100,000	$ 22,500	$ 20,000	$ 142,500	$ 142,500	$ 142,500	$ 142,500
TOTAL GEORGE HALL ELEMENTARY													**$ 4,488,750**	**$ 4,392,563**	**$ 6,893,438**	**$ 6,663,656**
Highlands Elementary School Campus has A/C throughout but equipment is AGED; New MPR is being planned																
Filtration		35	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 87,500	$ -	$ 87,500	$ 19,688	$ 17,500	$ 124,688	$ 124,688	$ 124,688	$ 124,688
TOTAL HIGHLANDS ELEMENTARY													**$ 124,688**	**$ 124,688**	**$ 124,688**	**$ 124,688**
Laurel Elementary School																
A/C Addition (currently no A/C)																
In-classroom furnace with A/C coil	Gas/Elec	18	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,138,500	$ 1,475,000	$ 2,613,500	$ 588,038	$ 522,700	$ 3,724,238			
In-classroom heat pump	Electric	18	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,138,500	$ 1,412,750	$ 2,551,250	$ 574,031	$ 510,250		$ 3,635,531		
Rooftop packaged HVAC unit	Gas/Elec	18	$ 60,000	$ 11,250	$ 9,000	$ 50,500	$130,750	$ 2,353,500	$ 1,475,000	$ 3,828,500	$ 861,413	$ 765,700			$ 5,455,613	
Rooftop packaged HVAC unit	Electric	18	$ 56,250	$ 11,250	$ 9,000	$ 50,500	$127,000	$ 2,286,000	$ 1,412,750	$ 3,698,750	$ 832,219	$ 739,750				$ 5,270,719
Filtration		33	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 82,500	$ -	$ 82,500	$ 18,563	$ 16,500	$ 117,563	$ 117,563	$ 117,563	$ 117,563
TOTAL LAUREL ELEMENTARY													**$ 3,841,800**	**$ 3,753,094**	**$ 5,573,175**	**$ 5,388,281**
LEAD Elementary School (formerly Horrall)																
A/C Addition (currently no A/C)																
In-classroom furnace with A/C coil	Gas/Elec	23	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,454,750	$ 1,535,000	$ 2,989,750	$ 672,694	$ 597,950	$ 4,260,394			
In-classroom heat pump	Electric	23	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,454,750	$ 1,428,750	$ 2,883,500	$ 648,788	$ 576,700		$ 4,108,988		
Rooftop packaged HVAC unit	Gas/Elec	NOT APPLICABLE. ROOF IS TOO STEEP FOR ROOFTOP HVAC PACKAGED UNITS													$ -	
Rooftop packaged HVAC unit	Electric															$ -
In-classroom VRF (Variable Refrigerant Flow) unit	Electric	23	$ 36,375	$ 15,000	$ 5,000	$ 13,500	$ 69,875	$ 1,607,125	$ 1,428,750	$ 3,035,875	$ 683,072	$ 607,175			$ 4,326,122	$ 4,326,122
Filtration		42	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 105,000	$ -	$ 105,000	$ 23,625	$ 21,000	$ 149,625	$ 149,625	$ 149,625	$ 149,625
TOTAL LEAD ELEMENTARY													**$ 4,410,019**	**$ 4,258,613**	**$ 4,475,747**	**$ 4,475,748**

Description	Fuel Source	No. of Units	Cost per Unit					Mech+Arch Cost (Campus-wide)	Electrical Cost (Campus-wide)	Sub-contractor Cost	General Contractor Mark-up (22.5%)	Design Contingency	Total Construction Cost			
			HVAC Unit	Ductwork	Control	Architectural	Total per unit				22.50%	20.00%	Option 1A	**Option 1B**	Option 2A	Option 2B

Meadow Heights Elementary Sc New MPR is being planned

A/C Addition (currently no A/C)

In-classroom furnace with A/C coil	Gas/Elec	20	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,265,000	$ 821,250	$ 2,086,250	$ 469,406	$ 417,250	$ 2,972,906			
In-classroom heat pump	Electric	20	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,265,000	$ 1,292,500	$ 2,557,500	$ 575,438	$ 511,500		$ 3,644,438		
Rooftop packaged HVAC unit	Gas/Elec	20	$ 60,000	$ 11,250	$ 9,000	$ 50,500	$130,750	$ 2,615,000	$ 821,250	$ 3,436,250	$ 773,156	$ 687,250			$ 4,896,656	
Rooftop packaged HVAC unit	Electric	20	$ 56,250	$ 11,250	$ 9,000	$ 50,500	$127,000	$ 2,540,000	$ 1,292,500	$ 3,832,500	$ 862,313	$ 766,500				$ 5,461,313
Filtration		26	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 65,000	$ -	$ 65,000	$ 14,625	$ 13,000	$ 92,625	$ 92,625	$ 92,625	$ 92,625

TOTAL MEADOW HEIGHTS ELEMENTARY **$ 3,065,531 $ 3,737,063 $ 4,989,281 $ 5,553,938**

North Shoreview Montessori School

A/C Addition (currently no A/C)

In-classroom furnace with A/C coil	Gas/Elec	21	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,328,250	$ 990,000	$ 2,318,250	$ 521,606	$ 463,650	$ 3,303,506			
In-classroom heat pump	Electric	21	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,328,250	$ 1,341,250	$ 2,669,500	$ 600,638	$ 533,900		$ 3,804,038		
Rooftop packaged HVAC unit	Gas/Elec	21	$ 60,000	$ 11,250	$ 9,000	$ 50,500	$130,750	$ 2,745,750	$ 990,000	$ 3,735,750	$ 840,544	$ 747,150			$ 5,323,444	
Rooftop packaged HVAC unit	Electric	21	$ 56,250	$ 11,250	$ 9,000	$ 50,500	$127,000	$ 2,667,000	$ 1,341,250	$ 4,008,250	$ 901,856	$ 801,650				$ 5,711,756

HVAC Replacement

Replace Rooftop Units		2	$ 35,000	$ -	$ 2,500	$ 2,500	$ 40,000	$ 80,000	$ 6,000	$ 86,000	$ 19,350	$ 17,200	$ 128,550	$ 128,550	$ 128,550	$ 128,550
Replace Library Units		2	$ 29,750	$ 15,000	$ 2,500	$ 2,500	$ 49,750	$ 99,500	$ 6,000	$ 105,500	$ 23,738	$ 21,100	$ 156,338	$ 156,338	$ 156,338	$ 156,338
Replace Bard Units		1	$ 20,000	$ -	$ 2,500	$ 1,500	$ 24,000	$ 20,000	$ 3,000	$ 23,000	$ 5,175	$ 4,600	$ 35,775	$ 35,775	$ 35,775	$ 35,775
Filtration		26	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 65,000	$ -	$ 65,000	$ 14,625	$ 13,000	$ 92,625	$ 92,625	$ 92,625	$ 92,625

TOTAL NORTH SHOREVIEW ELEMENTARY **$ 3,716,794 $ 4,217,325 $ 5,736,731 $ 6,125,044**

Parkside Elementary School

A/C Addition (currently no A/C)

In-classroom furnace with A/C coil	Gas/Elec	20	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,265,000	$ 1,493,750	$ 2,758,750	$ 620,719	$ 551,750	$ 3,931,219			
In-classroom heat pump	Electric	20	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 1,265,000	$ 1,428,750	$ 2,693,750	$ 606,094	$ 538,750		$ 3,838,594		
Rooftop packaged HVAC unit	Gas/Elec	20	$ 60,000	$ 11,250	$ 9,000	$ 50,500	$130,750	$ 2,615,000	$ 1,493,750	$ 4,108,750	$ 924,469	$ 821,750			$ 5,854,969	
Rooftop packaged HVAC unit	Electric	20	$ 56,250	$ 11,250	$ 9,000	$ 50,500	$127,000	$ 2,540,000	$ 1,428,750	$ 3,968,750	$ 892,969	$ 793,750				$ 5,655,469

HVAC Replacement

Replace Rooftop Units		4	$ 35,000	$ -	$ 2,500	$ 2,500	$ 40,000	$ 160,000	$ 12,000	$ 172,000	$ 38,700	$ 34,400	$ 257,100	$ 257,100	$ 257,100	$ 257,100
Replace Library Units		1	$ 29,750	$ 15,000	$ 2,500	$ 2,500	$ 49,750	$ 49,750	$ 3,000	$ 52,750	$ 11,869	$ 10,550	$ 78,169	$ 78,169	$ 78,169	$ 78,169
Replace Bard Units		8	$ 20,000	$ -	$ 2,500	$ 2,500	$ 25,000	$ 200,000	$ 24,000	$ 224,000	$ 50,400	$ 44,800	$ 343,200	$ 343,200	$ 343,200	$ 343,200
Filtration		33	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 82,500	$ -	$ 82,500	$ 18,563	$ 16,500	$ 117,563	$ 117,563	$ 117,563	$ 117,563

TOTAL PARKSIDE ELEMENTARY **$ 4,727,250 $ 4,634,625 $ 6,651,000 $ 6,451,500**

Description	Fuel Source	No. of Units	Cost per Unit					Mech+Arch Cost (Campus-wide)	Electrical Cost (Campus-wide)	Sub-contractor Cost	General Contractor Mark-up (22.5%)	Design Contingency	Total Construction Cost			
			HVAC Unit	Ductwork	Control	Architectural	Total per unit				22.50%	20.00%	Option 1A	**Option 1B**	Option 2A	Option 2B
San Mateo Park Elementary School																
A/C Addition (currently no A/C)																
In-classroom furnace with A/C coil	Gas/Elec	2	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 126,500	$ 1,371,250	$ 1,497,750	$ 336,994	$ 299,550	$ 2,134,294			
In-classroom heat pump	Electric	2	$ 29,750	$ 15,000	$ 5,000	$ 13,500	$ 63,250	$ 126,500	$ 1,296,250	$ 1,422,750	$ 320,119	$ 284,550		$ 2,027,419		
Rooftop packaged HVAC unit	Gas/Elec	2	$ 60,000	$ 11,250	$ 9,000	$ 50,500	$130,750	$ 261,500	$ 1,371,250	$ 1,632,750	$ 367,369	$ 326,550			$ 2,326,669	
Rooftop packaged HVAC unit	Electric	2	$ 56,250	$ 11,250	$ 9,000	$ 50,500	$127,000	$ 254,000	$ 1,296,250	$ 1,550,250	$ 348,806	$ 310,050				$ 2,209,106
HVAC Replacement																
Replace Rooftop Units		2	$ 45,000	$ -	$ 2,500	$ 2,500	$ 50,000	$ 100,000	$ 6,000	$ 106,000	$ 23,850	$ 21,200	$ 157,050	$ 157,050	$ 157,050	$ 157,050
Replace RTU with DOAS +VRF		6	$ 90,000	$ 18,000	$ 9,000	$ 12,000	$129,000	$ 774,000	$ 160,000	$ 934,000	$ 210,150	$ 186,800	$ 1,490,950	$ 1,490,950	$ 1,490,950	$ 1,490,950
Replace Bard Units		5	$ 20,000	$ -	$ 2,500	$ 1,500	$ 24,000	$ 120,000	$ 15,000	$ 135,000	$ 30,375	$ 27,000	$ 207,375	$ 207,375	$ 207,375	$ 207,375
Filtration		15	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 37,500	$ -	$ 37,500	$ 8,438	$ 7,500	$ 53,438	$ 53,438	$ 53,438	$ 53,438
	VRF	1	$ 30,000	$ -	$ 9,000	$ -	$ 39,000	$ 39,000	$ -	$ 39,000	$ 8,775	$ 7,800	$ 55,575	$ 55,575	$ 55,575	$ 55,575
TOTAL SAN MATEO PARK ELEMENTARY													**$ 4,098,681**	**$ 3,991,806**	**$ 4,291,056**	**$ 4,173,494**
Sunnybrae Elementary School ALL AC but AGED and mostly BARD Units																
Filtration		42	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 105,000	$ -	$ 105,000	$ 23,625	$ 21,000	$ 149,625	$ 149,625	$ 149,625	$ 149,625
TOTAL SUNNYBRAE ELEMENTARY													**$ 149,625**	**$ 149,625**	**$ 149,625**	**$ 149,625**
Turnbull Children's Center ALL AC but AIRDALE UNITS																
Filtration		18	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 45,000	$ -	$ 45,000	$ 10,125	$ 9,000	$ 64,125	$ 64,125	$ 64,125	$ 64,125
TOTAL TURNBULL CHILDREN'S CENTER													**$ 64,125**	**$ 64,125**	**$ 64,125**	**$ 64,125**
District Office ALL AC but AGED																
Filtration		16	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 40,000	$ -	$ 40,000	$ 9,000	$ 8,000	$ 57,000	$ 57,000	$ 57,000	$ 57,000
TOTAL DISTRICT OFFICE													**$ 57,000**	**$ 57,000**	**$ 57,000**	**$ 57,000**
M&O Warehouse ALL AC, main unit aged (not sure it is permitted), but no Ventilation (fresh air) in any units.																
Filtration		1	$ 2,500	$ -	$ -	$ -	$ 2,500	$ 2,500	$ -	$ 2,500	$ 563	$ 500	$ 3,563	$ 3,563	$ 3,563	$ 3,563
TOTAL M&O WAREHOUSE													**$ 3,563**	**$ 3,563**	**$ 3,563**	**$ 3,563**

Description	Fuel Source	No. of Units	Cost per Unit					Mech+Arch Cost (Campus-wide)	Electrical Cost (Campus-wide)	Sub-contractor Cost	General Contractor Mark-up (22.5%)	Design Contingency	Total Construction Cost			
			HVAC Unit	Ductwork	Control	Architectural	Total per unit				22.50%	20.00%	Option 1A	**Option 1B**	Option 2A	Option 2B
TOTAL ALL CAMPUSES													**$ 69,454,175**	**$ 69,335,188**	**$ 89,643,219**	**$ 88,473,295**

FACILITY MASTER PLAN BUDGET

Description	Line No.															
HVAC - Upgrade / Replace	27A															$ 16,244,600
HVAC - Testing / Balancing	17B															$ 180,000
HVAC - Add A/C with Filtration	28A															$ 48,664,000
HVAC - Add Filtration at Existing HVAC	28B															$ 10,397,300
Upgrade Electrical Site Service (MS)	17A															$ 5,760,000
Upgrade Electrical Site Service (ES)	17A															$ 11,220,000
Upgrade Electrical Distributions	17B															$ 5,478,300
Less Electrical Cost for George Hall ES																$ (275,100)
Less HVAC, Air Filtration and Electrical Costs for Bowditch MS																$ (2,526,200)
Total FMP Budget													**95,142,900**	**95,142,900**	**95,142,900**	**95,142,900**
DIFFERENCE													**$ 25,688,725**	**$ 25,807,713**	**$ 5,499,681**	**$ 6,669,605**

PART VI

APPENDICES