

Appendix F

Army Reports on Barracks Construction Standards

The CD placed in the back inside cover contains the following two Army reports on barracks construction standards:

- ◆ NAHB Research Center, Inc., *Comparison of Life Cycle Costs of UEPH at Fort George G. Meade and Fort Detrick*, prepared for the Assistant Chief of Staff for Installation Management, August 12, 2004.
- ◆ Applied Research Associates Inc., *Progressive Collapse Analysis of the Replacement Barracks, Ft. Meade, Maryland—Final Report*, prepared for the U.S. Army Corps of Engineers Protective Design Center, August 2003.

**COMPARISON OF LIFE CYCLE COSTS
OF UEPH
AT FORT GEORGE G. MEADE AND
FORT DETRICK**

Prepared for
Assistant Chief of Staff
Installation Management
Army Housing Division
Unaccompanied Personnel Housing
Alexandria, Virginia

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400 Prince George's Boulevard
Upper Marlboro, MD 20774-8731

August 12, 2004

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COMPARISON OF LIFE CYCLE COSTS OF UEPH AT FORT GEORGE G. MEADE AND FORT DETRICK

INTRODUCTION

This document reports on a study that compares the Life Cycle Costs of two barracks projects built using alternative construction methods. One set of barracks, located at Fort Detrick, Maryland, was constructed using traditional barracks approach - masonry and steel framing. The other set of buildings, on Fort George G. Meade, Maryland, was built using light wood-frame construction, typically associated with private sector apartment construction.

The Fort Detrick barracks project is composed of 5 barracks buildings, each with 48 residence spaces/bedrooms, plus a soldiers' community center. The barracks and center account for 89,498 square feet of construction. The barracks account for 74,880 square feet of floor area, the community center accounts for 14,618 square feet.

The Fort Meade barracks project is composed of 8 barracks buildings, each with 72 rooms, plus a soldiers' community center. Together the barracks and center account for 215,785 square feet - 210,176 square feet of barracks and 5,609 for a community center.

The purpose of the study was to assess the nature of cost differences between the two approaches. For the purpose of this study, the costs were assumed to consist of the initial cost of construction, subsequent maintenance and repair costs throughout the next forty years of the life of the buildings and any salvage costs at the conclusion of the forty years. The expense of operating the buildings including such items as utilities and salaries of operational staff were assumed to be equal for both types of construction and thus were omitted from the study.

METHODOLOGY

The Replacement Reserve Report (RRR) was employed to assess the physical condition and the maintenance and future capital requirements of the barracks. The highly regarded RRR has been inspecting properties and providing physical and financial needs analysis since 1983, and their experience is primarily with condominium and apartment complexes.

RRR staff visited Fort Meade on June 9th 2004 and Fort Detrick on June 10th 2004. The details of the findings can be found in separate reports on each installation contained in Appendix A (Fort Detrick) and B (Fort Meade) to this report. The inspections and analyses resulted in specific year-by-year recommendations for preventive maintenance, maintenance and capital improvements over a forty-year horizon for each of the barracks projects.

Subsequently, this data were entered into a life-cycle model along with initial construction costs and salvage value. The details of the resultant analysis are presented in Appendices C and D of this report. Fort Detrick is in Appendix C and Fort Meade is in Appendix D.

FINDINGS

The Net Present Value of the costs to construct and maintain the two barracks project for 40 years are presented in the following table. While the NPV of Fort Meade's barracks exceeds that of Fort Detrick overall, the cost per bedroom and per square foot are less than Fort Detrick's.

	Fort Detrick	Fort Meade
Total Present Value (PV) of Construction Cost	\$13,034,980	\$19,585,007
Per Bedroom	\$54,312	\$34,002
Per Square Foot	\$145.65	\$90.76
Total PV of PM, Maint, and Capital Improvements	\$4,209,827	\$4,557,448
Per Bedroom	\$17,541	\$7,912
Per Square Foot	\$47.04	\$21.12
Total Present Value of 40 Year Life Cycle Cost	\$17,244,808	\$24,142,455
Per Bedroom	\$71,853	\$41,914
Per Square Foot	\$192.68	\$111.88

ASSUMPTIONS

The life cycle model used a real or constant dollar approach. This means that the effects of inflation are not part of the model and that costs are in terms of a constant purchasing power (2004 dollars). OMB Circular A94 Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Program states: "Future inflation is highly uncertain. Analysts should avoid having to make an assumption about the general rate of inflation whenever possible." Given that the RRR produced cost estimates in terms of currently prevailing prices, without reference to the effect of inflation, prudence required that a real dollar approach be adopted. Appendix C of OMB A94, revised February 2004, prescribes a 3.5 percent discount rate for real analysis of 30 years or more in length.

The life of the barracks was assumed to be 100 years. In conjunction with this, the life cycle computations entailed straight-line depreciation for 40 years so that a 60 percent salvage value (discounted to 2004 values) for each of the projects was assumed. A brief sensitivity analysis, in which the life span of the Fort Meade barracks was assumed to be 40 years, was conducted. The overall costs rose to \$19,298,245, but the square foot cost and the per bedroom costs (\$48,869 and \$130) remained well below that of Detrick's

The Detrick barracks are older than those at Meade. They were built in 1998 whereas the Meade project was built in 2003. This analysis ignores the cost of preventive maintenance, maintenance and capital costs occurring before 2005. Since the Fort Detrick project is older, this is not likely to change the outcome in terms of which alternative costs more.

APPENDIX A



THE REPLACEMENT RESERVE REPORT

CONDOMINIUMS

FEDERAL
&
STATE
ASSISTED
HOUSING

SPECIAL USE
PROPERTIES

RESORT
PROPERTIES

PREPARED FOR

FORT DETRICK UEPH BARRACKS

CAPITAL NEEDS ANALYSIS
LIFE CYCLE COSTS

LOCATED IN
FORT DETRICK, MARYLAND

JUNE 10, 2004



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THE REPLACEMENT RESERVE REPORT

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June 10, 2004

Mr. Phillip Davis
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400 Prince George Blvd..
Upper Marlboro, MD 20772

RE: FORT DETRICK UEPH BARRACKS

Dear Mr. Davis,

It is my pleasure to present you with the enclosed **REPLACEMENT RESERVE REPORT** for the **FORT DETRICK UEPH BARRACKS**.

The observations and recommendations noted in the report have been made only after close inspection and evaluation of the property components.

Thank you for the opportunity to prepare this analysis for you. I trust it will become a valuable aid and assist you in your property management endeavors and decisions.

Please do not hesitate to contact me with any questions or comments.

Very truly yours,

Charles J. Stuart, CPM

FIELD OFFICES:

BOSTON, MA
VIRGINIA BEACH, VA

The **FORT DETRICK UEPH BARRACKS** contains 240 bedrooms in 5 buildings. The development is six years of age, and is improved with a recreational building. The property employs a property management staff that administers day to day business affairs.

MISSION STATEMENT

The scope and purpose of this analysis is to provide a Capital Needs Analysis with 20 year projections, and, as part of this process, develop Life Cycle Costs to a period of 40 years. The client will utilize the information as part of an analysis that determines the highest and best practices in the development of UEPH type barracks. Accordingly, the reader may encounter references or discussions that compares the Fort Detrick barracks to barracks located at Fort Meade. The locations represent two different construction types and applications of products. As a housing unit, both barracks have similarities in enhancements and size. During our site inspections, a third objective was discussed to include desirability, leasing, and retention. An in-depth discussion begins on Page 22.

The methodology used in determining capital needs is two-fold. First, to perform an analysis regarding current physical conditions, which, through non-invasive observations and our experience in such matters, would indicate the probable remaining life of the property components. Second, the report will suggest the costs associated with capital repair and replacement over the next twenty-year period. As a product of these two functions, the report will also comment on observations made, the level of proficiency in maintaining the physical plant, deferred and preventative maintenance, and any possible life extension of the components.

When interpreting this report, the value of time should be considered. As a twenty-year period is a probable scenario based on our experiences, it is open to influences from many sources such as maintenance levels, economics, inflation of expenses, and the environment in which the property exists. Accordingly, give particular attention to suggested capital expenses during the next five-year period.

The observations made during the field inspections of **June 10, 2004** indicated that the level of service to the components is at a reasonable level. A capsule of components exhibiting liabilities, obsolescence, or deferred maintenance follows.

LIABILITIES

This report is not intended as a loss or risk assessment, however, it will comment on possible liabilities that may present a financial risk to our client. The reader will note several areas of concern explained within the text of the report.

OBSOLESCENCE

Within the text of the physical plant report pages the reader will note areas that indicate either functional or economic obsolescence. All obsolescence should be considered curable.

DEFERRED MAINTENANCE

It is obvious, in our professional opinion, that the property has maintained a responsible degree of maintenance. Given this history of operations, we did not observe, and would not expect to observe, intentionally deferred maintenance. This report suggests additional levels as an enhancement only. The subject property has a chronological age of improvements of **6 years**. In our professional opinion, the *effective age* for the improvements, enmasse, is slightly accelerated at approximately **7 years**.

FUTURE FINANCIAL REQUIREMENTS

Our process of projecting future financial needs is presented through two methods;

We see **minimum funding** requirements as meeting anticipated expenses, or, dedicating cash in/cash out with inflation and interest income over the projected period. **The Fort Detrick annual funding to meet future expenses is \$160,000 per year.**

Our second method of projecting reserve funding includes long term segregating of each site component. This rate is based on funding attrition of the components as they age, encompassing all components based on remaining use life, regardless of when actual expense may occur. This is considered the **maximum funding** level. **The Fort Detrick annual funding to meet a fully funded reserve is \$190,000 per year.**

All projections are considered dependent on low inflation rates, annual interest income, and reasonably professional property management.

	Fort Meade	\$/Bedroom
Capital Needs min. annual funding; \$150,000		\$260.42
Capital Needs max. annual funding; \$275,000		\$477.43
Life cycle costs total-40 year		\$16,191.00
Fort Detrick		
Capital Needs min. annual funding; \$160,000		\$666.67
Capital Needs max. annual funding; \$190,000		\$792.00
Life cycle costs total-40 year		\$32,601.00

To address two primary goals, this summary includes the chart above, showing the reserve rates and life cycle costs to be 2 to 3 times greater at Fort Detrick, than at Fort Meade. This is a permanent condition relative to the architecture, unit density, building products, and proficiency in construction. The reader will find a supplemental cost comparison in the Appendix section of this report.

HOW TO INTERPRET THIS DATA

The Project Profile: Each of the property components receives a capsule look at “*Effective Age*” and probable remaining use life. Effective Age is determined by original product quality, maintenance and preventative maintenance received during the in-service period, and related actual wear and tear. The capsule continues with a checklist of conditions that may be of particular interest to the reader.

	ORIGINAL LIFE	CHRONOLOGICAL AGE	EFFECTIVE AGE	USE LIFE YEARS
ASPHALT	25	15	10	15
ROOFING	20	15	17	6

SUMMARY

**DEFERRED MAINTENANCE:
OBSOLESCENCE:**

Observed conditions requiring maintenance considered to have been intentionally deferred. Economic obsolescence is used to describe worn out components. Functional obsolescence describes out-dated components or in utility.

**LIFE EXTENSION:
ALTERNATIVES:**

Functions suggested to extend component use life. New or better adapted products.

**COMMENTS
OBSERVATIONS
PREVENTATIVE
MAINTENANCE
&
SUGGESTIONS:**

Describes conditions observed, remaining use life, product specifications, and eventual timing and cost associated with replacement.

Each component receives a narrative of critical analysis, and a description of how funding and expenses are based, then recapped in the following format. This information is incorporated into the cash flow charts.

							INVENTORY & COST ANALYSIS
	QUANTITY	UNIT	UNIT VALUE	TOTAL VALUE	USE LIFE	CONSTANT SEGREGATED FUNDING	ACTUAL CASH EXPENSE & YEAR (S)
ASPHALT	1	LS	\$20,000	\$20,000	20	\$1,000 per year	\$0.00
TILE	100	SF	\$40.00	\$4,000	10	\$400 years 1-10	\$4,000 year 11

Two Types of Funding, and the Cash Flow Charts

Segregated Funding is the long-term reserve rate for each component over its useful life. Funding is established to coincide with attrition. The collective sum of all components’ segregated reserve builds the “maximum” funding level.

Dedicated or Actual Expense describes the use of existing or future funds for a planned expenditure. The collective sum of cash in / cash out builds the “minimum” suggested level of funding.

In both scenarios, the cash flow charts include current reserve balances, the impact of the current reserve rate, and a suggested rate to meet both levels of funding.

An Overview of Life Cycle Costs

Life Cycle Costing is the mathematical process of testing and evaluating products and building methods. Each of the components in this report includes a grid for probable preventative maintenance, operating maintenance, and capital expense during the next 40 years. The owner/operator analyst will be able to adjust the grid with original placement costs and actual operating costs over time. Formulas for various tests are located in the Appendix section of this report.

PHYSICAL PLANT REPORT
SITE IMPROVEMENTS I

GENERAL SITE CONDITIONS	LIFE SPAN			
	ORIGINAL LIFE	CHRONOLOGICAL AGE	EFFECTIVE AGE	USE LIFE YEARS
	50+	6	6	40+

	SUMMARY
DEFERRED MAINTENANCE:	None; services have been performed as needed.
OBSOLESCENCE:	None at this time.
LIFE EXTENSION:	Continue inspection services to identify maintenance needs.
ALTERNATIVES:	The current improvements are modern and appropriate.
COMMENTS	<i>Site conditions</i> are for discussion purposes only, without being included in financial projections. Conditions are relative and draw a correlation to the quality and methods applied to the building process and betterments.
OBSERVATIONS	The site is maturing with established planter beds and trees. There are no severe indications of soil erosion or loss within the plantings. Tree trimming will be an issue in the near future, as will the build up of some planter beds. Planter beds should observe weep hole locations. Concrete walkways would benefit from periodic applications of concrete surface sealer/hardener. Sporadic locations of surface spalling exist.
PREVENTATIVE MAINTENANCE & SUGGESTIONS:	Management should examine light levels closely in darkness and determine if sidewalk lighting is sufficient. Most site improvements are in good conditions. Post lights and fence will require periodic applications of film coat, as will signs and items of detail.

PROPERTY PHOTOS



INVENTORY & COST ANALYSIS

CAPITAL NEEDS	QUANTITY	UNIT	UNIT COST	TOTAL COST	USE LIFE	CONSTANT SEGREGATED FUNDING	ACTUAL CASH EXPENSE & YEAR
EXAMINING 20 YEARS EXAMPLE; SIDEWALKS	7,250	SF	\$5.50	\$39,875	50	\$798 per year	0.00

LIFE CYCLE COSTS	PREVENTATIVE MAINTENANCE	MAINTENANCE FUNCTIONS	CAPITAL COSTS	DISPOSAL
EXAMINING 40 YEARS EXAMPLE; SIDEWALKS	\$1,813 years 2, 7, 12, 17	\$1,000 years 5, 10, 15, 20, 25, 30, 35		

PHYSICAL PLANT REPORT
BUILDING ENVELOPE & IMPROVEMENTS I

	LIFE SPAN			
	ORIGINAL LIFE	CHRONOLOGICAL AGE	EFFECTIVE AGE	USE LIFE YEARS
WINDOWS & DOORS	40	6	4	30+
BRICK ENVELOPE	100	6	4	50+

	SUMMARY
<p>DEFERRED MAINTENANCE: None; services have been provided as needed.</p> <p>OBSOLESCENCE: None at this time.</p> <p>LIFE EXTENSION: The brick envelope has minor areas of voids in caulking and mortar joints.</p> <p>ALTERNATIVES: None suggested; the current products and services are proficient.</p> <p>COMMENTS OBSERVATIONS PREVENTATIVE MAINTENANCE & SUGGESTIONS:</p>	<p><i>The windows and doors</i> are industrial grade, with heavy steel frames and reinforced thermal barrier glass. Each unit is improved with two sets of windows and two egress doors. The total inventory of lites is estimated at 1,200; with a replacement value of \$225 each; total value \$270,000. The use life is 30 years, requiring an annual reserve rate of \$9,000. The exterior doors are made of steel with an insulated filling. The heavy doors are controlled with a hydraulic door closer. Management reports residents removing the closer arm, an action that can prompt severe injury to residents. The doors are very long term components, although the closers will be stressed. A token reserve rate of \$500 per year is included for the doors, while a reserve and expense rate of \$2,500 is included for hydraulic closers. A high attrition rate is possible within the closers, with a need to adjust the reserve and expense rate. The windows are shown with a 5% attrition rate over the use term.</p> <p><i>The building envelope</i> is observed with minor issues that could result in more problematic conditions over time. Caulking or mortar joints are missing at detail transitions of fixtures and hardware. Film coat is peeling from galvanized steel window headers. Hardware is loose or adrift, requiring minor maintenance and detail. Most of the conditions allow for weather penetration into the envelope. General conditions of the envelope are excellent, with a high proficiency of perfecting each mortar course. Design issues include a CMU split faced block built into the base of decorative columns. The block is wicking moisture and water, with standing water suspected. Future maintenance needs include an extensive caulking program every 8 years. Constant touch up of the film coat over galvanized surfaces will be needed until the galvanized surfaces wear, allowing the paint to adhere. Management should try a marine product for film coat on the metal. See also Railings; with a similar film coat issue. Caulking is included for years 2, 10, & 18 at an expense \$111,000. The reserve rate is \$13,875 per year.</p>

PROPERTY PHOTOS



	INVENTORY & COST ANALYSIS						
	QUANTITY	UNIT	UNIT COST	TOTAL COST	USE LIFE	CONSTANT SEGREGATED FUNDING	ACTUAL CASH EXPENSE & YEAR
WINDOWS	1,200	EA	\$225	\$270,000	30	\$12,000 per year	\$450 per year
DOORS	300	EA	\$1,150	\$345,000	50+		
CLOSERS	300	EA	\$550	\$165,000	10		\$2,500 per year
BRICK ENVELOPE	1	L/S	\$277,500	\$277,500	20+	\$13,875 per year	\$111,000 yrs 2, 10, 18

	PREVENTATIVE MAINTENANCE	MAINTENANCE FUNCTIONS	CAPITAL COSTS	DISPOSAL
LIFE CYCLE COSTS				
WINDOWS & DOORS		\$1,000 per year	\$2,950 per year; \$270,000 year 30	\$2,400
BRICK ENVELOPE	\$111,000 years 2, 10, 18, 26, 34 (caulking cycles)	(door adjustments)	(closer & windows replacements)	

PHYSICAL PLANT REPORT

BUILDING ENVELOPE & IMPROVEMENTS II

ROOFING DECKS, RAILINGS, STAIRS	LIFE SPAN			
	ORIGINAL LIFE	CHRONOLOGICAL AGE	EFFECTIVE AGE	USE LIFE YEARS
	40+	6	5	35+
100/50	6	6/7	100+	

	SUMMARY
DEFERRED MAINTENANCE: OBsolescence: LIFE EXTENSION: ALTERNATIVES: COMMENTS OBSERVATIONS PREVENTATIVE MAINTENANCE & SUGGESTIONS:	<p>Intentional deferment is not observed.</p> <p>None at this time.</p> <p>Observe the need for occasional coatings on decks and railings.</p> <p>None suggested; the current products are industrial applications with curb appeal.</p> <p><i>The roofing surfaces</i> include standing seam anodized metal surfaces. The system includes dormer vents, ridge vents, and snow brakes. It is unknown if ice and water shield is installed, or the composition of valley materials. The current roof is usable for at least 40 years, and extending life further after applying zinc coating or other membranes. The inventory includes coverage of 76,334 square feet of surface area. Replacement costs are based on \$12.75 per square foot; \$973,259 total value, reserved over 40 years at \$24,331 per year. The long term maintenance costs include 5% of the inventory requiring finish, flashing, or panel replacement over the use term; \$1,217 per year. Actual timing of expenses will likely vary, especially prior to year 15. The color may be fading at this time, and should be assessed regularly.</p> <p><i>Decks and railings</i> include the multi-tiered concrete floor plates with heavy steel railings. The deck plates were originally sealed after construction, and due for a repeat application now. Observations include minor cracks related to shrinkage and settlement, requiring sealing to avoid water penetration and cyclic freeze thaw damage. Expenses are estimated at \$45,000 each cycle for power washing and surface sealer/hardener. Expenses should be included for every five years beginning in year 2. The annual reserve rate is \$9,000 per year. Railings are made of heavy steel, and anchored into place on the deck plate with heavy stainless steel bolts. The factory anodized surface is failing in numerous locations, and will require cyclic film coat with a quality metal paint. The scope of work will increase over time. The stairs are of similar construction with heavy steel in stringers and pouring pans. Observations include water penetration leading to rust and metal rot. Accordingly, the film coat program will need to address both components, as well as other items of detail such as window frames and entry doors, in years 2, 10, 18, 26, 34 at an expense of \$147,000 per cycle. The cycles coincide with caulking expenses described on page 7. The expense requires an annual reserve rate of \$18,375; increasing this category total to \$27,375 per year.</p>

PROPERTY PHOTOS



INVENTORY & COST ANALYSIS

ROOFING DECKS, RAILINGS, STAIRS	QUANTITY	UNIT	UNIT COST	TOTAL COST	USE LIFE	CONSTANT SEGREGATED FUNDING	ACTUAL CASH EXPENSE & YEAR
	76,334	SF	\$12.75	\$973,259	40+	\$24,331 per year	0.00
	1	L/S	\$547,500	\$547,500	40+	\$27,375 per year	

LIFE CYCLE COSTS	PREVENTATIVE MAINTENANCE	MAINTENANCE FUNCTIONS	CAPITAL COSTS	DISPOSAL
	(roof hardware)	(roof finish)		
	\$2,500 per year	\$1,217 per year		
ROOFING DECKS, RAILINGS, STAIRS	\$45,000 yrs 2,7,12,17,22,27,32,37	\$147,000 yrs 2, 10, 18, 26, 34		
	(power wash & surface seal)	(film coat)		

PHYSICAL PLANT REPORT
BUILDING ENVELOPE & IMPROVEMENTS III

	LIFE SPAN			
	ORIGINAL LIFE	CHRONOLOGICAL AGE	EFFECTIVE AGE	USE LIFE YEARS
ENVELOPE DETAIL	40	6	6	30+
SECURITY LIGHTING	40	6	6	30+
(NO GUTTERS-CONDUCTORS)				

	SUMMARY
DEFERRED MAINTENANCE:	None; services have been performed as needed.
OBSOLESCENCE:	None at this time; step nosings are approaching economic obsolescence.
LIFE EXTENSION:	Inspect and service step nosings regularly as a safety issue.
ALTERNATIVES:	None suggested; the current components are appropriate and modern.
COMMENTS	<p><i>The items of detail</i> include EIFS surfaces as decorative elevations on the upper courses, and decorative vents. Current conditions are like new without observed issues. The EIFS systems typically require renewed film coat every 8 to 10 years, or an application of pigmented product. Pricing is based on 1,250 square feet per building; 7,500 square feet total inventory, at \$4.50 per square foot, \$33,750 required in years 4, 14, 24, & 34. The reserve rate is \$3,375 per year for all years. Vents will be enhanced when serviced with the film coat. No additional costs or reserves are required for the vents.</p> <p>Each building is improved with four sets of concrete entry steps traversing ground level to the first floor deck. The decks were poured in place and improved with hand rails and steel nosings on the steps. Proficiency was lacking when setting the nosing, resulting in rusting conditions and movement. Conditions should be inspected and proven regularly. Choices are ample for retrofit products. Future needs are estimated at \$2,500 every five years, in years 2, 7, 12, 17, 22, 27, 32, & 37. The annual reserve rate is \$500 per year.</p> <p><i>The security lighting</i> is in excellent condition. The fixtures include a vandal-proof decorative fixture and lens located next to each entry door. Lighting is incandescent, without signs of heat damage or weather penetration. The 300-unit inventory is valued at \$49,500; reserved over 35 years at \$1,414 per year.</p> <p><i>The work order system</i> describes exhaust fans and mechanical motors in the attic. It is very possible that increased heat and humidity from these components will accelerate wearing conditions in numerous other products. A general observation of the utility closets such as those with the domestic hot water is that the space is extremely tight with no circulation or make up air. Conditions are possible corrosive, impacting surge protection and annunciation systems.</p>
OBSERVATIONS	
PREVENTATIVE MAINTENANCE & SUGGESTIONS:	

PROPERTY PHOTOS



INVENTORY & COST ANALYSIS

	QUANTITY	UNIT	UNIT COST	TOTAL COST	USE LIFE	CONSTANT SEGREGATED FUNDING	ACTUAL CASH EXPENSE & YEAR
ENVELOPE DETAIL	1	L/S	\$77,500	\$77,500	2+	\$3,875 per year	\$33,750 yrs 4 & 14
SECURITY LIGHTING	1	L/S	\$28,280	\$28,280	20+	\$1,414 per year	\$2,500 yrs 2, 7, 12, 17
LIFE CYCLE COSTS							
ENVELOPE DETAIL	PREVENTATIVE MAINTENANCE (EIFS maintenance) =		MAINTENANCE FUNCTIONS \$33,750 yrs 4, 14, 24, & 34			CAPITAL COSTS	DISPOSAL
SECURITY LIGHTING	(steps & stairs) =		\$2,500 yrs 2, 7, 12, 17, 22, 27, 32, & 37			\$49,500 year 36 (retrofit lighting)	

	LIFE SPAN			
	ORIGINAL LIFE	CHRONOLOGICAL AGE	EFFECTIVE AGE	USE LIFE YEARS
HEATING SYSTEMS	50	6	10	30+
DOMESTIC HOT WATER	20	6	15	1

	SUMMARY
<p>DEFERRED MAINTENANCE: None; proficient services have been provided.</p> <p>OBSOLESCENCE: None at this time.</p> <p>LIFE EXTENSION: Continue the service level with professional contractors. Continue water treatment.</p> <p>ALTERNATIVES: None suggested; the current products and applications are appropriate and modern.</p> <p>COMMENTS</p> <p>OBSERVATIONS</p> <p>PREVENTATIVE MAINTENANCE & SUGGESTIONS:</p>	<p><i>The heating system</i> includes two Smith 28A Series cast iron sectional boilers. The natural gas fired Smith boiler is a quality product capable of at least 40 year use with reasonable maintenance procedures. Follow the manufacturer's suggested maintenance plan to protect the long term warranty. Current observations indicate a need for isolation valves to protect the boilers during summer down time. Chilled water is circulating through the boilers, creating constant condensation, surface rust, and damages. The boilers supply a central hydronic system. Controls are also modern at this time; requiring retrofits in years 10 & 20 at an expense of \$5,000. The inventory value is \$68,000; reserved over 35 years at \$1,943 per year. Year 1 includes an expense of \$10,000 for new piping.</p> <p><i>The hot water systems</i> include two Weben Jarco boilers in each building. Each boiler feeds a packaged storage tank. Conditions are poor, with observations of excessive decay leading to suspect integrity. The boilers should be assessed for any warranty coverage. Controls and valves can not be relied on in emergency conditions, such as a boiler rupturing from fatigue. Replacement costs are excessive for like kind retrofit, with \$6,300 for the boiler and \$900 for the 119 gallon storage tanks. Alternatives should be explored. The current inventory value is \$86,400; replaced in two phases of years 1 & 2 of \$43,200 each. Each room should also be corrected for the lack of make up air and the condition of piping. Six rooms require \$15,000 during each of the initial phased replacement years. The annual reserve rate is shown at \$4,320 per year.</p>

PROPERTY PHOTOS



INVENTORY & COST ANALYSIS

	QUANTITY	UNIT	UNIT COST	TOTAL COST	USE LIFE	CONSTANT SEGREGATED FUNDING	ACTUAL CASH EXPENSE & YEAR
	HEATING SYSTEMS	1	L/S	\$38,860	\$38,860	1+	\$1,943 per year
DOMESTIC HOT WATER	1	L/S	\$86,400	\$86,400	0	\$4,320 per year	\$5,000 yrs 10 & 20 \$58,200 years 1 & 2

	PREVENTATIVE MAINTENANCE	MAINTENANCE FUNCTIONS	CAPITAL COSTS	DISPOSAL
LIFE CYCLE COSTS				
HEATING SYSTEMS	\$600 per year	\$7,000 years 9, 24, 39 (gaskets)	\$10,000 year 1	
DOMESTIC HOT WATER	\$3,600 per year		\$5,000 yrs 10, 20, 30	
			\$58,200 years 1 & 2	\$5,000
	(\$300 per boiler PM annual)		\$86,400 year 21	\$5,000

	LIFE SPAN			
	ORIGINAL LIFE	CHRONOLOGICAL AGE	EFFECTIVE AGE	USE LIFE YEARS
COOLING SYSTEMS	25	6	10	15+
VENTILATION	40	6	6	30+
MECHANICAL MISC.	10	1-6	1-6	4-9

	SUMMARY
DEFERRED MAINTENANCE:	None; services are performed as needed.
OBSCOLESCENCE:	Expect cyclic obsolescence within the laundry equipment.
LIFE EXTENSION:	Utilize professional contractors for service needs.
ALTERNATIVES:	Numerous manufacturers and products are available for retrofit.
COMMENTS OBSERVATIONS PREVENTATIVE MAINTENANCE & SUGGESTIONS:	<p><i>The cooling system</i> includes a central chiller, evaporator, and fan coil units in the residences. Reviewing the work order system for the past 6 years indicates that the system components have been problematic for the chiller and fan coil units. The chiller can be rebuilt every 15 years for a total use time of approx. 40 years; the evaporator is replaced without rebuilding, and the fan coil units are indefinite as long as parts are available. Expenses include \$25,000 in years 5 & 20 (and 35 for life cycle costs) in chiller rehab, and \$165,000 for the evaporator in year 20. The annual reserve rate is \$9,767 per year.</p> <p><i>The ventilation systems</i> are located in the attic. The riser type systems are improved with small motors for exhaust only, and left to the operating system for unexpected failures. Eventual modernization is addressed with a token reserve rate of \$100 per year. Replacement will be as needed as failure occurs, shown with \$1,000 per year as maintenance in Life Cycle Costs.</p> <p><i>The miscellaneous mechanical inventory</i> includes fire safety systems, fresh water pumping, and circulating hydronic systems. Each system includes related controls. The fire safety system includes full suppression with modern controls including smoke and rate of rise heat detectors tied to central annunciation and location panels. The system is located in the same utility rooms as the corroding hot water systems, and should be relocated or properly vented. There is battery back up and automatic call forwarding included with the system, and an exterior location panel. Typical costs include regular periods of enhancement to address attrition as well as modernization; \$2,500 per year with expenses of \$12,500 in years 5, 10, 15, & 20.</p> <p>Fresh water pumping systems are located in the central mechanical room; improved with large horsepower pumps. Retrofit is cyclic, included for every 5 years at \$7,500 each cyclic. The annual reserve rate is \$1,500.</p> <p>The hydronic system is a multi-pipe system, utilized throughout the year for heating and cooling with central delivery to all buildings. The system receives water treatment as preventative maintenance. Use life is at least 50 years; addressed with a token reserve rate of \$5,000 per year. The central mechanical room is proficiently finished with pipe insulation, pipe identification and flow; although allowing excessive water into the environment of the room.</p>

PROPERTY PHOTOS



INVENTORY & COST ANALYSIS

	QUANTITY	UNIT	UNIT COST	TOTAL COST	USE LIFE	CONSTANT SEGREGATED FUNDING	ACTUAL CASH EXPENSE & YEAR
COOLING SYSTEMS	1	L/S	\$195,340	\$195,340	5+	\$9,767 per year	\$25,000 (5) \$190,000 (20)
VENTILATION	1	L/S	\$2,000	\$2,000	20+	\$100 per year	0.00
MECHANICAL MISC.	1	L/S	\$380,000	\$380,000	5+	\$19,000 per year	\$12,500 yrs 5, 10, 15, 20 \$7,500 yrs 5, 10, 15, 20

LIFE CYCLE COSTS	PREVENTATIVE MAINTENANCE	MAINTENANCE FUNCTIONS	CAPITAL COSTS	DISPOSAL
COOLING SYSTEMS	\$3,500 per year (service)	\$15,000 per year (rehab & service)	\$25,000 yrs 5,20,35 \$165,000 yr 20	\$5,000
VENTILATION		(crisis replacement) \$1,000 per year		
MECHANICAL MISC.	\$25,000 per year (treatment)	\$25,000 per year (rebuilding)	\$20,000 yrs 5,10,15,20,25,30,35 (pumps & motors)	

PHYSICAL PLANT REPORT

RESIDENCE UNIT IMPROVEMENTS

FLOORING KITCHEN AND BATH DÉCOR	LIFE SPAN			
	ORIGINAL LIFE	CHRONOLOGICAL AGE	EFFECTIVE AGE	USE LIFE YEARS
	7/25/40+	1-6	1-6	0-5/20/35
	30	6	6	25+
	7	6	3	3+

	SUMMARY
<p>DEFERRED MAINTENANCE: None; services are performed as needed.</p> <p>OBSOLESCENCE: None at this time; décor is anticipated to be cyclic.</p> <p>LIFE EXTENSION: Continue the current level of service.</p> <p>ALTERNATIVES: None suggested; the products are observed with reasonable quality.</p> <p>COMMENTS OBSERVATIONS PREVENTATIVE MAINTENANCE & SUGGESTIONS:</p>	<p><i>Flooring</i> includes a composite vinyl tile in the kitchen area, ceramic tile in bathrooms, and carpeting in the bedroom and living area. The closets are also carpeted. Expected use life varies from 3 years to over 40 years, although the period can fluctuate depending on the amount of use and care/abuse. Inventory values include \$101,333 for 3,167 SY of carpeting at \$32; reserved over 7 years at \$14,476 per year. The expense is shown annually, although actual timing will likely vary. The vinyl tile is valued at \$12,480; reserved over 25 years at \$499 per year. Ceramic tile is estimated at \$52,500; requiring a reserve rate of \$1,313 per year. All of the inventory will vary in expense years, depending on turnover, accelerated damages, and availability of the units.</p> <p><i>The kitchens</i> are improved with base cabinets and stainless steel sinks, wall hung cabinets, and composite countertop. Product quality is good, allowing for a use life of up 30 years. Bath vanities include similar product quality. Estimated value is \$3,200 per unit; \$480,000 total value, reserved over 30 years at \$16,000.</p> <p><i>Decoration</i> includes painted sheet rock walls, porcelain tile bath wall, and window dressing. The painting and window dressing will require enhancement on an average 7 year cycle; valued at \$600 per unit; \$90,000 total value reserved over 7 years at \$12,857 per year. The expense is shown as an annual requirement.</p>

PROPERTY PHOTOS



FLOORING KITCHEN AND BATH DÉCOR	INVENTORY & COST ANALYSIS						
	QUANTITY	UNIT	UNIT COST	TOTAL COST	USE LIFE	CONSTANT SEGREGATED FUNDING	ACTUAL CASH EXPENSE & YEAR
	1	L/S	\$325,760	\$325,760	1-20	\$16,288 per year	\$14,476 per year
	1	L/S	\$320,000	\$320,000	20+	\$16,000 per year	
	1	L/S	\$257,140	\$257,140	1-20+	\$12,857 per year	\$12,857 per year

LIFE CYCLE COSTS	PREVENTATIVE MAINTENANCE	MAINTENANCE FUNCTIONS	CAPITAL COSTS	DISPOSAL
FLOORING		\$1,350 per year (contract cleaning)	\$14,476 per yr; \$12,480 yr 26 (cyclic replacement)	\$1,000
KITCHEN AND BATH DÉCOR			\$480,000 year 31 \$12,857 per year	\$10,000

PHYSICAL PLANT REPORT

RECREATION & SERVICE BUILDING

	LIFE SPAN			
	ORIGINAL LIFE	CHRONOLOGICAL AGE	EFFECTIVE AGE	USE LIFE YEARS
FINISH SYSTEMS	15	6	5	10+
MECHANICAL SYSTEMS	40	6	6	30+
ENHANCEMENTS	10	6	5	5

	SUMMARY
<p>DEFERRED MAINTENANCE: None; services have been provided as needed.</p> <p>OBsolescence: None at this time.</p> <p>LIFE EXTENSION: Continue the current level of service.</p> <p>ALTERNATIVES: None suggested; the facility is modern and attractive.</p> <p>COMMENTS OBSERVATIONS PREVENTATIVE MAINTENANCE & SUGGESTIONS:</p>	<p><i>Finish systems</i> of the community center include quarry tile in the laundry area and vinyl tile in the recreation areas. Ceramic tile finishes the public bathrooms. There is inverted lighting. Cyclic costs include painting enhancement; every year at \$500. The annual reserve rate is \$500 for the expense. Vinyl tile replacement occurs in the out years with an expense of \$2,000; the reserve rate of \$80 is included below. Regular enhancements with framed art work and items of detail, such as window dressing, are included as an expense and reserve rate each year of \$500.</p> <p><i>Mechanical systems</i> include a separate air handling system and a hot water heater. All other functions come from the central system. Special attention should be given to the electrical and gas systems in the laundry area. No GFI (ground fault interrupter) was observed. Typical enhancements have included GFI in residential buildings. Test & prove. Further, natural gas had an odor present during the inspection, also requiring testing and proving. An annual expense of \$1,200 is included for mechanical enhancement as needed.</p> <p><i>Enhancements</i> include two bathrooms finished with ceramic tile, and a wash area with stainless steel sinks and ceramic walls. The inventory is capable of long term use to year 30 or longer. An annual reserve rate and expense of \$1,000 is included to allow for improved inventory.</p>

PROPERTY PHOTOS



	INVENTORY & COST ANALYSIS						
	QUANTITY	UNIT	UNIT COST	TOTAL COST	USE LIFE	CONSTANT SEGREGATED FUNDING	ACTUAL CASH EXPENSE & YEAR
FINISH SYSTEMS	1	L/S	\$21,600	\$21,600	1-20+	\$1,080 per year	\$1,000 per year
MECHANICAL SYSTEMS	1	L/S	\$24,000	\$24,000	1-20+	\$1,200 per year	\$1,200 per year
ENHANCEMENTS	1	L/S	\$20,000	\$20,000	1-20+	\$1,000 per year	\$1,000 per year

	PREVENTATIVE MAINTENANCE	MAINTENANCE FUNCTIONS	CAPITAL COSTS	DISPOSAL
LIFE CYCLE COSTS				
FINISH SYSTEMS			\$1,000 per yr	\$2,000 yr 25
MECHANICAL SYSTEMS	\$500 per year (service)		\$1,200 per year	
ENHANCEMENTS			\$1,000 per year	

This section of the report describes conditions, which form the basis of establishing a funding level for unknown conditions. Typically, these items would include components of the improvements that are unavailable for inspection and evaluation of condition. It is not based on a percentage or other factor that forms a simple cushion.

The WATER SUPPLY LINES, PLUMBING, and SANITARY FACILITIES, FLUES, CHASES, DRAINS, ELECTRICAL SUPPLY, CONDUITS, ETC., do not have a history of failure and can be expected to attain a normal life span well in excess of an additional fifty years. The degree of failure and service can only be determined over time. Funding an annual contingency is suggested at a level of **\$1,500 per year**.

The limited common area also includes the **STRUCTURE AND FOUNDATION**. These locations are unavailable for inspection or examination, although certain aspects of conditions are known. Specifically, field inspections observed the floor plates with minor shrinkage cracks that may be prevalent only in exterior locations. This Report suggests periodic applications of concrete sealer/hardener as a maintenance function. We suggest annual funding of **\$1,000**.

Comparing the two differing types of structural components of Forts Meade and Detrick, the future needs are unknown. However, costs are expected to be negligible, and dependent on the proficiency of maintaining related components such as the envelope integrity, roofing, etc. Both construction types are expected to achieve at least 100-year use life.

TOTAL RECOMMENDED FUNDING: \$2,500 PER YEAR.

Although this amount may be arbitrary in scope, it creates funding that can be adjusted in future updates after the performance history is reviewed.

**CONCLUSION, PART A
SEGREGATED COSTS FOR A FULLY-FUNDED RESERVE**

**Fort Detrick
June 10, 2004
SEGREGATED FUNDING PRIOR TO APPLICATION OF EXISTING RESERVE ACCOUNT BALANCES**

COMPONENT	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
windows/doors	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000
brick envelope	13,875	13,875	13,875	13,875	13,875	13,875	13,875	13,875	13,875	13,875	13,875	13,875	13,875	13,875	13,875	13,875	13,875	13,875	13,875	13,875
roofing	24,331	24,331	24,331	24,331	24,331	24,331	24,331	24,331	24,331	24,331	24,331	24,331	24,331	24,331	24,331	24,331	24,331	24,331	24,331	24,331
decks, railings	27,375	27,375	27,375	27,375	27,375	27,375	27,375	27,375	27,375	27,375	27,375	27,375	27,375	27,375	27,375	27,375	27,375	27,375	27,375	27,375
envelope detail	3,875	3,875	3,875	3,875	3,875	3,875	3,875	3,875	3,875	3,875	3,875	3,875	3,875	3,875	3,875	3,875	3,875	3,875	3,875	3,875
security lighting	1,414	1,414	1,414	1,414	1,414	1,414	1,414	1,414	1,414	1,414	1,414	1,414	1,414	1,414	1,414	1,414	1,414	1,414	1,414	1,414
heating systems	1,943	1,943	1,943	1,943	1,943	1,943	1,943	1,943	1,943	1,943	1,943	1,943	1,943	1,943	1,943	1,943	1,943	1,943	1,943	1,943
domestic hot water	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320	4,320
cooling systems	9,767	9,767	9,767	9,767	9,767	9,767	9,767	9,767	9,767	9,767	9,767	9,767	9,767	9,767	9,767	9,767	9,767	9,767	9,767	9,767
ventilation	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
mechanical misc.	19,000	19,000	19,000	19,000	19,000	19,000	19,000	19,000	19,000	19,000	19,000	19,000	19,000	19,000	19,000	19,000	19,000	19,000	19,000	19,000
unit flooring	16,288	16,288	16,288	16,288	16,288	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176
kitchen & baths	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000	16,000
décor	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857
rec finish	1,080	1,080	1,080	1,080	1,080	1,080	1,080	1,080	1,080	1,080	1,080	1,080	1,080	1,080	1,080	1,080	1,080	1,080	1,080	1,080
rec mechanical	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
rec enhancements	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
contingency	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reserve	168,925	168,925	168,925	168,925	168,925	202,813	202,813	202,813	202,813	202,813	202,813	202,813	202,813	202,813	202,813	202,813	202,813	202,813	202,813	202,813
Cash Expense	101,683	205,183	33,483	67,233	78,483	33,483	35,983	33,483	33,483	169,483	33,483	35,983	33,483	67,233	53,483	33,483	35,983	144,483	33,483	248,483
Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024

CONCLUSION, PART B
CURRENT FUNDING VS. A FULLY-FUNDED RESERVE

Fort Detrick
June 10, 2004
THE CURRENT LEVEL OF FUNDING IS SHOWN vs. A FULLY FUNDED RESERVE

Year	Cash Balance Forwarded	Annual Funding	Actual Cash Expense	Cash Shortfall	Cash Balance with 3% interest	Reserve Required	Coverage Shortfall
2005	\$5,000	\$0	\$101,683	(\$96,683)	(\$96,683)	\$168,925	(\$265,608)
2006	(\$96,683)	\$0	\$205,183	(\$301,866)	(\$301,866)	\$236,167	(\$538,033)
2007	(\$301,866)	\$0	\$33,483	(\$335,349)	(\$335,349)	\$199,909	(\$535,258)
2008	(\$335,349)	\$0	\$67,233	(\$402,582)	(\$402,582)	\$335,351	(\$737,933)
2009	(\$402,582)	\$0	\$78,483	(\$481,065)	(\$481,065)	\$437,043	(\$918,108)
2010	(\$481,065)	\$0	\$33,483	(\$514,548)	(\$514,548)	\$561,373	(\$1,075,921)
2011	(\$514,548)	\$0	\$35,983	(\$550,531)	(\$550,531)	\$730,703	(\$1,281,234)
2012	(\$550,531)	\$0	\$33,483	(\$584,014)	(\$584,014)	\$897,533	(\$1,481,547)
2013	(\$584,014)	\$0	\$33,483	(\$617,497)	(\$617,497)	\$1,066,863	(\$1,684,360)
2014	(\$617,497)	\$0	\$169,483	(\$786,980)	(\$786,980)	\$1,236,193	(\$2,023,173)
2015	(\$786,980)	\$0	\$33,483	(\$820,463)	(\$820,463)	\$1,269,523	(\$2,089,986)
2016	(\$820,463)	\$0	\$35,983	(\$856,446)	(\$856,446)	\$1,438,853	(\$2,295,299)
2017	(\$856,446)	\$0	\$33,483	(\$889,929)	(\$889,929)	\$1,605,683	(\$2,495,612)
2018	(\$889,929)	\$0	\$67,233	(\$957,162)	(\$957,162)	\$1,775,013	(\$2,732,175)
2019	(\$957,162)	\$0	\$53,483	(\$1,010,645)	(\$1,010,645)	\$1,910,593	(\$2,921,238)
2020	(\$1,010,645)	\$0	\$33,483	(\$1,044,128)	(\$1,044,128)	\$2,059,923	(\$3,104,051)
2021	(\$1,044,128)	\$0	\$35,983	(\$1,080,111)	(\$1,080,111)	\$2,229,253	(\$3,309,364)
2022	(\$1,080,111)	\$0	\$144,483	(\$1,224,594)	(\$1,224,594)	\$2,396,083	(\$3,620,677)
2023	(\$1,224,594)	\$0	\$33,483	(\$1,258,077)	(\$1,258,077)	\$2,454,413	(\$3,712,490)
2024	(\$1,258,077)	\$0	\$248,483	(\$1,506,560)	(\$1,506,560)	\$2,623,743	(\$4,130,303)
CYCLE END TOTALS:		\$0	\$1,511,560		(\$1,506,560)	\$2,623,743	(\$4,130,303)

Net interest is compounded at 3% per year, allowing two percent to be allocated for inflation of expenses. See appendix for information regarding inflation. This scenario is good for a limited time approximately three years. All projections require regular updates.

CONCLUSION, PART C
SUGGESTED LEVEL OF FUNDING FOR A FULLY-FUNDED RESERVE

Fort Detrick
June 10, 2004
THE SUGGESTED LEVEL OF FUNDING IS SHOWN vs. A FULLY FUNDED RESERVE

Year	Cash Balance Forwarded	Annual Funding	Actual Cash Expense	Cash Shortfall	Cash Balance with 3% interest	Reserve Required	Coverage Shortfall
2005	\$5,000	\$190,000	\$101,683	\$0	\$96,117	\$168,925	(\$72,808)
2006	\$96,117	\$190,000	\$205,183	\$0	\$83,362	\$236,167	(\$152,805)
2007	\$83,362	\$190,000	\$33,483	\$0	\$247,075	\$199,909	\$0
2008	\$247,075	\$190,000	\$67,233	\$0	\$380,937	\$335,351	\$0
2009	\$380,937	\$190,000	\$78,483	\$0	\$507,228	\$437,043	\$0
2010	\$507,228	\$190,000	\$33,483	\$0	\$683,657	\$561,373	\$0
2011	\$683,657	\$190,000	\$35,983	\$0	\$862,804	\$730,703	\$0
2012	\$862,804	\$190,000	\$33,483	\$0	\$1,049,901	\$897,533	\$0
2013	\$1,049,901	\$190,000	\$33,483	\$0	\$1,242,610	\$1,066,863	\$0
2014	\$1,242,610	\$190,000	\$169,483	\$0	\$1,301,021	\$1,236,193	\$0
2015	\$1,301,021	\$190,000	\$33,483	\$0	\$1,501,264	\$1,269,523	\$0
2016	\$1,501,264	\$190,000	\$35,983	\$0	\$1,704,940	\$1,438,853	\$0
2017	\$1,704,940	\$190,000	\$33,483	\$0	\$1,917,301	\$1,605,683	\$0
2018	\$1,917,301	\$190,000	\$67,233	\$0	\$2,101,270	\$1,775,013	\$0
2019	\$2,101,270	\$190,000	\$53,483	\$0	\$2,304,920	\$1,910,593	\$0
2020	\$2,304,920	\$190,000	\$33,483	\$0	\$2,535,280	\$2,059,923	\$0
2021	\$2,535,280	\$190,000	\$35,983	\$0	\$2,769,976	\$2,229,253	\$0
2022	\$2,769,976	\$190,000	\$144,483	\$0	\$2,899,958	\$2,396,083	\$0
2023	\$2,899,958	\$190,000	\$33,483	\$0	\$3,148,169	\$2,454,413	\$0
2024	\$3,148,169	\$190,000	\$248,483	\$0	\$3,182,377	\$2,623,743	\$0
CYCLE END TOTALS:		\$3,800,000	\$1,511,560	\$0	\$3,182,377	\$2,623,743	\$0

Net interest is compounded at 3% per year, allowing two percent to be allocated for inflation of expenses. See appendix for information regarding inflation. This scenario is good for a limited time approximately three years. All projections require regular up-dates.

**CONCLUSION, PART D
DEDICATED EXPENSE BY YEAR**

**Fort Detrick
June 10, 2004
DEDICATED EXPENSES PRIOR TO APPLICATION OF EXISTING RESERVE ACCOUNT BALANCES**

COMPONENT	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
windows/doors	2,950	2,950	2,950	2,950	2,950	2,950	2,950	2,950	2,950	2,950	2,950	2,950	2,950	2,950	2,950	2,950	2,950	2,950	2,950	2,950
brick envelope	0	111,000	0	0	0	0	0	0	0	111,000	0	0	0	0	0	0	0	111,000	0	0
roofing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
decks, railings	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
envelope detail	0	2,500	0	33,750	0	0	2,500	0	0	0	0	2,500	0	33,750	0	0	2,500	0	0	0
security lighting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
heating systems	10,000	0	0	0	0	0	0	0	0	5,000	0	0	0	0	0	0	0	0	0	5,000
domestic hot water	58,200	58,200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cooling systems	0	0	0	0	25,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	190,000
ventilation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
mechanical misc.	0	0	0	0	20,000	0	0	0	0	20,000	0	0	0	0	20,000	0	0	0	0	20,000
unit flooring	14,476	14,476	14,476	14,476	14,476	14,476	14,476	14,476	14,476	14,476	14,476	14,476	14,476	14,476	14,476	14,476	14,476	14,476	14,476	14,476
kitchen & baths	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
décor	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857	12,857
rec finish	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
rec mechanical	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
rec enhancements	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash Expense	101,683	205,183	33,483	67,233	78,483	33,483	35,983	33,483	33,483	169,483	33,483	35,983	33,483	67,233	53,483	33,483	35,983	144,483	33,483	248,483
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024

CONCLUSION, PART E
CURRENT LEVEL OF FUNDING VS. ACTUAL EXPENSES

Fort Detrick
June 10, 2004
THE CURRENT LEVEL OF FUNDING IS SHOWN vs. TIMING OF DEDICATED EXPENSES

Year	Cash Balance Forwarded	Annual Funding	Actual Cash Expense	Cash Shortfall	Cash Balance with 3% interest
2005	\$5,000	\$0	\$101,683	(\$96,683)	(\$96,683)
2006	(\$96,683)	\$0	\$205,183	(\$301,866)	(\$301,866)
2007	(\$301,866)	\$0	\$33,483	(\$335,349)	(\$335,349)
2008	(\$335,349)	\$0	\$67,233	(\$402,582)	(\$402,582)
2009	(\$402,582)	\$0	\$78,483	(\$481,065)	(\$481,065)
2010	(\$481,065)	\$0	\$33,483	(\$514,548)	(\$514,548)
2011	(\$514,548)	\$0	\$35,983	(\$550,531)	(\$550,531)
2012	(\$550,531)	\$0	\$33,483	(\$584,014)	(\$584,014)
2013	(\$584,014)	\$0	\$33,483	(\$617,497)	(\$617,497)
2014	(\$617,497)	\$0	\$169,483	(\$786,980)	(\$786,980)
2015	(\$786,980)	\$0	\$33,483	(\$820,463)	(\$820,463)
2016	(\$820,463)	\$0	\$35,983	(\$856,446)	(\$856,446)
2017	(\$856,446)	\$0	\$33,483	(\$889,929)	(\$889,929)
2018	(\$889,929)	\$0	\$67,233	(\$957,162)	(\$957,162)
2019	(\$957,162)	\$0	\$53,483	(\$1,010,645)	(\$1,010,645)
2020	(\$1,010,645)	\$0	\$33,483	(\$1,044,128)	(\$1,044,128)
2021	(\$1,044,128)	\$0	\$35,983	(\$1,080,111)	(\$1,080,111)
2022	(\$1,080,111)	\$0	\$144,483	(\$1,224,594)	(\$1,224,594)
2023	(\$1,224,594)	\$0	\$33,483	(\$1,258,077)	(\$1,258,077)
2024	(\$1,258,077)	\$0	\$248,483	(\$1,506,560)	(\$1,506,560)
CYCLE END TOTALS:		\$0	\$1,511,560		(\$1,506,560)

Net interest is compounded at 3% per year, allowing two percent to be allocated for inflation of expenses. See appendix for information regarding inflation. This scenario is good for a limited time approximately three years. All projections require regular updates.

CONCLUSION, PART F
SUGGESTED FUNDING LEVEL TO MEET DEDICATED EXPENSES

Fort Detrick
June 10, 2004
SUGGESTED FUNDING LEVEL TO MEET DEDICATED EXPENSES

Year	Cash Balance Forwarded	Annual Funding	Actual Cash Expense	Cash Shortfall	Cash Balance with 3% interest		
2005	\$5,000	\$160,000	\$101,683	\$0	\$65,217		
2006	\$65,217	\$160,000	\$205,183	\$0	\$20,635		
2007	\$20,635	\$100,000	\$33,483	\$0	\$89,766		
2008	\$89,766	\$100,000	\$67,233	\$0	\$126,209		
2009	\$126,209	\$100,000	\$78,483	\$0	\$152,158		
2010	\$152,158	\$100,000	\$33,483	\$0	\$225,235		
2011	\$225,235	\$100,000	\$35,983	\$0	\$297,930		
2012	\$297,930	\$100,000	\$33,483	\$0	\$375,380		
2013	\$375,380	\$100,000	\$33,483	\$0	\$455,154		
2014	\$455,154	\$100,000	\$169,483	\$0	\$397,241		
2015	\$397,241	\$100,000	\$33,483	\$0	\$477,671		
2016	\$477,671	\$100,000	\$35,983	\$0	\$557,938		
2017	\$557,938	\$100,000	\$33,483	\$0	\$643,189		
2018	\$643,189	\$100,000	\$67,233	\$0	\$696,235		
2019	\$696,235	\$100,000	\$53,483	\$0	\$765,034		
2020	\$765,034	\$100,000	\$33,483	\$0	\$856,498		
2021	\$856,498	\$100,000	\$35,983	\$0	\$948,130		
2022	\$948,130	\$100,000	\$144,483	\$0	\$930,757		
2023	\$930,757	\$100,000	\$33,483	\$0	\$1,027,192		
2024	\$1,027,192	\$100,000	\$248,483	\$0	\$905,070		
CYCLE END TOTALS:		\$2,120,000	\$1,511,560	\$0	\$905,070		

Net interest is compounded at 3% per year, allowing two percent to be allocated for inflation of expenses. See appendix for information regarding inflation. This scenario is good for a limited time approximately three years. All projections require regular updates.

DESIRABILITY, LEASING, AND RETENTION

Client representatives posed the question of how to create desirability of the units to achieve increased occupancy levels.

The response and answers to this challenge include addressing the government/military entity as a private unit in a competitive marketplace.

A thorough understanding of market conditions is necessary, utilizing a “best of type, built up method” of weighing comparables to the subject property.

Polling of residents, the troops, is necessary to understand their perception of value.

The client is challenged with very limited existing square footage within the residential unit, and will likely find that combining units is a necessity and a possibility. Numerous aging housing authorities are faced with a similar task, and are now successful with a reduced inventory and an increased unit size.

Creating a unit that is comparable to or superior to those in the open market will create retention while minimizing turnover costs. Policies should be established or reviewed regarding privacy and access to the UEPH resident by superiors.

Comparing changes within the two subject properties of Fort Meade and Fort Detrick, both sites will be impacted proportionately in square foot costs/per unit costs if the units are doubled. Due to the difference in construction types, Fort Meade units will have somewhat easier methods in rehab construction.

PREVENTATIVE MAINTENANCE AND LIFE EXTENSION

The property maintains a service request and delivery system that records the failures, service levels, complaints, etc. of each component listed in this report. This system should also be utilized to record preventative maintenance efforts.

SUGGESTIONS FOR IMMEDIATE ATTENTION

1. Immediately address all liability issues noted in this report.
2. Domestic hot water vessels are suspect in integrity and safety. Plumbing is affected by excessive corrosion and loss. Further, additional equipment is at risk in the same mechanical rooms due to lack of circulating air.
3. Management should consider adapting the door closer hardware to prevent removal of the closer. Similar conditions have consistently resulted in injury to residents.
4. Management may elect to use all, some, or none of our suggestions and predicted scenarios.

LIMITATIONS OF THE REPORT

During our investigation and observations, we encountered the following conditions that limited our presentation or resulted in assumptions:

1. No invasive testing was performed on any component.
2. Property perimeters were not observed for accuracy.
3. An engineering of the property has not been conducted.

THE REPLACEMENT RESERVE REPORT is not intended to give advice of a legal nature, and, accordingly, should not be used as such advice. An engineering of the property has not been performed, and no assessment of code compliance, any form of 21E, asbestos, or lead paint conditions offered. This **REPORT** does not warrant expressing an opinion of utility or inutility.

Many of the observations made in the **REPORT** are a result of random sampling of property components. This process would not allow for discovery of all potential defects or hazards associated with the physical plant. The report should not be used for the purpose of loss prevention or risk assessment.

Much of the information made available to the author is a result of personnel interviews, such as with managing agents, maintenance personnel, contractors, etc. While these sources are deemed reliable, they cannot be guaranteed authoritative.

The financial projections are supported for only the time frame in which they were compiled. Use of this information cannot be supported beyond that period, which would require regular review and amendments to the **REPORT**.

Any single error within the text of the report does not void the entire report finding. Possession of the report does not necessarily constitute ownership.

THE REPLACEMENT RESERVE REPORT has been prepared for numerous government-assisted housing complexes, condominium associations, developers, institutions, and other facilities throughout New England since 1984. In the spring of 1993, we opened our Cape Canaveral office to serve North and South Carolina, Georgia, and Florida. In 1996, our Virginia Beach branch opened to serve the mid-Atlantic region.

CHARLES J. STUART, CPM is the **REPORT'S** author and founder. A Certified Property Manager of the Institute of Real Estate Management, Mr. Stuart has thirty years of industry experience and is an author and speaker regarding the subject of capital planning and replacement reserves for the Community Associations Institute. Mr. Stuart is also a course instructor for the Institute of Real Estate Management, a contributing editor for the R. S. Means Company, a worldwide construction consulting and estimating company, and a member of the Sweet's CD-ROM Advisory Council.

STEPHEN SALA, CIVIL ENGINEER brings twenty years of diverse experience, in the design and construction areas of engineering, from projects that span both domestic and international markets. Mr. Sala has been involved with projects varying in value from five to two million dollars. An author on the subject of construction management, Mr. Sala is also regarded as a specialist in "expert testimony" on this subject.

JAMES A. DOHRMAN, PE - CIVIL is registered in five states as a Professional Engineer with a specialty in *Forensic Engineering*. Mr. Dohrman has extensive international and domestic experience in solid waste and related water resource subjects as well as being an accomplished author and speaker in these areas.

JAMES B. MICHAEL, JR., AIA is a Registered Architect in Massachusetts and a member of the American Institute of Architects. A recognized expert in siding/thermal protection systems, Mr. Michael has extensive experience and knowledge of New England, southeast and worldwide locations.

JOHN G. SWENOR, PE – CIVIL holds membership in the American Society of Professional Engineers and the Society of Professional Real Estate Inspectors. He has been involved in the construction field for the past 25 years with projects ranging in size to \$30 million that encompass commercial, institutional, and residential use. Mr. Swenor has acted as an owner's representative and inspector on several school projects and been involved in all aspects of project and trade inspections. Additionally, Mr. Swenor has extensive knowledge of capital planning for institutional properties.

Our staff also includes experienced personnel that conduct measurements and inventory of the physical plants, and an administrative team that is experienced with AutoCad and architectural costs software systems.

It is assumed that the property known as Fort Detrick UEPH is in compliance with all federal, state, and local laws, codes, regulations, and statutes.

THE REPLACEMENT RESERVE REPORT or its authors are not responsible for defects known or unknown, and reject all liability for such defects, known, or unknown, which may effect or cause harm or damage to the association or its residents.

All subsequent reviews and amendments to this **REPORT** are an expense beyond the invoice associated with this **REPORT**. **THE REPLACEMENT RESERVE REPORT** is not responsible to perform future reviews and amendments.

Any adjustments, changes, alterations, additions, or deletions to this **REPORT** by anyone other than the author voids the entire report.

Competent management of the entity is assumed.

All values and projections are open to influences from the economy, the environment, the level of service, and the degree of actual wear and tear through use. Accordingly, all opinions expressed are subject to change.

APPENDIX

LIFE CYCLE COSTING FORMULAS

ADDITIONAL PROPERTY PHOTOS

INFLATION STATISTICS

SAMPLE ANNUAL OPERATING CALENDAR

COSTS COMPARISON CHART

Life Cycle Costing

A technique of economic evaluation that sums over a given study period the cost of initial investment less resale value, replacements, operations, energy use, and maintenance and repair of an investment decision.

The important aspect of understand Life Cycle Costing is to be familiar with the notions of compounding, discounting, present value, and equivalent uniform annual value.

Compounding- the process of computing the value of an original principal sum based on interest calculated on the sum of the original principal and accrued interest.

Example: A principle sum of \$1,000 at a compound interest rate of 10% per annum increases to \$1,611 in 5 years, \$2,594 in 10 years, \$4,177 in 15 years, \$6,727 in 20 years, and \$10,840 in 25 years.

Discounting- a technique for converting cash flows that occur over time to equivalent amounts at a common time.

Example: It is apparent that if one had to pay out to meet an obligation of either \$1,611 in 5 years, \$2,594 in 10 years, \$4,177 in 15 years, \$6,727 in 20 years or \$10,840 in 25 years the amount to be invested initially at a 10% interest would be \$1,000. This amount is referred to as the present value of a future amount and it is calculated by “discounting” a future value in a specific year at a given rate of interest.

Present Value- the value of a benefit or cost found by discounting future cash flows to the base time.

Example:

Basic mathematics for calculating Present Value:

P = Present sum of money

F = Future sum of money

i = Interest or discount rate (expressed as decimal and not a percentage)

n = Number of years

Year	Future Value (F)
1	$P(1+i)$
2	$P(1+i)(1+i) = P(1+i)^2$
3	$P(1+i)^2(1+i) = P(1+i)^3$

What is the present value (P) of an anticipated maintenance expense of \$300 in year 3 (F) if the interest rate is 10%?

$$\begin{aligned}
 P &= F \times 1/(1+i)^n = 300 \times 1/(1+0.10)^n = 300 \times 1/1.33 \\
 &= 300 \times 0.75 \\
 &= \$225
 \end{aligned}$$

From an interest standpoint, this tells us that \$225 is the amount that would have to be deposited today into an account paying at 10% interest per annum in order to provide \$300 at the end of year 3 to meet the anticipated expense.

The Cash Flow and Formula Method for Calculating Life Cycle Costs

There are basically two approaches to calculating life cycle costs—the *cash flow* method and the *formula* method which, when applicable, is somewhat more simple.

The Cash Flow Method

To illustrate the Cash Flow Method, we will use a simple example of a facility manager considering the purchase of maintenance equipment required for a four-year period for which initial costs, energy costs and maintenance costs of alternative proposals vary.

The financial criteria on which the economic evaluation will be based are the following:

Interest/ Discount Rate - 10%

Energy Escalation Rate - 8% per annum
 Labor and Material Rate - 4% per annum
 Period of Study - 4 years

The following data is provided in one of the alternative proposals to be analyzed:

- Initial Capital Cost - \$1,000
- Maintenance Costs – A fixed annual cost of \$100 per year quoted by supplier (no escalation to be considered).
- Annual Energy Costs – Initially \$100 per year and subject to 8% annual escalation—i.e., \$108 for year one.
- Salvage value – At the end of the four-year period, the equipment has no further useful life and the supplier agrees to purchase it as scrap for \$50.

The Cash Flow Method for calculating Life Cycle Costs are based on the following steps:

- Step 1. Prepare a Cash Flow Diagram
- Step 2. Establish a Time Schedule of Costs
- Step 3. Calculate Annual Net Cash Flows
- Step 4. Calculate Present Value Factors
- Step 5. Calculate Present Values of Annual Cash Flows and Life Cycle Costs

Step 1.

Cash Flow Diagrams are often prepared to understand the problem better. Revenues are noted as vertical lines above a horizontal time axis, and disbursements are noted as vertical lines below it.

Step 2.

The table below presents revenues and disbursements for each year of the study:

Example:

A Year	B Capital Cost	C Maintenance Cost	D Energy Cost (8% escalation)
0	1,000	--	--
1	--	100	108
2	--	100	117
3	--	100	126
4	(50)	100	136

Note that the disbursements in this example are considered positive, and revenues for the salvage value are negative

Step 3.

The table below provides the net cash flow (NCF) for each year, which could be a disbursement or a revenue.

Example:

A Year	B Capital Costs	C Maintenance Costs	D Energy Costs (8% Escalation)	E NCF (B + C + D)
0	1,000	--	--	1,000
1	--	100	108	208
2	--	100	117	217
3	--	100	126	226
4	(50)	100	136	186

Step 4.

As in a previous example, present value factors based on 10% interest will be calculated for each year to convert the annual net cash flows to present values.

Example:

Year n	PV Factor $1/(1+i)^n$
0	1
1	$1/(1+0.1)^1 = 0.91$
2	$1/(1+0.1)^2 = 0.83$
3	$1/(1+0.1)^3 = 0.75$
4	$1/(1+0.1)^4 = 0.68$

Step 5.

Annual net cash flows are converted to present values of the base year. Their sum (Total Present Value) will represent the life cycle cost of the alternative.

Example:

Year n	NCF	PV Factor	PV \$
0	1,000	1	1,000
1	208	0.91	189
2	217	0.83	180
3	226	0.75	170
4	186	0.68	126
PV Life Cycle Cost	--	--	1,665

The total life cycle cost of this alternative in terms of today's dollar (if this year is the base year) is \$1,665. This means that if a present sum of \$1,655 were deposited today at an interest rate of 10%, all expenses could be paid over a four-year period, at which time the bank balance would be zero.

Once the cost of the other proposals have been calculated in present value dollars, the facilities manager will be in a position to quantify the differences in life cycle costs and decide which proposal represents the lowest cost of ownership in the long run.

The approach outlined is a practical one when considering the purchase of equipment such as elevators, controls, etc., quotations should not only include capital costs, but also the costs of long-term maintenance contracts which could make a higher initial cost proposal lower over the life cycle of equipment.

The Formula Method

It is also possible to solve the previous example utilizing the Formula Method if the problem is adaptable to this technique. Business calculators or discount factor tables such as those published by The American Society of Testing and Materials can be employed to generate the present value factors and results may be obtained more quickly.

In some cases, the complexity of the calculations will necessitate the "cash flow" method, with calculations done manually or using a spreadsheet program.

Example:

With the formula method approach, the calculations for the life cycle cost of the maintenance equipment alternative analyzed would be as follows:

1. PV of Initial Investment	\$1,000
2. PV of Maintenance Costs	
Annual Cost (A) x UPV Factor	
100 x 3.17	\$317
3. PV of Energy Cost	
Base Year Cost (A) x UPV*	\$382
100 x 3.82	
4. Salvage (Scrap) Value	
Future Value (F) x SPV	
(50) x 0.68	(34)
5. Life Cycle Cost/ Total Present Value	\$1,665

UPV-Uniform Present Value
SPV-Single Present Value
UPV*-Uniform Present Value Modified (*)

The calculated life cycle cost of \$1,665 is identical to that obtained with the cash flow method, but is arrived with less effort.

Equivalent Uniform Annual Value- *A uniform annual amount equivalent to the project cost or benefits, taking into account the time value of money throughout the study period.*

As noted previously in the definition of the Life Cycle Costs, these may be expressed as a lump sum present value with a base time reference, or in equivalent uniform annual values (EAUV) over the study period; decision-makers may prefer one or the other, or require both for the analysis of investment alternatives.

To express life cycle costs in annual values, it is necessary to first determine the lump sum present value of an alternative and multiply it by the Uniform Capital Recovery (UCR) factor given the interest rate and time period. This process is identical to calculating annual payments for a mortgage.

Example:

The present value life cycle cost for one of the maintenance equipment alternatives analyzed amounted to \$1,665; what is the equivalent uniform annual value “A”?

Given: P	(a principal sum or present value life cycle cost)	= \$1,665
	i	= 10%
	n	= 4 years
	UCR Factor	= 0.32 (from standard factors table for i = 10%, n = 4 years)
	A	= equivalent uniform annual value – to be determined
Solution:	A	= P x UCR
		= \$1,665 x 0.32
		= \$530

The life cycle cost of the alternative may therefore be expressed as a lump sum, \$1,665, or an annual value of \$530 based on a four-year time period.

Other Methods of Evaluating Economic Performance

While calculating life cycle costs is a helpful tool for the facilities manager evaluating alternatives, there are other approaches for evaluating economic performance of building investments. Among these other methods are *payback*, *net benefits*, and *internal rate of return*; these are described in detail in an American Society of Testing and Materials compilation of *Building Economics Standards*, which are endorsed by the American Association of Cost Engineers (AACE).

References for Annual Book of ASTM Standards, Vol. 04.07

ASTM Standards

- ❖ Terminology of Building Economics
- ❖ Practice for Measuring Life Cycle Costs of Buildings and Building Systems
- ❖ Practice for Measuring Benefit-to-Cost and Savings-to-Investment Ratios for Buildings and Building Systems
- ❖ Practice for Measuring Internal Rates of Return and Adjusted Internal Rates of return for Investments in Buildings and Building Systems
- ❖ Practice for Measuring Net Benefits for Investments in Buildings and Building Systems
- ❖ Practice for Measuring Payback for Investments in Buildings and Building Systems
- ❖ Guide for Selecting Economics Methods for Evaluating Investments in Buildings and Building Systems
- ❖ Guide for Selecting Techniques for treating Uncertainty and Risk in the Economic Evaluation of Buildings and Building Systems
- ❖ Standard Classification for Building Elements and Related Site Work

APPENDIX MATERIAL
ADDITIONAL PHOTOGRAPHS



NOTES:

Census Economic Briefing Rooms



Manufacturing and Trade Inventories and Sales
 U.S. total business sales for May were \$937.6 bil, up 0.7% from last month. Month-end inventories were \$1,219.9 bil, up 0.4% from last month. (Released 07/15/04)

Previous	Current
-0.1	0.7
% Change in sales April 2004	% Change in sales May 2004



Advance Retail and Food Service Sales
 U.S. retail and food service sales for June were \$331.9 billion, down 1.1 percent from the previous month. (Released 07/14/04)

Previous	Current
1.4	-1.1
% change May 2004	% change June 2004



Quarterly Financial Report - Retail Trade
 After-tax profits for retail corporations' with assets greater than \$50 million averaged 2.6 cents per dollar of sales for the first quarter 2004, down 0.9 (+/-0.1)cents from the preceding quarter. (Released: July 14, 2004. Next: October 13, 2004.)

Previous	Current
+1.0	-0.9
% change 4th qtr 2003	% change 1st qtr 2004



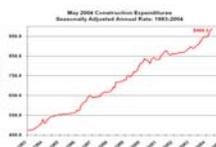
U.S. International Trade in Goods and Services
 The Nation's international deficit in goods and services decreased to \$46.0 billion in May, from \$48.1 billion (revised) in April, as exports increased more than imports.

Previous	Current
-48.1	-46.0
\$ billion April 2004	\$ billion May 2004



Monthly Wholesale Trade: Sales and Inventories
 May 2004 sales of merchant wholesalers were \$270.4 billion, up 0.5% from last month. End-of-month inventories were \$305.5 billion, up 1.2% from last month. (7/9/04)

Previous	Current
0.2	1.2
% change in Inv	% change in Inv

		April 2004	May 2004
 Manufacturers' new orders	Manufacturers' Shipments, Inventories, and Orders New orders for manufactured goods in May decreased \$1.0 billion or 0.3 percent to \$358.2 billion. (Released July 2, 2004).	Previous -1.1 % change April 2004	Current -0.3 % change May 2004
 Value of Construction Put in Place	Construction Spending Total construction activity for May 2004 (\$988.5 billion) was 0.3 percent above the revised April 2004 (\$985.7 billion). Please see our website for further details: http://www.census.gov/constructionspending	Previous 1.2 % change April 2004	Current 0.3 % change May 2004
 New Home Sales	New Home Sales Sales of new one-family houses in May 2004 were at a seasonally adjusted annual rate of 1,369,000. This is 14.8% above the revised April 2004 figure of 1,192,000.	Previous -7.9 % change April 2004	Current 14.8 % change May 2004
 Durable goods new orders	Advance Report on Durable Goods Manufacturers' Shipments and Orders New orders for manufactured durable goods in May decreased \$3.2 billion to \$189.1 billion. (Released June 24, 2004).	Previous -2.6 % change April 2004	Current -1.6 % change May 2004
 New housing starts	Housing Starts Privately owned housing starts in May were at a seasonally adjusted annual rate of 1,967,000 down 0.7% from the revised April 2004 figure of 1,981,000.	Previous -1.0 % change April 2004	Current -0.7 % change May 2004



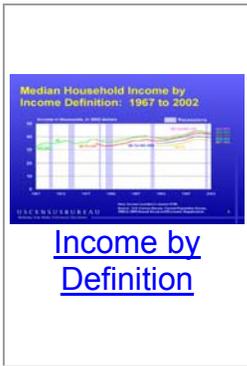
Quarterly Financial Report - Manufacturing, Mining and Trade
 Manufacturing corporations' seasonally adjusted after-tax profits averaged 6.4 cents per dollar of sales for the first quarter of 2004, unchanged from the preceding quarter. (Released: June 14, 2004. Next Release: September 13, 2004.)

Previous	Current
+1.3	0.0
cents 4th Qtr 2003	cents 1st Qtr 2004



Homeownership
 The homeownership rate in the first quarter 2004 (68.6 percent) was higher than the first quarter 2003 rate (68.0 percent). The homeownership rates in the Northeast and the West were higher than one year ago, while rates in the Midwest and South remained statistically unchanged.

Previous	Current
68.0	68.6
percent 1st Qtr 2003	percent 1st Qtr 2004



Household Income
 Median household money income in the United States in 2002 was \$42,409, 1.1 percent lower than in 2001 after adjusting for 1.6 percent inflation. Under four alternative income definitions that deduct income and payroll taxes and include the value of various noncash benefits, real median household income did not change for three of the four income alternatives and declined 0.8 percent for income after taxes.

Previous	Current
\$42,900	\$42,409
in 2002 dollars 2001	in 2002 dollars 2002



Poverty
 For the second consecutive year the poverty rate rose, from 11.7 percent in 2001 to 12.1 percent in 2002. The number of poor increased also, by 1.7 million, to 34.6 million poor in 2002.

Previous	Current
11.7	12.1
percent 2001	percent 2002

SUGGESTED ANNUAL OPERATING EVENTS CALENDAR

KEY:	● Inspection	● Preventative Maintenance Service	● Regular Service	● Capital Repairs	● Capital Replacement
-------------	---	--	--	---	---

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
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OPERATIONS CALENDAR

Asphalt Surfaces				●●●●				●●●●		●●●●		
Tennis Courts				●●●●				●●●●		●●●●		
Swimming Pools				●●	●●●●	●●●●	●●●●	●●●●	●			
Siding Material	●		●		●	●	●	●●	●●		●	
Roofing Material		●		●		●●	●●	●	●	●		●
Lighting Systems	●											
Heating Boilers	●●●●					●●●●		●●●●		●●●●	●●●●	●●●●
Domestic Hot Water	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●
Landscape			●●●		●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●
Pests and Insects				●●●●	●●●●	●●	●	●	●●	●●●	●	
Painting Program				●	●	●	●●●●	●●●●	●●●●	●●●●		

SAMPLE

CAPITAL CALENDAR

Building Roof #7								●●●●				
Building Roof #8							●●●●					
Building Roof #9						●●●●						
Treatment Plant									●●●●			

Calendar assumes a four week month. **By no means all inclusive; a sample only.** Schedule should include components unique to property.

Costs Comparison by Unit/Sq.Ft.

Comparison of Projected Maintenance & Repair Expenses; Undiscounted Dollars	Fort Detrick Barracks FY 1996, PN 46200 Total Cost over 40 years, unadjusted			Fort Meade Barracks FY 2000/2001, PN 46169/47367 Total Cost over 40 Yrs, Unadjusted			Detrick divided by Meade	
	Total Cost for Complex	Cost per Space or Bedroom 240 Spaces	Cost per SF - Including Community Bldg 89,498 SF	Total Cost for Complex	Cost per Space or Bedroom 576 Spaces	Cost per SF - Including Community Bldg 215,785 SF		
Windows, Doors, and Brick Envelope	\$985,400	\$4,106	\$11.01	\$616,547	\$1,070	\$2.86	3.9	Fort Meade starts the plan with expenses for envelope modifications such as weep holes and crack filling, Fort Detrick addresses constant door closer replacements and a more expensive window and door inventory that has a constant attrition. Caulking of transitions is twice the expense at Fort Detrick than Fort Meade.
Roofing, Decks, Railings & Stairs	\$1,243,680	\$5,182	\$13.90	\$1,292,912	\$2,245	\$5.99	2.3	Costs at Fort Detrick represent attrition and cyclic maintenance, while costs at Fort Meade address cyclic replacement. Fort Meade will be impacted by poor attic design and ventilation, while Fort Detrick will incur accelerated conditions related to potential machinery and ventilation issues of the attic spaces.
Envelope Detail, Gutters and Security Lighting	\$204,500	\$852	\$2.28	\$164,600	\$286	\$0.76	3.0	Fort Detrick issues are related to film coat failure. The single difference setting apart the two sites would be the railings at Fort Detrick with anodized surface failure requiring painting as a maintenance function.
Space and Water Heating	\$426,800	\$1,778	\$4.77	\$336,000	\$583	\$1.56	3.1	Fort Detrick has issues with domestic hot water systems. Fort Detrick is faced with replacement of the existing domestic hot water system. Conditions are related to design of the mechanical rooms, water leaks, and lack of proficient inspection. Fort Detrick also incurs an immediate expense for isolation valves to save the heating boilers from accelerated loss.
Cooling, Ventilation & Mech. Misc.	\$3,165,000	\$13,188	\$35.36	\$1,039,020	\$1,804	\$4.82	7.3	Fort Meade is currently benefiting from projections that are typical, or, best case scenarios being almost new in condition. Fort Detrick is more accelerated based on historical maintenance costs that are disproportionate to the norm. Fort Detrick also replaces major cooling components in later years.
Flooring, Kitchen & Baths, and Décor	\$1,650,800	\$6,878	\$18.45	\$5,224,800	\$9,071	\$24.21	0.8	Fort Meade will require greater expenses related solely to the number of units. While costs and timing of expenses are similar, the inventory size is relative to the variance in expense.
Plumbing Systems, Mechanical Systems, and Enhancements	\$148,000	\$617	\$1.65	\$24,250	\$42	\$0.11	15.0	Fort Detrick operates extensive laundry facilities. The annual expenses are increased for Fort Detrick due to the laundry operation, mechanical systems, etc.
Common Hallways, Décor, Common Area Misc. (N/A)	-	-	-	\$627,700	\$1,090	\$2.91	-	Fort Meade has these components and costs unique to itself. Fort Detrick is not improved with these components.
TOTAL	\$7,824,180	\$32,601	\$87.42	\$9,325,829	\$16,191	\$43.22		

APPENDIX B



THE REPLACEMENT RESERVE REPORT

CONDOMINIUMS

FEDERAL
&
STATE
ASSISTED
HOUSING

SPECIAL USE
PROPERTIES

RESORT
PROPERTIES

PREPARED FOR

FORT GEORGE G. MEADE UEPH BARRACKS

CAPITAL NEEDS ANALYSIS
LIFE CYCLE COSTS

LOCATED IN
FORT MEADE, MARYLAND

JUNE 9, 2004



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THE REPLACEMENT RESERVE REPORT

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June 9, 2004

Mr. Phillip Davis
National Association of Home Builders Research Center
400 Prince George Blvd..
Upper Marlboro, MD 20772

RE: FORT MEADE UEPH BARRACKS

Dear Mr. Davis,

It is my pleasure to present you with the enclosed **REPLACEMENT RESERVE REPORT** for the **FORT MEADE UEPH BARRACKS**.

The observations and recommendations noted in the report have been made only after close inspection and evaluation of the property components.

Thank you for the opportunity to prepare this analysis for you. I trust it will become a valuable aid and assist you in your property management endeavors and decisions.

Please do not hesitate to contact me with any questions or comments.

Very truly yours,

Charles J. Stuart, CPM

FIELD OFFICES:

BOSTON, MA
VIRGINIA BEACH, VA

The **FORT MEADE UEPH BARRACKS** contains 576 housing units in 8 buildings. The development is one year of age, and is improved with a recreational building. The property employs a property management staff that administers day to day business affairs.

MISSION STATEMENT

The scope and purpose of this analysis is to provide a Capital Needs Analysis with 20 year projections, and, as part of this process, develop Life Cycle Costs to a period of 40 years. The client will utilize the information as part of an analysis that determines the highest and best practices in the development of UEPH type barracks. Accordingly, the reader may encounter references or discussions that compares the Fort Detrick barracks to barracks located at Fort Meade. The locations represent two different construction types and applications of products. As a housing unit, both barracks have similarities in enhancements and size. During our site inspections, a third objective was discussed to include desirability, leasing, and retention. An in-depth discussion begins on Page 23.

The methodology used in determining capital needs is two-fold. First, to perform an analysis regarding current physical conditions, which, through non-invasive observations and our experience in such matters, would indicate the probable remaining life of the property components. Second, the report will suggest the costs associated with capital repair and replacement over the next twenty-year period. As a product of these two functions, the report will also comment on observations made, the level of proficiency in maintaining the physical plant, deferred and preventative maintenance, and any possible life extension of the components.

When interpreting this report, the value of time should be considered. As a twenty-year period is a probable scenario based on our experiences, it is open to influences from many sources such as maintenance levels, economics, inflation of expenses, and the environment in which the property exists. Accordingly, give particular attention to suggested capital expenses during the next five-year period.

The observations made during the field inspections of **June 9, 2004** indicated that the level of service to the components is at a reasonable level. A capsule of components exhibiting liabilities, obsolescence, or deferred maintenance follows.

LIABILITIES

This report is not intended as a loss or risk assessment, however, it will comment on possible liabilities that may present a financial risk to our client. The reader will note several areas of concern explained within the text of the report.

OBSOLESCENCE

Within the text of the physical plant report pages the reader will note areas that indicate either functional or economic obsolescence. All obsolescence should be considered curable.

DEFERRED MAINTENANCE

It is obvious, in our professional opinion, that the property has maintained a responsible degree of maintenance. Given this history of operations, we did not observe, and would not expect to observe, intentionally deferred maintenance. This report suggests additional levels as an enhancement only. The subject property has a chronological age of improvements of **1 year**. In our professional opinion, the *effective age* for the improvements, enmasse, is accelerated at approximately **2 years**.

FUTURE FINANCIAL REQUIREMENTS

Our process of projecting future financial needs is presented through two methods;

We see **minimum funding** requirements as meeting anticipated expenses, or, dedicating cash in/cash out with inflation and interest income over the projected period. **The Fort Meade annual funding to meet future expenses is \$150,000 per year.**

Our second method of projecting reserve funding includes long term segregating of each site component. This rate is based on funding attrition of the components as they age, encompassing all components based on remaining use life, regardless of when actual expense may occur. This is considered the **maximum funding** level. **The Fort Meade annual funding to meet a fully funded reserve is \$275,000 per year.**

All projections are considered dependent on low inflation rates, annual interest income, and reasonably professional property management.

	Fort Meade	\$/Bedroom
Capital Needs min. annual funding;		
	\$150,000	\$260.42
Capital Needs max. annual funding;		
	\$275,000	\$477.43
Life cycle costs total-40 year		\$16,191.00
	Fort Detrick	
Capital Needs min. annual funding;		
	\$160,000	\$666.67
Capital Needs max. annual funding;		
	\$190,000	\$792.00
Life cycle costs total-40 year		\$32,601.00

To address two primary goals, this summary includes the chart above, showing the reserve rates and life cycle costs to be 2 to 3 times greater at Fort Detrick, than at Fort Meade. This is a permanent condition relative to the architecture, unit density, building products, and proficiency in construction. The reader will find a supplemental cost comparison in the Appendix section of this report.

HOW TO INTERPRET THIS DATA

The Project Profile: Each of the property components receives a capsule look at “*Effective Age*” and probable remaining use life. Effective Age is determined by original product quality, maintenance and preventative maintenance received during the in-service period, and related actual wear and tear. The capsule continues with a checklist of conditions that may be of particular interest to the reader.

	ORIGINAL LIFE	CHRONOLOGICAL AGE	EFFECTIVE AGE	USE LIFE YEARS
ASPHALT	25	15	10	15
ROOFING	20	15	17	6

SUMMARY	
DEFERRED MAINTENANCE: OBSOLESCENCE:	Observed conditions requiring maintenance considered to have been intentionally deferred. Economic obsolescence is used to describe worn out components. Functional obsolescence describes out-dated components or in utility.
LIFE EXTENSION: ALTERNATIVES:	Functions suggested to extend component use life. New or better adapted products.
COMMENTS OBSERVATIONS PREVENTATIVE MAINTENANCE & SUGGESTIONS:	Describes conditions observed, remaining use life, product specifications, and eventual timing and cost associated with replacement.

Each component receives a narrative of critical analysis, and a description of how funding and expenses are based, then recapped in the following format. This information is incorporated into the cash flow charts.

							INVENTORY & COST ANALYSIS
	QUANTITY	UNIT	UNIT VALUE	TOTAL VALUE	USE LIFE	CONSTANT SEGREGATED FUNDING	ACTUAL CASH EXPENSE & YEAR (S)
ASPHALT	1	LS	\$20,000	\$20,000	20	\$1,000 per year	\$0.00
TILE	100	SF	\$40.00	\$4,000	10	\$400 years 1-10	\$4,000 year 11

Two Types of Funding, and the Cash Flow Charts

Segregated Funding is the long-term reserve rate for each component over its useful life. Funding is established to coincide with attrition. The collective sum of all components’ segregated reserve builds the “maximum” funding level.

Dedicated or Actual Expense describes the use of existing or future funds for a planned expenditure. The collective sum of cash in / cash out builds the “minimum” suggested level of funding.

In both scenarios, the cash flow charts include current reserve balances, the impact of the current reserve rate, and a suggested rate to meet both levels of funding.

An Overview of Life Cycle Costs

Life Cycle Costing is the mathematical process of testing and evaluating products and building methods. Each of the components in this report includes a grid for probable preventative maintenance, operating maintenance, and capital expense during the next 40 years. The owner/operator analyst will be able to adjust the grid with original placement costs and actual operating costs over time. Formulas for various tests are located in the Appendix section of this report.

	LIFE SPAN		
	ORIGINAL LIFE	CHRONOLOGICAL AGE	EFFECTIVE AGE
GENERAL SITE CONDITIONS	50+	1	1
			USE LIFE YEARS
			50

	SUMMARY
<p>DEFERRED MAINTENANCE: OBsolescence: LIFE EXTENSION: ALTERNATIVES:</p> <p>COMMENTS OBSERVATIONS PREVENTATIVE MAINTENANCE & SUGGESTIONS:</p>	<p>None; services have been performed as needed.</p> <p>Management is considering the addition of a gazebo and other site amenities to address possible functional obsolescence.</p> <p>Continue inspection services to identify maintenance needs.</p> <p>The current improvements are modern and appropriate.</p> <p>Site conditions are for discussion purposes only, without being included in financial projections. The site is recently built, with some items left to finish as a builder punch list. The finish grade is relatively flat with a gentle swale, although built up near many building entries. Foot traffic controls are suggested near entry points that are observed with damages to sod. Management is currently aware of and relocating several deciduous trees planted too close to the structures. The tree is a Patented Locust Shademaster that develops a long, extensive root system capable of damage to walks and building components. Asphalt conditions include a medium grade bitumen that requires an improved finish and transition to the concrete gutters and swales. The transition is lacking in proficient roller compaction to prevent crumbling and spalling. Future expenses will require seal coating, rubberized crack filling likely at the transitions, and striping that conforms to UFAS or ADAAG guidelines for barrier free access. The first cycle should be considered for next year, repeating every four years.</p> <p>Site amenities at this time include quality sets of heavy iron tables and chairs fixed to concrete pads. Consider regular applications of a quality metal film coat to metal surfaces, and occasional use of concrete surface sealer/hardener for the concrete pads.</p> <p>The site is also improved with multiple locations of shadow box fence that encloses an air conditioning evaporator and doubles as a screen for the trash containers. After being exposed to the weather for the first year, the fence inventory now requires either a clear preservative or a pigmented acrylic stain. There is a galvanized chain link fence within the enclosure that requires minor adjustments to hardware and gates.</p> <p>Management is considering an enhancement with a gazebo and additional seating.</p>

PROPERTY PHOTOS



INVENTORY & COST ANALYSIS

	QUANTITY	UNIT	UNIT COST	TOTAL COST	USE LIFE	CONSTANT SEGREGATED FUNDING	ACTUAL CASH EXPENSE & YEAR
GENERAL SITE CONDITIONS	-	-	-	-	-	0.00	0.00
EXAMPLE: ASPHALT SEALING	72,000	SF	\$0.18	\$12,960	1	\$3,240 per year	\$12,960 yrs 2, 6, 10, 14, 18
20 YEAR PROJECTIONS							

	PREVENTATIVE MAINTENANCE	MAINTENANCE FUNCTIONS	CAPITAL COSTS	DISPOSAL
LIFE CYCLE COSTS				
GENERAL SITE CONDITIONS	-	-	-	-
EXAMPLE: ASPHALT	\$12,960 yrs 2,6,10,14,18	\$4,500 year 1	\$93,600 year 24	\$0
40 YEAR PROJECTIONS				

PHYSICAL PLANT REPORT

BUILDING ENVELOPE & IMPROVEMENTS I

	LIFE SPAN			
	ORIGINAL LIFE	CHRONOLOGICAL AGE	EFFECTIVE AGE	USE LIFE YEARS
WINDOWS & DOORS	40	1	1	40/30
BRICK ENVELOPE	100	1	2	50+

	SUMMARY
<p>DEFERRED MAINTENANCE: Services have been performed when needed without deferment.</p> <p>OBSOLESCENCE: Functional obsolescence exists within weep hole locations; stress cracks represent economic obsolescence.</p> <p>LIFE EXTENSION: Retrofit the weep holes and monitor stress cracks.</p> <p>ALTERNATIVES: None suggested; the products are modern and appropriate.</p> <p>COMMENTS OBSERVATIONS PREVENTATIVE MAINTENANCE & SUGGESTIONS:</p> <p><i>The window inventory is observed in excellent condition. Caulking costs of the infill frame is included below with the envelope. The 656 unit inventory has a replacement value of \$239,440; reserved over a full use life span of 40 years at \$5,986 per year for all years. The commercial storefront doors are experiencing problematic conditions with wind shear that has a history of loss. Stationary panels are suggested for both sides of the entry platform to deflect wind conditions, utilizing anodized panels attached to the buildings. A deflector panel of 48" would also halt the foot traffic damage to the sod; see the picture on page 6. Thirty two panels are required, at an expense of \$13,600 increasing the entry components to a value of \$52,000 reserved over 30 years at \$1,733 per year. Sporadic costs are likely to replace thermal gasket breaks; at 10% of the inventory over seven cycles during the use life of the products.</i></p> <p><i>The brick envelope requires correction of weep holes placed as high as 30" into the courses. Courses below the weep holes are observed with standing water and considerable lime efflorescence. Drill a diagonal hole, placing a plastic sleeve into the lowest mortar joint. Stress cracks are observed in two columns of Ivory Hall. The condition is prevailing but sporadic through other buildings. Prevent cyclic freeze thaw damage with a silicone caulk, and observe. Initial settlement/movement will likely subside. Placement of movement monitors is a possibility, although likely to yield little information. Mortar joint integrity is good, although an excessive amount of construction flaws are observed at transitions Future costs require replacement of control joint gaskets (15 year use life; \$120,000 total) and caulking at transitions (8 year use life; \$52,000 total) such as window frames. Silicone coatings are not suggested at this time; however, excessive settlement cracks may dictate the necessity.</i></p>	

PROPERTY PHOTOS



INVENTORY & COST ANALYSIS

	QUANTITY	UNIT	UNIT COST	TOTAL COST	USE LIFE	CONSTANT SEGREGATED FUNDING	ACTUAL CASH EXPENSE & YEAR
WINDOWS & DOORS	656	EA	\$365	\$239,440	40	\$7,719 per year	\$13,600 year 1
	16	EA	\$2,400	\$38,400	30		
	32	EA	\$425	\$13,600	30		
BRICK ENVELOPE	1	L/S	\$290,000	\$290,000	4-50+	\$14,500 per year	\$120,000 year 15 \$52,000 yrs 4, 12, 20

	PREVENTATIVE MAINTENANCE	MAINTENANCE FUNCTIONS	CAPITAL COSTS	DISPOSAL
LIFE CYCLE COSTS WINDOWS & DOORS		\$3,421 yrs 5,10,15,20,25,30,35 (attrition replacement)	\$13,600 yr 1 \$52,000 yr 30	0.00 \$17,000
BRICK ENVELOPE		\$10,000 year 1 (weep holes)	\$120,000 year 15, 30 \$52,000 yrs 4, 12, 20, 28, 36 (caulking)	0.00

PHYSICAL PLANT REPORT
BUILDING ENVELOPE & IMPROVEMENTS II

ROOFING DECKS, RAILINGS, STAIRS	LIFE SPAN			
	ORIGINAL LIFE	CHRONOLOGICAL AGE	EFFECTIVE AGE	USE LIFE YEARS
	20	1	1+	15
50	1	1	50	

	SUMMARY
<p>DEFERRED MAINTENANCE:</p> <p>OBSOLESCENCE:</p> <p>LIFE EXTENSION:</p> <p>ALTERNATIVES:</p> <p>COMMENTS</p> <p>OBSERVATIONS</p> <p>PREVENTATIVE MAINTENANCE</p> <p>&</p> <p>SUGGESTIONS:</p>	<p>None; services are provided as needed.</p> <p>Obsolescence is not indicated at this time.</p> <p>Consider an annual service contract with a qualified roofing company.</p> <p>Increase and assure ventilation of the attic cavity.</p> <p><i>The roofing system is observed to have minor issues at this time, with long term problematic conditions likely. Current observations include lifting of the ridge cap in sporadic locations, and ill fitting products in valley flashing. There are locations of fastener failure, however, minor in scope at this time. Attic ventilation should be questioned and proven. The current design is either non-existent for flow, or self-defeating. The use of ice and water shield (See Grace Construction Products) should be verified at all eave edges, pass-throughs, valleys, ridges, and rakes. Utilities passing through the attic should be insulated. The worst scenario of high attic temperatures and excessive humidity creates a shortened use life of the roof products. Issues of fastener failure become prevailing, either at the shingle or sheathing. One method to reclaim accelerated conditions includes an annual service contract with a qualified roofer. Typical services include repair of fastener failure and blow-offs, water penetrations, flashing repairs, etc. The inventory includes coverage of 100,138 square feet of surface area; replaced at \$4.75 with ice and water shield. Phased replacement and optimum use life requires 17 years of funding at \$27,980 per year.</i></p> <p><i>There are no balconies, stairs, or decks. The entries are, however, improved with multi-step concrete entries finished with an iron hand rail. Operating maintenance should include periodic applications of a concrete sealer/hardener, and a quality metal film coat. No replacement costs are suggested. The life cycle costs include the projected maintenance expenses every 5 years.</i></p>

PROPERTY PHOTOS



INVENTORY & COST ANALYSIS

ROOFING DECKS, RAILINGS	QUANTITY	UNIT	UNIT COST	TOTAL COST	USE LIFE	CONSTANT SEGREGATED FUNDING	ACTUAL CASH EXPENSE & YEAR
		100,138	SF	\$4.75	\$475,656	17	\$27,980 per year
	16	EA	8,500	\$136,000	50	\$2,720 per year	0.00

LIFE CYCLE COSTS	PREVENTATIVE MAINTENANCE	MAINTENANCE FUNCTIONS	CAPITAL COSTS	DISPOSAL
ROOFING	\$7,500 per year		\$425,587 year 18, 38 (cyclic replacement)	\$50,069
DECKS, RAILINGS		\$5,200 years 3,8,13,18,23,28,33,38 (surface maintenance)		

PHYSICAL PLANT REPORT
BUILDING ENVELOPE & IMPROVEMENTS III

	LIFE SPAN			
	ORIGINAL LIFE	CHRONOLOGICAL AGE	EFFECTIVE AGE	USE LIFE YEARS
ENVELOPE DETAIL	40	1	1	35+
GUTTERS/CONDUCTORS	40	1	1	35+
SECURITY LIGHTING	40	1	1	35+

	SUMMARY
<p>DEFERRED MAINTENANCE: None; services have been performed.</p> <p>OBsolescence: None at this time.</p> <p>LIFE EXTENSION: Continue regular inspections to identify service needs.</p> <p>ALTERNATIVES: None suggested; the existing components are appropriate for the use intended.</p> <p>COMMENTS</p> <p>OBSERVATIONS</p> <p>PREVENTATIVE MAINTENANCE & SUGGESTIONS:</p>	<p><i>There are several items of detail as part of the siding elevations, including louvered vents, EIFS on the gable of the dormers, and anodized aluminum trim. Current conditions are like new without observed issues. Future needs will likely be dependent on the proficiency in maintenance of related components, such as caulking transitions, film coat, ventilation of attic spaces, etc. The EIFS systems typically require renewed film coat every 8 to 10 years, or an application of pigmented product. Pricing is based on 4 locations each building of 225 square feet; 7,200 square feet total inventory, at \$4.50 per square foot, \$32,400 required in years 9 & 18. The reserve rate is \$3,600 per year for all years. Metal surfaces may remain in use for the long term without a need for film coat.</i></p> <p><i>The gutter and conductor inventory is in good condition at this time. Fastening pins will require periodic service, especially if ice dams compromise structural materials. Current observations include suspect pitch of the trays, rubber seams that will require proving, and conductors that require regular inspections of hardware. The inventory includes 3,408 of gutter trays valued at \$42,600; and conductors valued at \$16,800. The reserve rate is \$1,697 per year.</i></p> <p><i>The security lighting is in excellent condition. The 80-unit inventory will be impacted by moisture infiltration and heat conditions over the use period. If serviced correctly, especially at the fixture drains and seals, the products will operate for 40 or more years. The inventory is valued at \$22,000; reserved over 40 years at \$550 each year.</i></p>

PROPERTY PHOTOS



INVENTORY & COST ANALYSIS

	QUANTITY	UNIT	UNIT COST	TOTAL COST	USE LIFE	CONSTANT SEGREGATED FUNDING	ACTUAL CASH EXPENSE & YEAR
ENVELOPE DETAIL	1	L/S	\$72,000	\$72,000	20+	\$3,600 per year	\$32,400 yrs 9 & 18
GUTTERS/CONDUCTORS	1	L/S	\$33,940	\$33,940	20+	\$1,697 per year	0.00
SECURITY LIGHTING	1	L/S	\$11,000	\$11,000	20+	\$550 per year	0.00

	PREVENTATIVE MAINTENANCE	MAINTENANCE FUNCTIONS	CAPITAL COSTS	DISPOSAL
ENVELOPE DETAIL		\$32,400 yrs 9, 18, 27, 36	(EIFS service)	
GUTTERS/CONDUCTORS		\$5,000 yrs 5, 10, 15, 20, 25, 30, 35	(refasten and repair)	
SECURITY LIGHTING	-			-

**PHYSICAL PLANT REPORT
INTERIOR COMMON AREA I**

	LIFE SPAN			
	ORIGINAL LIFE	CHRONOLOGICAL AGE	EFFECTIVE AGE	USE LIFE YEARS
COMMON HALLWAYS	35	1	1	30+
DÉCOR	7	1	1	6
COMMON AREA MISC.	20-50	1	1	20-50

	SUMMARY
DEFERRED MAINTENANCE:	None; services have been performed as needed.
OBsolescence:	Expect cyclic obsolescence of décor.
LIFE EXTENSION:	Continue the current service and housekeeping practices and policies.
ALTERNATIVES:	None suggested; the products are appropriate.
COMMENTS	<i>The common hallways</i> are finished with a vinyl composite tile, as are the entry foyers and stairway landings. Observations include excellent housekeeping that includes machine waxing. Minor issues are questioned by the staff, including small breaks as the tile terminates near or under heating systems, and the underlayment settles. The condition will likely lessen as movement subsides. The inventory includes 23,520 square feet of coverage, improved at \$2.75 per square foot. Total value is \$64,680. The 25 year use life requires an annual reserve rate of \$2,587 per year.
OBSERVATIONS	<i>The décor includes</i> painted sheetrock walls, doors, and door frames. Stairs and hand rails are also painted. The stairs and rails are made of heavy steel, with a diamondplate stair tread that will remain in service the life of the building. The décor inventory includes acoustical ceilings and decorative wall sconce lighting. All the items of inventory are capable of indefinite use, with replacement only to smaller detail items resulting from damage. Accordingly, this line item cycles the interior painting at \$11,500 per building; \$92,000 total cycle costs in years 6, 13, & 20. The annual reserve rate is \$13,143 for all years. Management would be best advised to increase the quality of film coat to a more durable, washable product.
PREVENTATIVE MAINTENANCE & SUGGESTIONS:	<i>The miscellaneous category</i> includes the mail systems, and the locking passage sets of the units. The mail systems are capable of 50 year use life; with a value of \$85 per box, \$57,120 total value reserved over 50 years at \$1,142 each year. The passage sets will wear within 25 years, and exhibit a variety of maladies. Replacement value is \$83,520 for the 576 units, reserved over 25 years at \$3,341 per year.

PROPERTY PHOTOS



	INVENTORY & COST ANALYSIS						
	QUANTITY	UNIT	UNIT COST	TOTAL COST	USE LIFE	CONSTANT SEGREGATED FUNDING	ACTUAL CASH EXPENSE & YEAR
COMMON HALLWAYS	23,520	SF	\$2.75	\$64,680	20+	\$2,587 per year	0.00
DÉCOR	3	EA	\$92,000	\$276,000	6+	\$13,143 per year	\$92,000 yrs 6, 13, 20
COMMON AREA MISC.	1	L/S	\$89,660	\$89,660	20+	\$4,483 per year	0.00

LIFE CYCLE COSTS	PREVENTATIVE MAINTENANCE	MAINTENANCE FUNCTIONS	CAPITAL COSTS	DISPOSAL
COMMON HALLWAYS			\$64,680 yr 25	
DÉCOR		(cyclic painting)	\$92,000 yrs 6, 13, 20, 27, 34	
COMMON AREA MISC.		(lock services) \$1,500 yrs 12-24	\$83,520 year 25	

	LIFE SPAN			
	ORIGINAL LIFE	CHRONOLOGICAL AGE	EFFECTIVE AGE	USE LIFE YEARS
HEATING SYSTEMS	50	1	1	50
DOMESTIC HOT WATER	20	1	1	19

	SUMMARY
DEFERRED MAINTENANCE:	None; proficient services have been provided.
OBSOLESCENCE:	None at this time.
LIFE EXTENSION:	Continue the service level with professional contractors. Continue water treatment.
ALTERNATIVES:	None suggested; the current products and applications are appropriate and modern.
COMMENTS	<p><i>The heating system</i> includes cast iron sectional boilers. The natural gas fired Smith boiler is a quality product capable of at least 40 year use with reasonable maintenance procedures. Follow the manufacturer's suggested maintenance plan to protect the long term warranty. The client should determine the cause of the boiler being at operating temp on an 85 degree day during inspection. Controls are also modern at this time; requiring retrofits in years 10 & 20 at an expense of \$2,500 each unit. The inventory value is \$212,000; reserved over 35 years at \$6,058 per year.</p> <p><i>The hot water systems</i> include two PVI Industries high-recovery natural gas hot water boilers in each building. Each boiler is self-contained with 175 gallon storage. The tanks are either nickel or polymer coated, and claimed by the manufacturer capable of achieving long term use. Replacement value is \$60,000; reserved over 19 years at \$3,158 per year. Retrofit expenses are included for year 20. Normal maintenance services should inspect and prove barometric dampers that were observed stuck in the fully open position.</p>
OBSERVATIONS	
PREVENTATIVE MAINTENANCE & SUGGESTIONS:	

PROPERTY PHOTOS



INVENTORY & COST ANALYSIS

	QUANTITY	UNIT	UNIT COST	TOTAL COST	USE LIFE	CONSTANT SEGREGATED FUNDING	ACTUAL CASH EXPENSE & YEAR
HEATING SYSTEMS	1	L/S	\$121,160	\$121,160	20+	\$6,058 per year	\$20,000 yrs 10 & 20
DOMESTIC HOT WATER	1	L/S	\$63,160	\$63,160	19+	\$3,158 per year	\$60,000 year 20

	PREVENTATIVE MAINTENANCE	MAINTENANCE FUNCTIONS	CAPITAL COSTS	DISPOSAL
LIFE CYCLE COSTS				
HEATING SYSTEMS	\$2,400 per year	\$12,000 years 15 & 30	\$20,000 yrs 10, 20, 30 (control up-dates)	
DOMESTIC HOT WATER	\$2,400 per year		\$56,000 year 20	\$4,000
	(boiler annual service)	(gasket replacements)		

PHYSICAL PLANT REPORT MECHANICAL SYSTEMS II

	LIFE SPAN			
	ORIGINAL LIFE	CHRONOLOGICAL AGE	EFFECTIVE AGE	USE LIFE YEARS
COOLING SYSTEMS	40	1	1	35+
VENTILATION	40	1	1	35+
MECHANICAL MISC.	10/20/50+	1	1	5/19/50+

	SUMMARY
<p>DEFERRED MAINTENANCE: None; systems are maintained proficiently.</p> <p>OBSOLESCENCE: Expect cyclic obsolescence within fire safety systems.</p> <p>LIFE EXTENSION: Continue services with professional contractors.</p> <p>ALTERNATIVES: None suggested; the existing components are modern and appropriate.</p> <p>COMMENTS OBSERVATIONS PREVENTATIVE MAINTENANCE & SUGGESTIONS:</p>	<p><i>The cooling systems</i> include efficient zone chillers and fan coil units tied to a central evaporator. The fan coil system is reverse cycle, also utilizing the hydronic system during heating periods. Replacement of the components is expected to be minor and sporadic during the use term with qualified maintenance. The life cycle costs include a ten percent attrition over the use period, with an annual expense of \$3,500 for preventative maintenance. The reserve rate addresses inventory value of \$625,000; at \$15,625 each year over a period of 40 years.</p> <p><i>Ventilation systems</i> include air handling units within the utility closets. The components are of reasonable product quality, and expected to achieve long term use life with only minor expenses. Ventilation is also shown with a ten percent attrition, and annual expenses of \$1,000 for preventative maintenance. The inventory value is estimated at \$350,000 for all buildings.</p> <p><i>The miscellaneous mechanical</i> inventory includes fire safety systems, fresh water pumping, and circulating hydronic systems. Each system includes related controls. The fire safety system includes full suppression with modern controls including smoke and rate of rise heat detectors tied to a central annunciation and location panel. There is battery back up and automatic call forwarding included with the system. Typical costs include regular periods of enhancement to address attrition as well as modernization; \$2,500 per year with expenses of \$12,500 in years 5, 10, 15, & 20.</p> <p>Fresh water pumping systems are, by nature, typically accelerated due to constant use. The \$9,500 system in each building has a total value of \$76,000 reserved over 19 years at \$4,000 each year. One cycle of expense is included for year 20.</p> <p>The hydronic system is a two-pipe system, utilized throughout the year for heating and cooling. The system receives water treatment as preventative maintenance. Use life is at least 50 years; addressed with a token reserve rate of \$500 per year. The mechanical rooms are proficiently finished with pipe insulation, pipe identification and flow; and a complete array of product information.</p>

PROPERTY PHOTOS



INVENTORY & COST ANALYSIS

	QUANTITY	UNIT	UNIT COST	TOTAL COST	USE LIFE	CONSTANT SEGREGATED FUNDING	ACTUAL CASH EXPENSE & YEAR
	COOLING SYSTEMS	1	L/S	\$312,500	\$312,500	20+	\$15,625 per year
VENTILATION	1	L/S	\$140,000	\$140,000	20+	\$7,000 per year	0.00
MECHANICAL MISC.	1	L/S	\$140,000	\$140,000	5+	\$7,000 per year	\$12,500 yrs 5, 10, 15, 20 \$76,000 year 20

LIFE CYCLE COSTS	PREVENTATIVE MAINTENANCE	MAINTENANCE FUNCTIONS	CAPITAL COSTS	DISPOSAL
COOLING SYSTEMS	\$3,500 per year (annual services)		\$1,563 per year	
VENTILATION	\$1,000 per year (annual services)		\$700 per year	
MECHANICAL MISC.	\$15,000 per year (annual services)		\$12,500 yrs 5,10,15,20,25,30,35 \$76,000 year 20	\$5,000

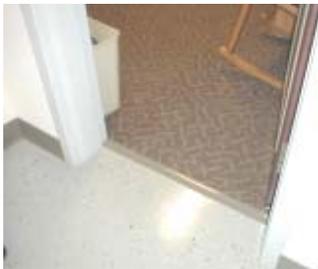
PHYSICAL PLANT REPORT

RESIDENCE UNIT IMPROVEMENTS

	LIFE SPAN			
	ORIGINAL LIFE	CHRONOLOGICAL AGE	EFFECTIVE AGE	USE LIFE YEARS
FLOORING	7/25/40+	1	1	6/24
KITCHEN AND BATH	30	1	1	25+
DÉCOR	7	1	1	6

	SUMMARY
<p>DEFERRED MAINTENANCE: None; services are performed as needed.</p> <p>OBSOLESCENCE: None at this time; décor is anticipated to be cyclic.</p> <p>LIFE EXTENSION: Continue the current level of service.</p> <p>ALTERNATIVES: None suggested; the products are observed with reasonable quality.</p> <p>COMMENTS OBSERVATIONS PREVENTATIVE MAINTENANCE & SUGGESTIONS:</p>	<p><i>Flooring</i> includes a composite vinyl tile in the kitchen/entry areas. Ceramic tile is improved in bathrooms and vanity locations. Carpeting is improved in the bedroom. Expected use life varies from 7 years to over 40 years, although the period can fluctuate depending on the amount of use and care/abuse. Inventory values include \$286,720 for 8,960 SY of carpeting at \$32; reserved over 7 years at \$40,960 per year. Cycle years are years 6, 13, & 20. The vinyl tile is valued at \$129,600; reserved over 25 years with \$5,184 per year. Ceramic tile is estimated at \$201,600; requiring a reserve rate of \$4,032 per year. All of the inventory will vary in expense years, depending on turnover, accelerated damages, and availability of the units.</p> <p><i>The kitchens</i> are improved with base cabinets and stainless steel sinks, wall hung cabinets, and composite countertop. Product quality is good, allowing for a use life of up to 30 years. Bath vanities include a matching product. Estimated value is \$3,200 per unit; \$1,843,200 total value, reserved over 30 years at \$61,440</p> <p><i>Decoration</i> includes painted sheet rock walls, porcelain tile bath wall, and window dressing. The painting and window dressing will require enhancement on an average 7 year cycle; valued at \$600 per unit; \$345,600 total value reserved over 7 years at \$49,371 per year. Cyclic expenses are shown in years 6, 13, & 20, although actual timing of expenses will vary.</p>

PROPERTY PHOTOS



INVENTORY & COST ANALYSIS

	QUANTITY	UNIT	UNIT COST	TOTAL COST	USE LIFE	CONSTANT SEGREGATED FUNDING	ACTUAL CASH EXPENSE & YEAR
FLOORING	1	L/S	\$1,003,520	\$1,003,520	6+	\$50,176 per year	\$286,720 yrs 6, 13, 20
KITCHEN AND BATH	1	L/S	\$1,228,800	\$1,228,800	20+	\$61,440 per year	0.00
DÉCOR	1	L/S	\$987,420	\$987,420	6+	\$49,371 per year	\$345,600 yrs 6, 13, 20

	PREVENTATIVE MAINTENANCE	MAINTENANCE FUNCTIONS	CAPITAL COSTS	DISPOSAL
LIFE CYCLE COSTS				
FLOORING		\$5,000 per year	\$286,720 yrs 6, 13, 20, 27, 34	
KITCHEN AND BATH			\$1,843,200 year 30	
DÉCOR		\$500 per year	\$345,600 yrs 6, 13, 20, 27, 34	
		(contract cleaning)		

PHYSICAL PLANT REPORT

RECREATION & SERVICE BUILDING

	LIFE SPAN			
	ORIGINAL LIFE	CHRONOLOGICAL AGE	EFFECTIVE AGE	USE LIFE YEARS
FINISH SYSTEMS	15	1	1	14+
MECHANICAL SYSTEMS	40	1	1	35+
ENHANCEMENTS	10	1	1	9

	SUMMARY
<p>DEFERRED MAINTENANCE:</p> <p>OBSOLESCENCE:</p> <p>LIFE EXTENSION:</p> <p>ALTERNATIVES:</p> <p>COMMENTS</p> <p>OBSERVATIONS</p> <p>PREVENTATIVE MAINTENANCE & SUGGESTIONS:</p>	<p>None; services have been provided as needed.</p> <p>None at this time.</p> <p>Continue the current level of service.</p> <p>None suggested; the facility is modern and attractive.</p> <p><i>Finish systems</i> of the community center include attractive ceramic tile floors in the open function area, kitchen, and baths. Carpet squares complete the game and TV areas. Walls are painted, with framed reproduction art and photos. Cyclic costs include painting enhancement every 7 years at \$3,500 each cycle, and carpet replacement in years 9 & 20 of \$750. The reserve rate is shown at \$1,000 per year.</p> <p><i>Mechanical systems</i> include a packaged York air conditioner and air system, domestic hot water boiler, and a Smith cast iron sectional boiler. Mechanical systems exhibit the same proficiency as found in the residential buildings. The domestic hot water boiler will require replacement every 10-12 years at an expense of \$1,500 each cycle, with all other major systems achieving at least 30 additional years of service. The annual reserve rate is \$4,000 per year.</p> <p><i>Enhancements</i> include extensive kitchen cabinets and counters, two bathrooms finished with ceramic tile, and a built in reception desk. Enhancement or replacement is not anticipated for at least 25 years, requiring an annual reserve rate of \$448 per year for all years.</p>

PROPERTY PHOTOS



INVENTORY & COST ANALYSIS

	QUANTITY	UNIT	UNIT COST	TOTAL COST	USE LIFE	CONSTANT SEGREGATED FUNDING	ACTUAL CASH EXPENSE & YEAR
FINISH SYSTEMS	1	L/S	\$20,000	\$20,000	6+	\$1,000 per year	\$3,500 yrs 6,13,20; \$750 yrs 9 & 20
MECHANICAL SYSTEMS	1	L/S	\$80,000	\$80,000	9+	\$4,000 per year	\$1,500 yrs 9 & 20
ENHANCEMENTS	1	L/S	\$8,960	\$8,960	20+	\$448 per year	0.00

LIFE CYCLE COSTS	PREVENTATIVE MAINTENANCE	MAINTENANCE FUNCTIONS	CAPITAL COSTS	DISPOSAL
FINISH SYSTEMS			\$3,500 yrs 6,13,20, 27,34; \$750 yrs 9, 20, 30	
MECHANICAL SYSTEMS			\$1,500 yrs 9, 20, 30	
ENHANCEMENTS				

This section of the report describes conditions, which form the basis of establishing a funding level for unknown conditions. Typically, these items would include components of the improvements that are unavailable for inspection and evaluation of conditions. It is not based on a percentage or other factor that forms a simple cushion.

The WATER SUPPLY LINES, PLUMBING, and SANITARY FACILITIES, FLUES, CHASES, DRAINS, ELECTRICAL SUPPLY, CONDUITS, ETC., do not have a history of failure and can be expected to attain a normal life span well in excess of an additional fifty years and beyond. The degree of failure and service can only be determined over time. Funding an annual contingency is suggested at a level of **\$1,500 per year**.

The inventory also includes the **STRUCTURE AND FOUNDATION**. These locations are unavailable for inspection or examination, although certain aspects of conditions are known. Specifically, field inspections observed minor settlement and stress cracks, believed to be relative to the first year of use. Movement is expected to become limited or to stop completely if similar to other new structures. Actual performance should be monitored closely by management or employ the services of a structural engineer and possible use of movement monitors. The byproduct of movement will need to be addressed as an operating expense, including interior sheet rock finish and brick repairs/caulking on the exterior. We suggest annual funding, as a minimum for all years, of **\$1,000**. The rate should be increased if movement continues after year 2.

Comparing the two differing types of structural components of Forts Meade and Detrick, the future needs are unknown. However, costs are expected to be negligible, and dependent on the proficiency of maintaining related components such as the envelope integrity, roofing, etc. Both construction types are expected to achieve at least 100-year use life.

TOTAL RECOMMENDED FUNDING: \$2,500 PER YEAR.

Although this amount may be arbitrary in scope, it creates funding that can be adjusted in future updates after the performance history is reviewed.

**Fort Meade
June 9, 2004
SEGREGATED FUNDING PRIOR TO APPLICATION OF EXISTING RESERVE ACCOUNT BALANCES**

COMPONENT	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
windows/doors	7,719	7,719	7,719	7,719	7,719	7,719	7,719	7,719	7,719	7,719	7,719	7,719	7,719	7,719	7,719	7,719	7,719	7,719	7,719	7,719
brick envelope	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500
roofing	27,980	27,980	27,980	27,980	27,980	27,980	27,980	27,980	27,980	27,980	27,980	27,980	27,980	27,980	27,980	27,980	27,980	27,980	27,980	27,980
decks, railings	2,720	2,720	2,720	2,720	2,720	2,720	2,720	2,720	2,720	2,720	2,720	2,720	2,720	2,720	2,720	2,720	2,720	2,720	2,720	2,720
envelope detail	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600	3,600
gutters, conductors	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697	1,697
security lighting	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550	550
common hallways	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587	2,587
décor	13,143	13,143	13,143	13,143	13,143	13,143	13,143	13,143	13,143	13,143	13,143	13,143	13,143	13,143	13,143	13,143	13,143	13,143	13,143	13,143
common area misc	4,483	4,483	4,483	4,483	4,483	4,483	4,483	4,483	4,483	4,483	4,483	4,483	4,483	4,483	4,483	4,483	4,483	4,483	4,483	4,483
heating systems	6,058	6,058	6,058	6,058	6,058	6,058	6,058	6,058	6,058	6,058	6,058	6,058	6,058	6,058	6,058	6,058	6,058	6,058	6,058	6,058
domestic hot water	3,158	3,158	3,158	3,158	3,158	3,158	3,158	3,158	3,158	3,158	3,158	3,158	3,158	3,158	3,158	3,158	3,158	3,158	3,158	3,158
cooling systems	15,625	15,625	15,625	15,625	15,625	15,625	15,625	15,625	15,625	15,625	15,625	15,625	15,625	15,625	15,625	15,625	15,625	15,625	15,625	15,625
ventilation	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000
mechanical misc.	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000
unit flooring	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176	50,176
kitchen & baths	61,440	61,440	61,440	61,440	61,440	61,440	61,440	61,440	61,440	61,440	61,440	61,440	61,440	61,440	61,440	61,440	61,440	61,440	61,440	61,440
décor	49,371	49,371	49,371	49,371	49,371	49,371	49,371	49,371	49,371	49,371	49,371	49,371	49,371	49,371	49,371	49,371	49,371	49,371	49,371	49,371
rec finish	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
rec mechanical	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
rec enhancements	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448
contingency	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reserve	286,755	286,755	286,755	286,755	286,755	286,755	286,755	286,755	286,755	286,755	286,755	286,755	286,755	286,755	286,755	286,755	286,755	286,755	286,755	286,755
Cash Expense	13,600	0	0	52,000	12,500	727,820	0	0	34,650	32,500	0	52,000	727,820	0	132,500	0	0	508,056	0	950,570
Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024

CONCLUSION, PART B
CURRENT FUNDING VS. A FULLY-FUNDED RESERVE

Fort Meade
June 9, 2004
THE CURRENT LEVEL OF FUNDING IS SHOWN vs. A FULLY FUNDED RESERVE

Year	Cash Balance Forwarded	Annual Funding	Actual Cash Expense	Cash Shortfall	Cash Balance with 3% interest	Reserve Required	Coverage Shortfall
2005	\$5,000	\$0	\$13,600	(\$8,600)	(\$8,600)	\$286,755	(\$295,355)
2006	(\$8,600)	\$0	\$0	(\$8,600)	(\$8,600)	\$559,910	(\$568,510)
2007	(\$8,600)	\$0	\$0	(\$8,600)	(\$8,600)	\$846,665	(\$855,265)
2008	(\$8,600)	\$0	\$52,000	(\$60,600)	(\$60,600)	\$1,133,420	(\$1,194,020)
2009	(\$60,600)	\$0	\$12,500	(\$73,100)	(\$73,100)	\$1,368,175	(\$1,441,275)
2010	(\$73,100)	\$0	\$727,820	(\$800,920)	(\$800,920)	\$1,642,430	(\$2,443,350)
2011	(\$800,920)	\$0	\$0	(\$800,920)	(\$800,920)	\$1,201,365	(\$2,002,285)
2012	(\$800,920)	\$0	\$0	(\$800,920)	(\$800,920)	\$1,488,120	(\$2,289,040)
2013	(\$800,920)	\$0	\$34,650	(\$835,570)	(\$835,570)	\$1,774,875	(\$2,610,445)
2014	(\$835,570)	\$0	\$32,500	(\$868,070)	(\$868,070)	\$2,026,980	(\$2,895,050)
2015	(\$868,070)	\$0	\$0	(\$868,070)	(\$868,070)	\$2,281,235	(\$3,149,305)
2016	(\$868,070)	\$0	\$52,000	(\$920,070)	(\$920,070)	\$2,567,990	(\$3,488,060)
2017	(\$920,070)	\$0	\$727,820	(\$1,647,890)	(\$1,647,890)	\$2,802,745	(\$4,450,635)
2018	(\$1,647,890)	\$0	\$0	(\$1,647,890)	(\$1,647,890)	\$2,361,680	(\$4,009,570)
2019	(\$1,647,890)	\$0	\$132,500	(\$1,780,390)	(\$1,780,390)	\$2,648,435	(\$4,428,825)
2020	(\$1,780,390)	\$0	\$0	(\$1,780,390)	(\$1,780,390)	\$2,802,690	(\$4,583,080)
2021	(\$1,780,390)	\$0	\$0	(\$1,780,390)	(\$1,780,390)	\$3,089,445	(\$4,869,835)
2022	(\$1,780,390)	\$0	\$508,056	(\$2,288,446)	(\$2,288,446)	\$3,376,200	(\$5,664,646)
2023	(\$2,288,446)	\$0	\$0	(\$2,288,446)	(\$2,288,446)	\$3,154,899	(\$5,443,345)
2024	(\$2,288,446)	\$0	\$950,570	(\$3,239,016)	(\$3,239,016)	\$3,441,654	(\$6,680,670)
CYCLE END TOTALS:		\$0	\$3,244,016		(\$3,239,016)	\$3,441,654	(\$6,680,670)

Net interest is compounded at 3% per year, allowing two percent to be allocated for inflation of expenses. See appendix for information regarding inflation. This scenario is good for a limited time approximately three years. All projections require regular updates.

CONCLUSION, PART C
SUGGESTED LEVEL OF FUNDING FOR A FULLY-FUNDED RESERVE

Fort Meade
June 9, 2004
THE SUGGESTED LEVEL OF FUNDING IS SHOWN vs. A FULLY FUNDED RESERVE

Year	Cash Balance Forwarded	Annual Funding	Actual Cash Expense	Cash Shortfall	Cash Balance with 3% interest	Reserve Required	Coverage Shortfall
2005	\$5,000	\$275,000	\$13,600	\$0	\$274,392	\$286,755	(\$12,363)
2006	\$274,392	\$275,000	\$0	\$0	\$565,874	\$559,910	\$0
2007	\$565,874	\$275,000	\$0	\$0	\$866,100	\$846,665	\$0
2008	\$866,100	\$275,000	\$52,000	\$0	\$1,121,773	\$1,133,420	(\$11,647)
2009	\$1,121,773	\$275,000	\$12,500	\$0	\$1,425,801	\$1,368,175	\$0
2010	\$1,425,801	\$275,000	\$727,820	\$0	\$1,002,171	\$1,642,430	(\$640,259)
2011	\$1,002,171	\$275,000	\$0	\$0	\$1,315,486	\$1,201,365	\$0
2012	\$1,315,486	\$275,000	\$0	\$0	\$1,638,200	\$1,488,120	\$0
2013	\$1,638,200	\$275,000	\$34,650	\$0	\$1,934,907	\$1,774,875	\$0
2014	\$1,934,907	\$275,000	\$32,500	\$0	\$2,242,729	\$2,026,980	\$0
2015	\$2,242,729	\$275,000	\$0	\$0	\$2,593,261	\$2,281,235	\$0
2016	\$2,593,261	\$275,000	\$52,000	\$0	\$2,900,749	\$2,567,990	\$0
2017	\$2,900,749	\$275,000	\$727,820	\$0	\$2,521,367	\$2,802,745	(\$281,378)
2018	\$2,521,367	\$275,000	\$0	\$0	\$2,880,258	\$2,361,680	\$0
2019	\$2,880,258	\$275,000	\$132,500	\$0	\$3,113,440	\$2,648,435	\$0
2020	\$3,113,440	\$275,000	\$0	\$0	\$3,490,093	\$2,802,690	\$0
2021	\$3,490,093	\$275,000	\$0	\$0	\$3,878,046	\$3,089,445	\$0
2022	\$3,878,046	\$275,000	\$508,056	\$0	\$3,754,340	\$3,376,200	\$0
2023	\$3,754,340	\$275,000	\$0	\$0	\$4,150,220	\$3,154,899	\$0
2024	\$4,150,220	\$275,000	\$950,570	\$0	\$3,578,890	\$3,441,654	\$0
CYCLE END TOTALS:		\$5,500,000	\$3,244,016	\$0	\$3,578,890	\$3,441,654	\$0

Net interest is compounded at 3% per year, allowing two percent to be allocated for inflation of expenses. See appendix for information regarding inflation. This scenario is good for a limited time approximately three years. All projections require regular up-dates.

**Fort Meade
June 9, 2004
DEDICATED EXPENSES PRIOR TO APPLICATION OF EXISTING RESERVE ACCOUNT BALANCES**

COMPONENT	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
windows/doors	13,600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
brick envelope	0	0	0	52,000	0	0	0	0	0	0	0	52,000	0	0	120,000	0	0	0	0	52,000
roofing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	475,656	0	0
decks, railings	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
envelope detail	0	0	0	0	0	0	0	0	32,400	0	0	0	0	0	0	0	0	32,400	0	0
gutters, conductors	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
security lighting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
common hallways	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
décor	0	0	0	0	0	92,000	0	0	0	0	0	0	92,000	0	0	0	0	0	0	92,000
common area misc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
heating systems	0	0	0	0	0	0	0	0	0	20,000	0	0	0	0	0	0	0	0	0	20,000
domestic hot water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60,000
cooling systems	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ventilation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
mechanical misc.	0	0	0	0	12,500	0	0	0	0	12,500	0	0	0	0	12,500	0	0	0	0	88,500
unit flooring	0	0	0	0	0	286,720	0	0	0	0	0	0	286,720	0	0	0	0	0	0	286,720
kitchen & baths	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
décor	0	0	0	0	0	345,600	0	0	0	0	0	0	345,600	0	0	0	0	0	0	345,600
rec finish	0	0	0	0	0	3,500	0	0	750	0	0	0	3,500	0	0	0	0	0	0	4,250
rec mechanical	0	0	0	0	0	0	0	0	1,500	0	0	0	0	0	0	0	0	0	0	1,500
rec enhancements	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash Expense	13,600	0	0	52,000	12,500	727,820	0	0	34,650	32,500	0	52,000	727,820	0	132,500	0	0	508,056	0	950,570
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024

CONCLUSION, PART E
CURRENT LEVEL OF FUNDING VS. ACTUAL EXPENSES

Fort Meade
June 9, 2004
THE CURRENT LEVEL OF FUNDING IS SHOWN vs. TIMING OF DEDICATED EXPENSES

Year	Cash Balance Forwarded	Annual Funding	Actual Cash Expense	Cash Shortfall	Cash Balance with 3% interest
2005	\$5,000	\$0	\$13,600	(\$8,600)	(\$8,600)
2006	(\$8,600)	\$0	\$0	(\$8,600)	(\$8,600)
2007	(\$8,600)	\$0	\$0	(\$8,600)	(\$8,600)
2008	(\$8,600)	\$0	\$52,000	(\$60,600)	(\$60,600)
2009	(\$60,600)	\$0	\$12,500	(\$73,100)	(\$73,100)
2010	(\$73,100)	\$0	\$727,820	(\$800,920)	(\$800,920)
2011	(\$800,920)	\$0	\$0	(\$800,920)	(\$800,920)
2012	(\$800,920)	\$0	\$0	(\$800,920)	(\$800,920)
2013	(\$800,920)	\$0	\$34,650	(\$835,570)	(\$835,570)
2014	(\$835,570)	\$0	\$32,500	(\$868,070)	(\$868,070)
2015	(\$868,070)	\$0	\$0	(\$868,070)	(\$868,070)
2016	(\$868,070)	\$0	\$52,000	(\$920,070)	(\$920,070)
2017	(\$920,070)	\$0	\$727,820	(\$1,647,890)	(\$1,647,890)
2018	(\$1,647,890)	\$0	\$0	(\$1,647,890)	(\$1,647,890)
2019	(\$1,647,890)	\$0	\$132,500	(\$1,780,390)	(\$1,780,390)
2020	(\$1,780,390)	\$0	\$0	(\$1,780,390)	(\$1,780,390)
2021	(\$1,780,390)	\$0	\$0	(\$1,780,390)	(\$1,780,390)
2022	(\$1,780,390)	\$0	\$508,056	(\$2,288,446)	(\$2,288,446)
2023	(\$2,288,446)	\$0	\$0	(\$2,288,446)	(\$2,288,446)
2024	(\$2,288,446)	\$0	\$950,570	(\$3,239,016)	(\$3,239,016)
CYCLE END TOTALS:		\$0	\$3,244,016		(\$3,239,016)

Net interest is compounded at 3% per year, allowing two percent to be allocated for inflation of expenses. See appendix for information regarding inflation. This scenario is good for a limited time approximately three years. All projections require regular updates.

CONCLUSION, PART F
SUGGESTED FUNDING LEVEL TO MEET DEDICATED EXPENSES

Fort Meade
June 9, 2004
SUGGESTED FUNDING LEVEL TO MEET DEDICATED EXPENSES

Year	Cash Balance Forwarded	Annual Funding	Actual Cash Expense	Cash Shortfall	Cash Balance with 3% interest		
2005	\$5,000	\$150,000	\$13,600	\$0	\$145,642		
2006	\$145,642	\$150,000	\$0	\$0	\$304,511		
2007	\$304,511	\$150,000	\$0	\$0	\$468,147		
2008	\$468,147	\$150,000	\$52,000	\$0	\$583,131		
2009	\$583,131	\$150,000	\$12,500	\$0	\$742,250		
2010	\$742,250	\$150,000	\$727,820	\$0	\$169,363		
2011	\$169,363	\$150,000	\$0	\$0	\$328,944		
2012	\$328,944	\$150,000	\$0	\$0	\$493,312		
2013	\$493,312	\$150,000	\$34,650	\$0	\$626,922		
2014	\$626,922	\$150,000	\$32,500	\$0	\$766,755		
2015	\$766,755	\$150,000	\$0	\$0	\$944,257		
2016	\$944,257	\$150,000	\$52,000	\$0	\$1,073,525		
2017	\$1,073,525	\$150,000	\$727,820	\$0	\$510,576		
2018	\$510,576	\$150,000	\$0	\$0	\$680,393		
2019	\$680,393	\$150,000	\$132,500	\$0	\$718,830		
2020	\$718,830	\$150,000	\$0	\$0	\$894,895		
2021	\$894,895	\$150,000	\$0	\$0	\$1,076,242		
2022	\$1,076,242	\$150,000	\$508,056	\$0	\$739,731		
2023	\$739,731	\$150,000	\$0	\$0	\$916,423		
2024	\$916,423	\$150,000	\$950,570	\$0	\$119,329		
CYCLE END TOTALS:		\$3,000,000	\$3,244,016	\$0	\$119,329		

Net interest is compounded at 3% per year, allowing two percent to be allocated for inflation of expenses. See appendix for information regarding inflation. This scenario is good for a limited time approximately three years. All projections require regular updates.

DESIRABILITY, LEASING, AND RETENTION

Client representatives posed the question of how to create desirability of the units to achieve increased occupancy levels.

The response and answers to this challenge include addressing the government/military entity as a private unit in a competitive marketplace.

A thorough understanding of market conditions is necessary, utilizing a “best of type, built up method” of weighing comparables to the subject property.

Polling of residents, the troops, is necessary to understand their perception of value.

The client is challenged with very limited existing square footage within the residential unit, and will likely find that combining units is a necessity and a possibility. Numerous aging housing authorities are faced with a similar task, and are now successful with a reduced inventory and an increased unit size.

Creating a unit that is comparable to or superior to those in the open market will create retention while minimizing turnover costs. Policies should be established or reviewed regarding privacy and access to the UEPH resident by superiors.

Comparing changes within the two subject properties of Fort Meade and Fort Detrick, both sites will be impacted proportionately in square foot costs/per unit costs if the units are doubled. Due to the difference in construction types, Fort Meade units will have somewhat easier methods in rehab construction.

PREVENTATIVE MAINTENANCE AND LIFE EXTENSION

The property maintains a service request and delivery system that records the failures, service levels, complaints, etc. of each component listed in this report. This system should also be utilized to record preventative maintenance efforts.

SUGGESTIONS FOR IMMEDIATE ATTENTION

1. Immediately address all liability issues noted in this report.
2. Investigate, prove, and service issues with the brick envelope, including weep holes and settlement cracks. It is a priority to evacuate trapped water and prevent water from becoming cyclic freeze thaw damage. Measure and observe settlement damages.
3. Investigate, prove, and adjust for proper attic ventilation. Conditions are expected to accelerate roofing use life.
4. Management may elect to use all, some, or none of our suggestions and predicted scenarios.

LIMITATIONS OF THE REPORT

During our investigation and observations, we encountered the following conditions that limited our presentation or resulted in assumptions:

1. No invasive testing was performed on any component.
2. Property perimeters were not observed for accuracy.
3. An engineering of the property has not been conducted.

THE REPLACEMENT RESERVE REPORT is not intended to give advice of a legal nature, and, accordingly, should not be used as such advice. An engineering of the property has not been performed, and no assessment of code compliance, any form of 21E, asbestos, or lead paint conditions offered. This **REPORT** does not warrant expressing an opinion of utility or inutility.

Many of the observations made in the **REPORT** are a result of random sampling of property components. This process would not allow for discovery of all potential defects or hazards associated with the physical plant. The report should not be used for the purpose of loss prevention or risk assessment.

Much of the information made available to the author is a result of personnel interviews, such as with managing agents, maintenance personnel, contractors, etc. While these sources are deemed reliable, they cannot be guaranteed authoritative.

The financial projections are supported for only the time frame in which they were compiled. Use of this information cannot be supported beyond that period, which would require regular review and amendments to the **REPORT**.

Any single error within the text of the report does not void the entire report finding. Possession of the report does not necessarily constitute ownership.

THE REPLACEMENT RESERVE REPORT has been prepared for numerous government-assisted housing complexes, condominium associations, developers, institutions, and other facilities throughout New England since 1984. In the spring of 1993, we opened our Cape Canaveral office to serve North and South Carolina, Georgia, and Florida. In 1996, our Virginia Beach branch opened to serve the mid-Atlantic region.

CHARLES J. STUART, CPM is the **REPORT'S** author and founder. A Certified Property Manager of the Institute of Real Estate Management, Mr. Stuart has thirty years of industry experience and is an author and speaker regarding the subject of capital planning and replacement reserves for the Community Associations Institute. Mr. Stuart is also a course instructor for the Institute of Real Estate Management, a contributing editor for the R. S. Means Company, a worldwide construction consulting and estimating company, and a member of the Sweet's CD-ROM Advisory Council.

STEPHEN SALA, CIVIL ENGINEER brings twenty years of diverse experience, in the design and construction areas of engineering, from projects that span both domestic and international markets. Mr. Sala has been involved with projects varying in value from five to two million dollars. An author on the subject of construction management, Mr. Sala is also regarded as a specialist in "expert testimony" on this subject.

JAMES A. DOHRMAN, PE - CIVIL is registered in five states as a Professional Engineer with a specialty in *Forensic Engineering*. Mr. Dohrman has extensive international and domestic experience in solid waste and related water resource subjects as well as being an accomplished author and speaker in these areas.

JAMES B. MICHAEL, JR., AIA is a Registered Architect in Massachusetts and a member of the American Institute of Architects. A recognized expert in siding/thermal protection systems, Mr. Michael has extensive experience and knowledge of New England, southeast and worldwide locations.

JOHN G. SWENOR, PE – CIVIL holds membership in the American Society of Professional Engineers and the Society of Professional Real Estate Inspectors. He has been involved in the construction field for the past 25 years with projects ranging in size to \$30 million that encompass commercial, institutional, and residential use. Mr. Swenor has acted as an owner's representative and inspector on several school projects and been involved in all aspects of project and trade inspections. Additionally, Mr. Swenor has extensive knowledge of capital planning for institutional properties.

Our staff also includes experienced personnel that conduct measurements and inventory of the physical plants, and an administrative team that is experienced with AutoCad and architectural costs software systems.

It is assumed that the property known as Fort Meade UEPH is in compliance with all federal, state, and local laws, codes, regulations, and statutes.

THE REPLACEMENT RESERVE REPORT or its authors are not responsible for defects known or unknown, and reject all liability for such defects, known, or unknown, which may effect or cause harm or damage to the association or its residents.

All subsequent reviews and amendments to this **REPORT** are an expense beyond the invoice associated with this **REPORT**. **THE REPLACEMENT RESERVE REPORT** is not responsible to perform future reviews and amendments.

Any adjustments, changes, alterations, additions, or deletions to this **REPORT** by anyone other than the author voids the entire report.

Competent management of the entity is assumed.

All values and projections are open to influences from the economy, the environment, the level of service, and the degree of actual wear and tear through use. Accordingly, all opinions expressed are subject to change.

APPENDIX

LIFE CYCLE COSTING FORMULAS

ADDITIONAL PROPERTY PHOTOS

INFLATION STATISTICS

SAMPLE ANNUAL OPERATING CALENDAR

COSTS COMPARISON CHART

Life Cycle Costing

A technique of economic evaluation that sums over a given study period the cost of initial investment less resale value, replacements, operations, energy use, and maintenance and repair of an investment decision.

The important aspect of understand Life Cycle Costing is to be familiar with the notions of compounding, discounting, present value, and equivalent uniform annual value.

Compounding- the process of computing the value of an original principal sum based on interest calculated on the sum of the original principal and accrued interest.

Example: A principle sum of \$1,000 at a compound interest rate of 10% per annum increases to \$1,611 in 5 years, \$2,594 in 10 years, \$4,177 in 15 years, \$6,727 in 20 years, and \$10,840 in 25 years.

Discounting- a technique for converting cash flows that occur over time to equivalent amounts at a common time.

Example: It is apparent that if one had to pay out to meet an obligation of either \$1,611 in 5 years, \$2,594 in 10 years, \$4,177 in 15 years, \$6,727 in 20 years or \$10,840 in 25 years the amount to be invested initially at a 10% interest would be \$1,000. This amount is referred to as the present value of a future amount and it is calculated by “discounting” a future value in a specific year at a given rate of interest.

Present Value- the value of a benefit or cost found by discounting future cash flows to the base time.

Example:

Basic mathematics for calculating Present Value:

P = Present sum of money

F = Future sum of money

i = Interest or discount rate (expressed as decimal and not a percentage)

n = Number of years

Year	Future Value (F)
1	$P(1+i)$
2	$P(1+i)(1+i) = P(1+i)^2$
3	$P(1+i)^2(1+i) = P(1+i)^3$

What is the present value (P) of an anticipated maintenance expense of \$300 in year 3 (F) if the interest rate is 10%?

$$\begin{aligned}
 P &= F \times 1/(1+i)^n = 300 \times 1/(1+0.10)^n = 300 \times 1/1.33 \\
 &= 300 \times 0.75 \\
 &= \$225
 \end{aligned}$$

From an interest standpoint, this tells us that \$225 is the amount that would have to be deposited today into an account paying at 10% interest per annum in order to provide \$300 at the end of year 3 to meet the anticipated expense.

The Cash Flow and Formula Method for Calculating Life Cycle Costs

There are basically two approaches to calculating life cycle costs—the *cash flow* method and the *formula* method which, when applicable, is somewhat more simple.

The Cash Flow Method

To illustrate the Cash Flow Method, we will use a simple example of a facility manager considering the purchase of maintenance equipment required for a four-year period for which initial costs, energy costs and maintenance costs of alternative proposals vary.

The financial criteria on which the economic evaluation will be based are the following:

Interest/ Discount Rate - 10%

Energy Escalation Rate - 8% per annum
 Labor and Material Rate - 4% per annum
 Period of Study - 4 years

The following data is provided in one of the alternative proposals to be analyzed:

- Initial Capital Cost - \$1,000
- Maintenance Costs – A fixed annual cost of \$100 per year quoted by supplier (no escalation to be considered).
- Annual Energy Costs – Initially \$100 per year and subject to 8% annual escalation—i.e., \$108 for year one.
- Salvage value – At the end of the four-year period, the equipment has no further useful life and the supplier agrees to purchase it as scrap for \$50.

The Cash Flow Method for calculating Life Cycle Costs are based on the following steps:

- Step 1. Prepare a Cash Flow Diagram
- Step 2. Establish a Time Schedule of Costs
- Step 3. Calculate Annual Net Cash Flows
- Step 4. Calculate Present Value Factors
- Step 5. Calculate Present Values of Annual Cash Flows and Life Cycle Costs

Step 1.

Cash Flow Diagrams are often prepared to understand the problem better. Revenues are noted as vertical lines above a horizontal time axis, and disbursements are noted as vertical lines below it.

Step 2.

The table below presents revenues and disbursements for each year of the study:

Example:

A Year	B Capital Cost	C Maintenance Cost	D Energy Cost (8% escalation)
0	1,000	--	--
1	--	100	108
2	--	100	117
3	--	100	126
4	(50)	100	136

Note that the disbursements in this example are considered positive, and revenues for the salvage value are negative

Step 3.

The table below provides the net cash flow (NCF) for each year, which could be a disbursement or a revenue.

Example:

A Year	B Capital Costs	C Maintenance Costs	D Energy Costs (8% Escalation)	E NCF (B + C + D)
0	1,000	--	--	1,000
1	--	100	108	208
2	--	100	117	217
3	--	100	126	226
4	(50)	100	136	186

Step 4.

As in a previous example, present value factors based on 10% interest will be calculated for each year to convert the annual net cash flows to present values.

Example:

Year n	PV Factor $1/(1+i)^n$
0	1
1	$1/(1+0.1)^1 = 0.91$
2	$1/(1+0.1)^2 = 0.83$
3	$1/(1+0.1)^3 = 0.75$
4	$1/(1+0.1)^4 = 0.68$

Step 5.

Annual net cash flows are converted to present values of the base year. Their sum (Total Present Value) will represent the life cycle cost of the alternative.

Example:

Year n	NCF	PV Factor	PV \$
0	1,000	1	1,000
1	208	0.91	189
2	217	0.83	180
3	226	0.75	170
4	186	0.68	126
PV Life Cycle Cost	--	--	1,665

The total life cycle cost of this alternative in terms of today's dollar (if this year is the base year) is \$1,665. This means that if a present sum of \$1,655 were deposited today at an interest rate of 10%, all expenses could be paid over a four-year period, at which time the bank balance would be zero.

Once the cost of the other proposals have been calculated in present value dollars, the facilities manager will be in a position to quantify the differences in life cycle costs and decide which proposal represents the lowest cost of ownership in the long run.

The approach outlined is a practical one when considering the purchase of equipment such as elevators, controls, etc., quotations should not only include capital costs, but also the costs of long-term maintenance contracts which could make a higher initial cost proposal lower over the life cycle of equipment.

The Formula Method

It is also possible to solve the previous example utilizing the Formula Method if the problem is adaptable to this technique. Business calculators or discount factor tables such as those published by The American Society of Testing and Materials can be employed to generate the present value factors and results may be obtained more quickly.

In some cases, the complexity of the calculations will necessitate the "cash flow" method, with calculations done manually or using a spreadsheet program.

Example:

With the formula method approach, the calculations for the life cycle cost of the maintenance equipment alternative analyzed would be as follows:

1. PV of Initial Investment	\$1,000
2. PV of Maintenance Costs	
Annual Cost (A) x UPV Factor	
100 x 3.17	\$317
3. PV of Energy Cost	
Base Year Cost (A) x UPV*	\$382
100 x 3.82	
4. Salvage (Scrap) Value	
Future Value (F) x SPV	
(50) x 0.68	<u>(34)</u>
5. Life Cycle Cost/ Total Present Value	\$1,665

UPV-Uniform Present Value
SPV-Single Present Value
UPV*-Uniform Present Value Modified (*)

The calculated life cycle cost of \$1,665 is identical to that obtained with the cash flow method, but is arrived with less effort.

Equivalent Uniform Annual Value- *A uniform annual amount equivalent to the project cost or benefits, taking into account the time value of money throughout the study period.*

As noted previously in the definition of the Life Cycle Costs, these may be expressed as a lump sum present value with a base time reference, or in equivalent uniform annual values (EAUV) over the study period; decision-makers may prefer one or the other, or require both for the analysis of investment alternatives.

To express life cycle costs in annual values, it is necessary to first determine the lump sum present value of an alternative and multiply it by the Uniform Capital Recovery (UCR) factor given the interest rate and time period. This process is identical to calculating annual payments for a mortgage.

Example:

The present value life cycle cost for one of the maintenance equipment alternatives analyzed amounted to \$1,665; what is the equivalent uniform annual value “A”?

Given: P	(a principal sum or present value life cycle cost)	= \$1,665
	i	= 10%
	n	= 4 years
	UCR Factor	= 0.32 (from standard factors table for i = 10%, n = 4 years)
	A	= equivalent uniform annual value – to be determined
Solution:	A	= P x UCR
		= \$1,665 x 0.32
		= \$530

The life cycle cost of the alternative may therefore be expressed as a lump sum, \$1,665, or an annual value of \$530 based on a four-year time period.

Other Methods of Evaluating Economic Performance

While calculating life cycle costs is a helpful tool for the facilities manager evaluating alternatives, there are other approaches for evaluating economic performance of building investments. Among these other methods are *payback*, *net benefits*, and *internal rate of return*; these are described in detail in an American Society of Testing and Materials compilation of *Building Economics Standards*, which are endorsed by the American Association of Cost Engineers (AACE).

References for Annual Book of ASTM Standards, Vol. 04.07

ASTM Standards

- ❖ Terminology of Building Economics
- ❖ Practice for Measuring Life Cycle Costs of Buildings and Building Systems
- ❖ Practice for Measuring Benefit-to-Cost and Savings-to-Investment Ratios for Buildings and Building Systems
- ❖ Practice for Measuring Internal Rates of Return and Adjusted Internal Rates of return for Investments in Buildings and Building Systems
- ❖ Practice for Measuring Net Benefits for Investments in Buildings and Building Systems
- ❖ Practice for Measuring Payback for Investments in Buildings and Building Systems
- ❖ Guide for Selecting Economics Methods for Evaluating Investments in Buildings and Building Systems
- ❖ Guide for Selecting Techniques for treating Uncertainty and Risk in the Economic Evaluation of Buildings and Building Systems
- ❖ Standard Classification for Building Elements and Related Site Work

APPENDIX MATERIAL
ADDITIONAL PHOTOGRAPHS



NOTES:

APPENDIX MATERIAL
ADDITIONAL PHOTOGRAPHS



NOTES:

Census Economic Briefing Rooms



Manufacturing and Trade Inventories and Sales
 U.S. total business sales for May were \$937.6 bil, up 0.7% from last month. Month-end inventories were \$1,219.9 bil, up 0.4% from last month. (Released 07/15/04)

Previous	Current
-0.1	0.7
% Change in sales April 2004	% Change in sales May 2004



Advance Retail and Food Service Sales
 U.S. retail and food service sales for June were \$331.9 billion, down 1.1 percent from the previous month. (Released 07/14/04)

Previous	Current
1.4	-1.1
% change May 2004	% change June 2004



Quarterly Financial Report - Retail Trade
 After-tax profits for retail corporations' with assets greater than \$50 million averaged 2.6 cents per dollar of sales for the first quarter 2004, down 0.9 (+/-0.1)cents from the preceding quarter. (Released: July 14, 2004. Next: October 13, 2004.)

Previous	Current
+1.0	-0.9
% change 4th qtr 2003	% change 1st qtr 2004



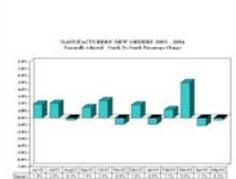
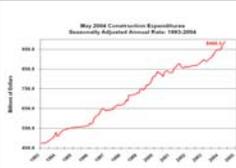
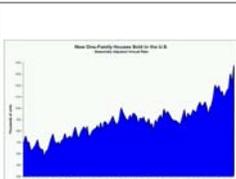
U.S. International Trade in Goods and Services
 The Nation's international deficit in goods and services decreased to \$46.0 billion in May, from \$48.1 billion (revised) in April, as exports increased more than imports.

Previous	Current
-48.1	-46.0
\$ billion April 2004	\$ billion May 2004



Monthly Wholesale Trade: Sales and Inventories
 May 2004 sales of merchant wholesalers were \$270.4 billion, up 0.5% from last month. End-of-month inventories were \$305.5 billion, up 1.2% from last month. (7/9/04)

Previous	Current
0.2	1.2
% change in Inv	% change in Inv

		April 2004	May 2004
 Manufacturers' new orders	Manufacturers' Shipments, Inventories, and Orders New orders for manufactured goods in May decreased \$1.0 billion or 0.3 percent to \$358.2 billion. (Released July 2, 2004).	Previous -1.1 % change April 2004	Current -0.3 % change May 2004
 Value of Construction Put in Place	Construction Spending Total construction activity for May 2004 (\$988.5 billion) was 0.3 percent above the revised April 2004 (\$985.7 billion). Please see our website for further details: http://www.census.gov/constructionspending	Previous 1.2 % change April 2004	Current 0.3 % change May 2004
 New Home Sales	New Home Sales Sales of new one-family houses in May 2004 were at a seasonally adjusted annual rate of 1,369,000. This is 14.8% above the revised April 2004 figure of 1,192,000.	Previous -7.9 % change April 2004	Current 14.8 % change May 2004
 Durable goods new orders	Advance Report on Durable Goods Manufacturers' Shipments and Orders New orders for manufactured durable goods in May decreased \$3.2 billion to \$189.1 billion. (Released June 24, 2004).	Previous -2.6 % change April 2004	Current -1.6 % change May 2004
 New housing starts	Housing Starts Privately owned housing starts in May were at a seasonally adjusted annual rate of 1,967,000 down 0.7% from the revised April 2004 figure of 1,981,000.	Previous -1.0 % change April 2004	Current -0.7 % change May 2004



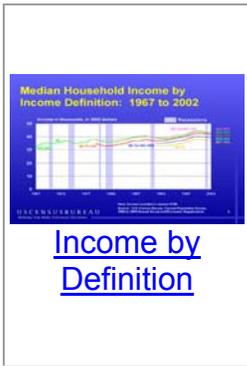
Quarterly Financial Report - Manufacturing, Mining and Trade
 Manufacturing corporations' seasonally adjusted after-tax profits averaged 6.4 cents per dollar of sales for the first quarter of 2004, unchanged from the preceding quarter. (Released: June 14, 2004. Next Release: September 13, 2004.)

Previous	Current
+1.3	0.0
cents 4th Qtr 2003	cents 1st Qtr 2004



Homeownership
 The homeownership rate in the first quarter 2004 (68.6 percent) was higher than the first quarter 2003 rate (68.0 percent). The homeownership rates in the Northeast and the West were higher than one year ago, while rates in the Midwest and South remained statistically unchanged.

Previous	Current
68.0	68.6
percent 1st Qtr 2003	percent 1st Qtr 2004



Household Income
 Median household money income in the United States in 2002 was \$42,409, 1.1 percent lower than in 2001 after adjusting for 1.6 percent inflation. Under four alternative income definitions that deduct income and payroll taxes and include the value of various noncash benefits, real median household income did not change for three of the four income alternatives and declined 0.8 percent for income after taxes.

Previous	Current
\$42,900	\$42,409
in 2002 dollars 2001	in 2002 dollars 2002



Poverty
 For the second consecutive year the poverty rate rose, from 11.7 percent in 2001 to 12.1 percent in 2002. The number of poor increased also, by 1.7 million, to 34.6 million poor in 2002.

Previous	Current
11.7	12.1
percent 2001	percent 2002

SUGGESTED ANNUAL OPERATING EVENTS CALENDAR

KEY:	● Inspection	● Preventative Maintenance Service	● Regular Service	● Capital Repairs	● Capital Replacement
-------------	---	--	--	---	---

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
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OPERATIONS CALENDAR

Asphalt Surfaces				●●●●				●●●●		●●●●		
Tennis Courts				●●●●				●●●●		●●●●		
Swimming Pools				●●	●●●●	●●●●	●●●●	●●●●	●			
Siding Material	●		●		●	●	●	●●	●●		●	
Roofing Material		●		●		●●	●●	●	●	●		●
Lighting Systems	●											
Heating Boilers	●●●●					●●●●		●●●●		●●●●	●●●●	●●●●
Domestic Hot Water	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●
Landscape			●●●		●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●	●●●●
Pests and Insects				●●●●	●●●●	●●	●	●	●●	●●●	●	
Painting Program				●	●	●	●●●●	●●●●	●●●●	●●●●		

SAMPLE

CAPITAL CALENDAR

Building Roof #7								●●●●				
Building Roof #8							●●●●					
Building Roof #9						●●●●						
Treatment Plant									●●●●			

Calendar assumes a four week month. **By no means all inclusive; a sample only.** Schedule should include components unique to property.

Costs Comparison by Unit/Sq.Ft.

Comparison of Projected Maintenance & Repair Expenses; Undiscounted Dollars	Fort Detrick Barracks FY 1996, PN 46200 Total Cost over 40 years, unadjusted			Fort Meade Barracks FY 2000/2001, PN 46169/47367 Total Cost over 40 Yrs, Unadjusted			Detrick divided by Meade	
	Total Cost for Complex	Cost per Space or Bedroom 240 Spaces	Cost per SF - Including Community Bldg 89,498 SF	Total Cost for Complex	Cost per Space or Bedroom 576 Spaces	Cost per SF - Including Community Bldg 215,785 SF		
Windows, Doors, and Brick Envelope	\$985,400	\$4,106	\$11.01	\$616,547	\$1,070	\$2.86	3.9	Fort Meade starts the plan with expenses for envelope modifications such as weep holes and crack filling, Fort Detrick addresses constant door closer replacements and a more expensive window and door inventory that has a constant attrition. Caulking of transitions is twice the expense at Fort Detrick than Fort Meade.
Roofing, Decks, Railings & Stairs	\$1,243,680	\$5,182	\$13.90	\$1,292,912	\$2,245	\$5.99	2.3	Costs at Fort Detrick represent attrition and cyclic maintenance, while costs at Fort Meade address cyclic replacement. Fort Meade will be impacted by poor attic design and ventilation, while Fort Detrick will incur accelerated conditions related to potential machinery and ventilation issues of the attic spaces.
Envelope Detail, Gutters and Security Lighting	\$204,500	\$852	\$2.28	\$164,600	\$286	\$0.76	3.0	Fort Detrick issues are related to film coat failure. The single difference setting apart the two sites would be the railings at Fort Detrick with anodized surface failure requiring painting as a maintenance function.
Space and Water Heating	\$426,800	\$1,778	\$4.77	\$336,000	\$583	\$1.56	3.1	Fort Detrick has issues with domestic hot water systems. Fort Detrick is faced with replacement of the existing domestic hot water system. Conditions are related to design of the mechanical rooms, water leaks, and lack of proficient inspection. Fort Detrick also incurs an immediate expense for isolation valves to save the heating boilers from accelerated loss.
Cooling, Ventilation & Mech. Misc.	\$3,165,000	\$13,188	\$35.36	\$1,039,020	\$1,804	\$4.82	7.3	Fort Meade is currently benefiting from projections that are typical, or, best case scenarios being almost new in condition. Fort Detrick is more accelerated based on historical maintenance costs that are disproportionate to the norm. Fort Detrick also replaces major cooling components in later years.
Flooring, Kitchen & Baths, and Décor	\$1,650,800	\$6,878	\$18.45	\$5,224,800	\$9,071	\$24.21	0.8	Fort Meade will require greater expenses related solely to the number of units. While costs and timing of expenses are similar, the inventory size is relative to the variance in expense.
Plumbing Systems, Mechanical Systems, and Enhancements	\$148,000	\$617	\$1.65	\$24,250	\$42	\$0.11	15.0	Fort Detrick operates extensive laundry facilities. The annual expenses are increased for Fort Detrick due to the laundry operation, mechanical systems, etc.
Common Hallways, Décor, Common Area Misc. (N/A)	-	-	-	\$627,700	\$1,090	\$2.91	-	Fort Meade has these components and costs unique to itself. Fort Detrick is not improved with these components.
TOTAL	\$7,824,180	\$32,601	\$87.42	\$9,325,829	\$16,191	\$43.22		

APPENDIX C

APPENDIX D

Fort Meade

Base Year
Real Discount Rates

Input Name
Input Values
2004

30+ Year 3.50%

40 Year Life Cycle Cost From RRR Input \$ (24,142,455)
Cost per Bedroom (576) \$ (41,913.98)
Cost per SF (215,785) \$ (111.88)

Present Value of Combined Costs (Year 2004 Basis)

Years	Construction Cost	Preventive Maintena	Maintenance Costs	Capital Costs	Disposal Costs	Building Salvage Value	Total	
2003	-1	\$ (22,922,415)					\$ (22,922,415)	
2004	0							
2005	1		\$ (31,258)	\$ (15,236)	\$ (15,592)	\$ -	\$ (62,086)	
2006	2		\$ (30,201)	\$ (5,223)	\$ (2,149)	\$ -	\$ (37,573)	
2007	3		\$ (29,179)	\$ (9,818)	\$ (2,077)	\$ -	\$ (41,074)	
2008	4		\$ (28,193)	\$ (4,876)	\$ (48,107)	\$ -	\$ (81,176)	
2009	5		\$ (27,239)	\$ (11,924)	\$ (12,646)	\$ -	\$ (51,809)	
2010	6		\$ (26,318)	\$ (80,692)	\$ (528,087)	\$ -	\$ (635,097)	
2011	7		\$ (25,428)	\$ (4,398)	\$ (1,810)	\$ -	\$ (31,636)	
2012	8		\$ (24,568)	\$ (8,267)	\$ (1,748)	\$ -	\$ (34,583)	
2013	9		\$ (23,737)	\$ (28,291)	\$ (3,369)	\$ -	\$ (55,397)	
2014	10		\$ (22,935)	\$ (10,040)	\$ (25,072)	\$ -	\$ (58,047)	
2015	11		\$ (22,159)	\$ (3,833)	\$ (1,577)	\$ -	\$ (27,569)	
2016	12		\$ (21,410)	\$ (4,713)	\$ (36,533)	\$ -	\$ (62,656)	
2017	13		\$ (20,686)	\$ (67,782)	\$ (415,071)	\$ -	\$ (503,539)	
2018	14		\$ (19,986)	\$ (4,399)	\$ (1,422)	\$ -	\$ (25,808)	
2019	15		\$ (19,310)	\$ (16,651)	\$ (81,834)	\$ -	\$ (117,796)	
2020	16		\$ (18,657)	\$ (4,107)	\$ (1,328)	\$ -	\$ (24,092)	
2021	17		\$ (18,026)	\$ (3,968)	\$ (1,283)	\$ -	\$ (23,277)	
2022	18		\$ (17,417)	\$ (24,427)	\$ (234,334)	\$ (27,423)	\$ (303,601)	
2023	19		\$ (16,828)	\$ (3,704)	\$ (1,198)	\$ -	\$ (21,730)	
2024	20		\$ (16,259)	\$ (54,923)	\$ (438,086)	\$ (4,602)	\$ (513,869)	
2025	21		\$ (15,709)	\$ (3,458)	\$ (1,118)	\$ -	\$ (20,285)	
2026	22		\$ (15,178)	\$ (3,341)	\$ (1,080)	\$ -	\$ (19,599)	
2027	23		\$ (14,665)	\$ (5,626)	\$ (1,044)	\$ -	\$ (21,334)	
2028	24		\$ (14,169)	\$ (3,119)	\$ (1,008)	\$ -	\$ (18,296)	
2029	25		\$ (13,690)	\$ (5,993)	\$ (70,154)	\$ -	\$ (89,836)	
2030	26		\$ (13,227)	\$ (2,288)	\$ (941)	\$ -	\$ (16,455)	
2031	27		\$ (12,779)	\$ (52,202)	\$ (256,424)	\$ -	\$ (321,405)	
2032	28		\$ (12,347)	\$ (4,155)	\$ (21,069)	\$ -	\$ (37,571)	
2033	29		\$ (11,930)	\$ (2,063)	\$ (849)	\$ -	\$ (14,842)	
2034	30		\$ (11,526)	\$ (9,395)	\$ (743,844)	\$ (6,162)	\$ (770,928)	
2035	31		\$ (11,136)	\$ (1,926)	\$ (793)	\$ -	\$ (13,855)	
2036	32		\$ (10,760)	\$ (1,861)	\$ (766)	\$ -	\$ (13,387)	
2037	33		\$ (10,396)	\$ (3,498)	\$ (740)	\$ -	\$ (14,634)	
2038	34		\$ (10,044)	\$ (30,797)	\$ (201,547)	\$ -	\$ (242,388)	
2039	35		\$ (9,705)	\$ (4,248)	\$ (4,505)	\$ -	\$ (18,459)	
2040	36		\$ (9,377)	\$ (11,175)	\$ (16,000)	\$ -	\$ (36,552)	
2041	37		\$ (9,060)	\$ (1,567)	\$ (645)	\$ -	\$ (11,271)	
2042	38		\$ (8,753)	\$ (2,945)	\$ (117,768)	\$ (13,782)	\$ (143,248)	
2043	39		\$ (8,457)	\$ (1,463)	\$ (602)	\$ -	\$ (10,522)	
2044	40		\$ (8,171)	\$ (1,413)	\$ (581)	\$ -	\$ (10,166)	
2045	41		\$ -	\$ -	\$ -	\$ 3,337,409	\$ 3,337,409	
2046	42		\$ -	\$ -	\$ -	\$ -	\$ -	
2047	43		\$ -	\$ -	\$ -	\$ -	\$ -	
2048	44		\$ -	\$ -	\$ -	\$ -	\$ -	
2049	45		\$ -	\$ -	\$ -	\$ -	\$ -	
2050	46		\$ -	\$ -	\$ -	\$ -	\$ -	
2051	47		\$ -	\$ -	\$ -	\$ -	\$ -	
2052	48		\$ -	\$ -	\$ -	\$ -	\$ -	
2053	49		\$ -	\$ -	\$ -	\$ -	\$ -	
2054	50		\$ -	\$ -	\$ -	\$ -	\$ -	
2055	51		\$ -	\$ -	\$ -	\$ -	\$ -	
2056	52		\$ -	\$ -	\$ -	\$ -	\$ -	
2057	53		\$ -	\$ -	\$ -	\$ -	\$ -	
2058	54		\$ -	\$ -	\$ -	\$ -	\$ -	
2059	55		\$ -	\$ -	\$ -	\$ -	\$ -	
2060	56		\$ -	\$ -	\$ -	\$ -	\$ -	
2061	57		\$ -	\$ -	\$ -	\$ -	\$ -	
2062	58		\$ -	\$ -	\$ -	\$ -	\$ -	
2063	59		\$ -	\$ -	\$ -	\$ -	\$ -	
2064	60		\$ -	\$ -	\$ -	\$ -	\$ -	
2065	61		\$ -	\$ -	\$ -	\$ -	\$ -	
PV		\$ (22,922,415)	\$ (690,873)	\$ (519,807)	\$ (3,294,800)	\$ (51,968)	\$ 3,337,409	\$ (24,142,455)

Progressive Collapse Analysis of the Replacement Barracks, Ft. Meade, Maryland

Final Report

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