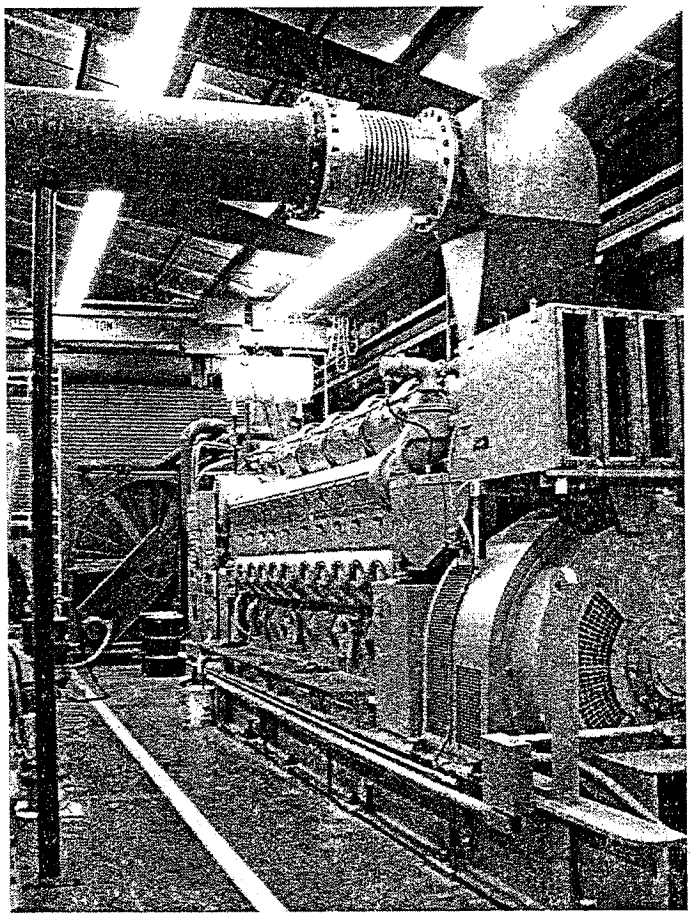
PETERSBURG POWER PLANT RELOCATION MASTER PLAN AND PROGRAM

FOR THE

CITY OF PETERSBURG, ALASKA



February 02, 2004

Minch Ritter Voelckers
Architecture, Planning, Interior Design
800 Glacier Avenue, Suite A
Juneau, Alaska 99801
907-586-1371

AMC Engineers
Mechanical and Electrical Engineering
701 East Tudor Road, Suite 250
Anchorage, Alaska 99503-7457
907-257-9100

PETERSBURG POWER PLANT RELOCATION
MASTER PLAN AND PROGRAM

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PETERSBURG POWER PLANT RELOCATION
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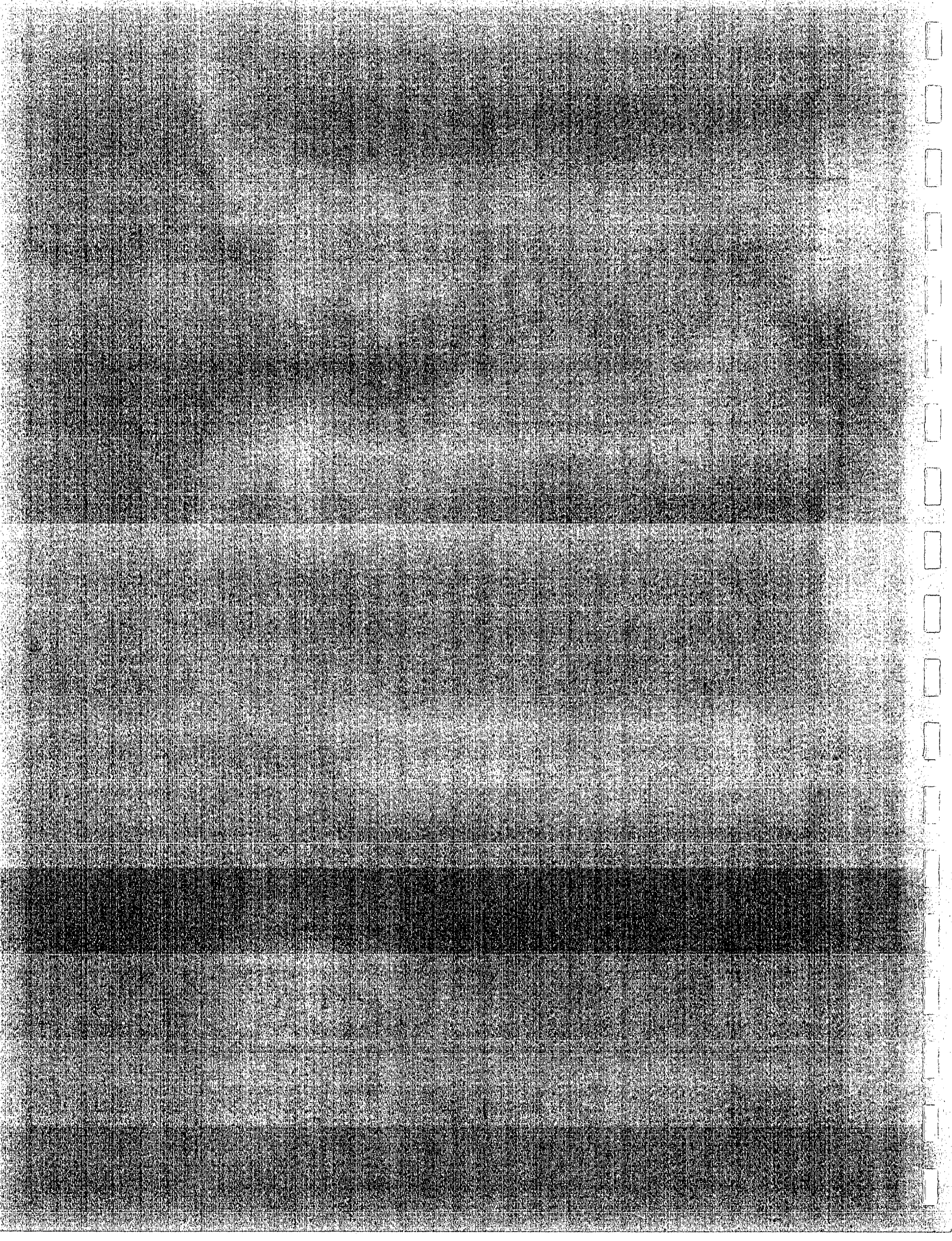
CHAPTER ONE
EXECUTIVE SUMMARY



PETERSBURG POWER PLANT RELOCATION MASTER PLAN AND PROGRAM

EXECUTIVE SUMMARY

The Petersburg Power Plant Relocation Master Plan and Program includes a range of complex issues and components that must be carefully coordinated and planned to take place in a concise time chronology. Tasks that must be completed range from continued preparation of sites, parallel studies and designs, construction of buildings and support structures, installation of power generation, distribution systems, SCADA, relocation of personnel, and preparation of existing power plant site for new uses and facilities. These tasks will occur in phases to allow for controlled and quality assured work and to minimize interruption of customer services. The power supply, however, cannot be interrupted to the customers of Petersburg Municipal Power and Light. The planning, phasing and verification of all work is therefore critical. This executive summary highlights several of the more important aspects of this master plan and program document.

Petersburg Municipal Power and Light (PMP&L) serves approximately 1,860 consumers within the city limits and remainder of Mitkof Island. POWER Engineers Inc. was retained in 1997 to prepare a 20 Year Plan to identify and define additions and modifications required for PMP&L to continue providing its consumers with quality and reliable service for the next 20 years (from 1997). Many of the recommendations and assumptions included in the 20 Year Plan have been used in the preparation of this document.

The City of Petersburg has three power generation sources to serve the existing load: 1) Tyee Hydro Project; 2) Crystal Lake Hydro Project; and 3) Downtown Diesel Plant. The Crystal Lake Hydro Project is base loaded with the remaining generation normally supplied by the Tyee Hydro Project. Since the addition of the Tyee Hydro Project, the Downtown Diesel Plant has been used as a backup (standby) source of power in the event the Tyee source is unavailable. [1]

Currently, the peak load for the PMP&L system is approximately 8.5 MW. The existing maximum generation capacity of the Downtown Diesel Plant is 10.1 MW. However, 3.5 MW of this capacity is in poor condition and unreliable, with potentially excessive rebuild costs. Thus, although Petersburg is not currently generation deficient, at times it may not be possible to supply peak power demand.

The existing office, crew, and diesel plant facilities are old and are not performing adequately. As the years progress, maintenance on the existing generation plant and facilities will become more and more extensive, parts availability more limited, and reliability will continue to

[1] Petersburg Municipal Power and Light, 20 Year Plan Draft Report, p. 2; Ron Beazer, P.E., Jeff Mann.

decrease.[2] Additionally, some of the existing equipment will likely not meet the more stringent emissions standards that will be required for a new facility air quality permit.

Upon completion of construction the comprehensive the new facilities at Scow Bay will include an Administration/Crew Center, Power Plant, storage yard, and related equipment. The City can consolidate all electric utility facilities and components into one general area away from the city core. A new power plant with a recommended power output capacity of at least 12 MW and modern combination crew and administration building would provide Petersburg with a highly reliable source of backup generation and customer services for the next two or three decades.[3]

The preliminary total project budget for the proposed power plant relocation, including all direct and indirect costs, is in the range of $23,000,000 to $24,000,000. This preliminary budget is based on the installation of three new 3 MW generation set packages (including all switchgear, radiators, etc.), and the relocation of two existing 2,500 kW EMD generator sets. Under this scenario, the power output capacity of the new power plant would be 14 MW.

The preliminary schedule for the proposed power plant relocation indicates that after procurement of funds, permitting, geotechnical investigation, design, and related activities, actual construction of the Power Plant will commence around mid 2005. Construction of the Administration Crew Center would commence in late 2005. The total project is scheduled to be complete in December 2007 or early 2008.

[2] ibid.

[3] Petersburg Municipal Power and Light, 20 Year Plan Draft Report, p 3; Ron Beazer, P.E., Jeff Mann.

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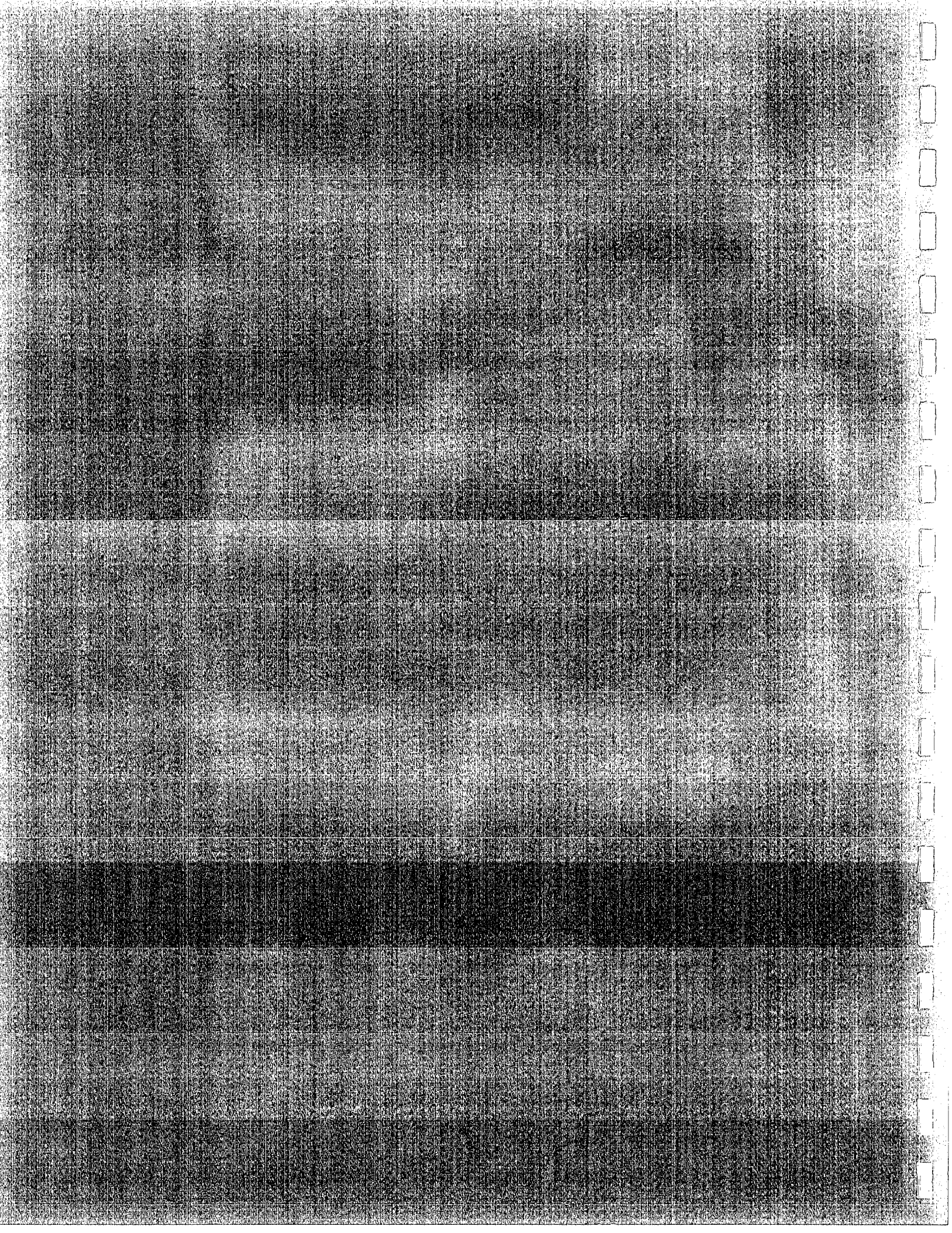
CHAPTER TWO
INTRODUCTION AND APPROACH



PETERSBURG POWER PLANT RELOCATION
MASTER PLAN AND PROGRAM

INTRODUCTION AND APPROACH

This master plan and programming study is the first step in a process to build a new Power Plant, Administration/Crew Center, and related support facilities on City-owned land at Scow Bay. This study includes the completion of six primary tasks as follows:

- Proposed project schedule including all phases of design and construction.
- Preliminary project budget including all direct and indirect costs.
- Two site master plan schemes.
- Space requirements and adjacencies for individual buildings.
- Design narratives for all disciplines describing recommended building systems, materials, and equipment.
- Recommendations for power generation, distribution, and SCADA.

Future steps will include procurement of funding sources, permitting, geotechnical investigation of both sites, surveying, additional hazardous materials studies, design, and preparation of contract documents.

GENERAL BACKGROUND AND TIMELINE

In April 2003 Minch Ritter Voelckers Architects submitted a letter of interest to the City of Petersburg to provide professional programming and planning services to conduct a study for the proposed relocation of Petersburg electrical facilities. MRV Architects teamed with AMC Engineers of Anchorage, R&M Engineering of Juneau, BBFM Engineers of Anchorage, POWER Engineers of Idaho, Murray and Associates of Juneau, and HMS of Anchorage to support and assist with the complex planning, programming, and engineering issues to be addressed in this study.

In May 2003, Joe Nelson, Superintendent of Petersburg Municipal Power and Light (PMP&L) notified Richard Ritter of Minch Ritter and Voelckers Architects that the *Letter of Interest* was generally acceptable, and asked for additional information concerning cost and time. Richard Ritter forwarded this information and a professional services contract was eventually negotiated and signed in July 2003.

A telephone conference was conducted with the entire consultant team on July 25, 2003 to discuss general approach and key tasks. It was agreed that an initial site visit by Richard Ritter and representatives of AMC Engineers and POWER Engineers would be conducted in as soon as practical in August 2003.

On August 14th, Richard Ritter of MRV Architects, David Boggs of AMC Engineers, and Shawn Crea of POWER Engineers arrived in Petersburg for a site visit and kickoff meeting with Joe Nelson, Superintendent of Petersburg Municipal Power and Light, and other PMP&L staff members. During this two-day visit, both the existing Power Plant, materials and equipment yard, and Scow Bay sites were visited. The team completed several programming and planning sessions for power generation, building construction, and the Scow Bay site. The visit concluded with a general wrap-up discussion and briefing meeting with Petersburg City Manager Bruce Jones.

On November 21st 2003 a preliminary draft copy of this document was mailed to Joe Nelson for review and feedback. Review comments were received on November 28th and forwarded to members of the consultant team for incorporation.

On December 3rd Richard Ritter forwarded a preliminary project budget to Joe Nelson for use the City of Petersburg in preliminary meetings with the Denali Commission. This budget has been updated and included in this first draft pending completion of further construction cost estimates by HMS, Inc. of Anchorage.

The Owner and Consultant Directory is located on the next page.

OWNER AND CONSULTANT DIRECTORY

CITY OF PETERSBURG
Bruce Jones, City Manager
T: (907) 772-4425 Ext. 22

PETERSBURG MUNICIPAL POWER & LIGHT
P.O. Box 329
Petersburg, Alaska 99833
Joe Nelson, Superintendent
John Clark, Electrician/Operator
Bob Ziemke, Mechanic/Operator
Mike Leonard, Line Foreman
Sue Flanary, Office Manager
pmpl@ci.petersburg.ak.us
T: (907) 772-4203
F: (907)772-9287

MINCH RITTER VOELCKERS ARCHITECTS
800 Glacier Ave., Suite A
Juneau, Alaska 99801
Prime consultant, overall project management
Project Manager: Richard Ritter
rich@mrvarchitects.com
Project coordination: Mary Anderson
mary@mrvarchitects.com
T: (907) 586-1371
F: (907) 463-5544
C: (907) 723-8850

AMC ENGINEERS
701 East Tudor Road, Suite 250
Anchorage, Alaska 99503-7457
Electrical engineering
Mechanical engineering for the power plant
Principal-in-Charge: Dave Adams
Project Engineer: Dave Boggs
dbogg@amc-engineers.com
T: (907) 257-9100
F: (907) 257-9191

POWER ENGINEERS
Subconsultant to AMC Engineers
Project Manager: Shawn Crea, PE
Power Engineers, Inc.
PO Box 1066
Hailey, ID 83333
screa@powereng.com
ph: 208-788-0341
fax: 208-788-5738

R & M ENGINEERING
6205 Glacier Highway
Juneau, Alaska 99801
Civil engineering, geotechnical
Principal-in-Charge: Mark Pusich
mpusich@rmjuneau.com
T: (907) 780-6060
F: (907) 780-4611

BBFM ENGINEERS
510 L Street, Suite 200
Anchorage, Alaska 99501
Structural engineering
Principal-in-Charge: Dennis Berry
dberry@bbfm.com
T: (907) 274-2236
F: (907) 274-2520

MURRAY & ASSOCIATES
P.O. Box 21081
Juneau, Alaska 99802
Mechanical engineering for Admin./Crew
Principal-in-Charge: Doug Murray
doug@murraypc.com
T: (907) 780-6151
F: (907) 780-6182

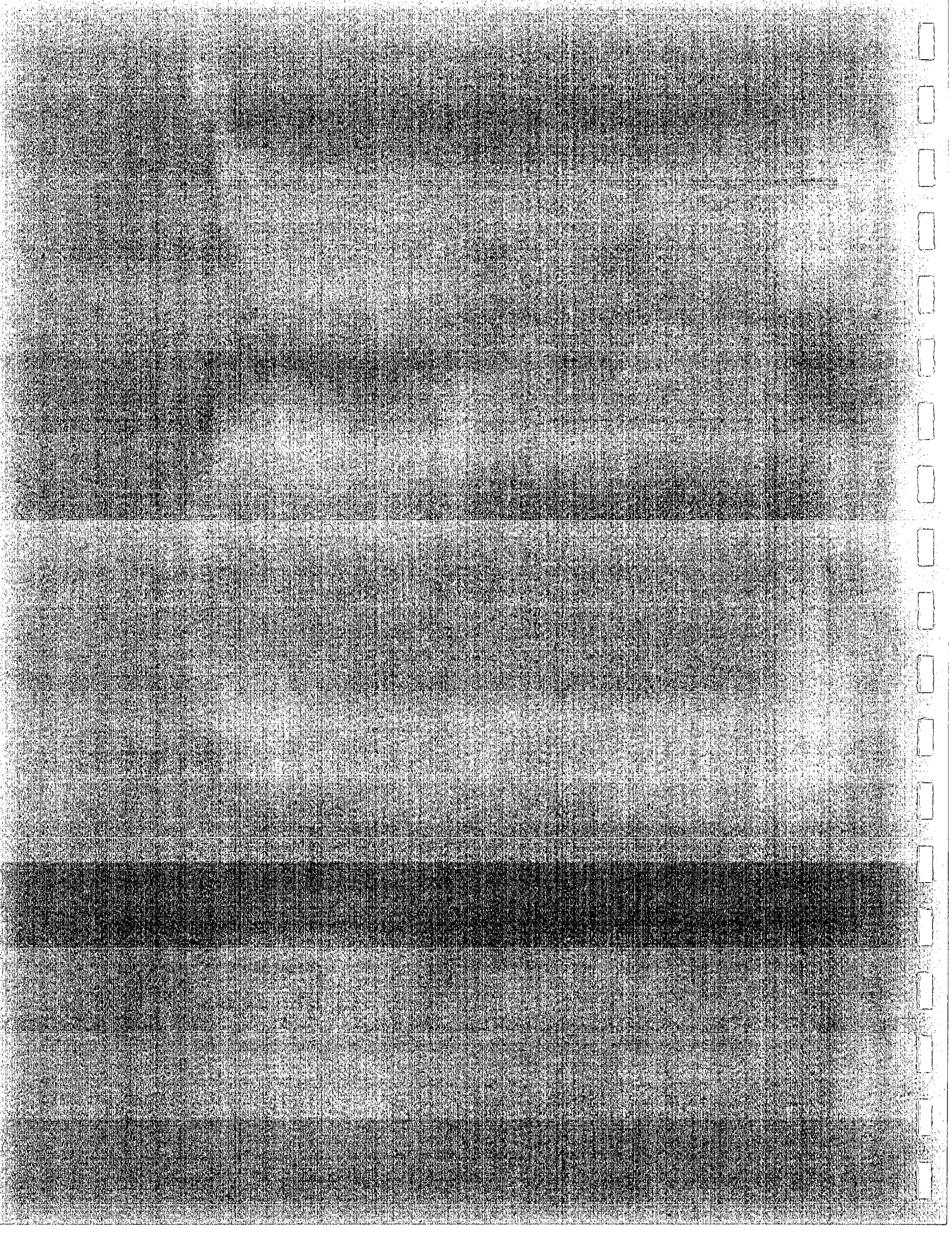
CARSON DORN
712 West 12th Street
Juneau, Alaska 99801
Hazardous materials consultant
Principal-in-Charge: Tom Carson
tcarson@carsondorn.com
T: (907) 586-4447
F: (907) 586-591

HMS, INC.
4103 Minnesota Drive
Anchorage, Alaska 99503
Cost estimating
Principal Cost Estimator: Ehsan Mughal
ehsan@hmsalaska.com
T: (907) 561-1653, F: (907) 562-0420

RICK G. BRAUN
Land surveying
P.O. Box 211, Petersburg, Alaska 99833
T: (907) 772-3986, F: (907) 772-2112

PETERSBURG POWER PLANT RELOCATION
MASTERPLAN AND PROGRAM

CHAPTER THREE
CODES AND ZONING



PETERSBURG POWER PLANT RELOCATION
MASTERPLAN AND PROGRAM

CODE SUMMARY

The project shall be designed and constructed to comply with the following codes:

- 2003 International Building Code
- Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG, 7-1-96 Edition).
- 2003 International Mechanical Code.
- 2003 Uniform Plumbing Code.
- 2002 National Electric Code.
- 2002 National Electric Safety Code.
- 2003 International Fire Code
- 2001 ASME B31.1 Power Piping Code

2003 INTERNATIONAL BUILDING CODE REQUIREMENTS

As noted above, the project will be designed and constructed to comply with the requirements of the *2003 International Building Code*, including any State and local amendments, when the project is designed and built. The *2003 IBC* is currently under review by the Alaska State Fire Marshal and should be adopted with provisions by January 2004. The proposed project schedule indicates that both the Power Plant and Administration/Crew Center should begin construction in 2005, prior to the release of the *2006 IBC* by the International Code Council. Although there is some discussion occurring in the Alaska State Legislature concerning adoption of the *NFPA 5000 Building Construction and Safety Code* in lieu of the IBC, acceptance of this code by seems unlikely.

Construction Type: The City of Petersburg prefers that the least restrictive construction type be utilized for the each building. Noncombustible construction is also preferred. This would indicate Type II-B Construction for both buildings.

Building Use and Occupancy Classification: A preliminary review of *2003 International Building Code* indicates the following occupancy classifications for these buildings:

- Power Plant Building: Factory Industrial F-1 Moderate-Hazard Occupancy.
- Administration/Crew Center: Business Group B Occupancy.

Maintenance and Operations: Approaches to code compliance that rely on items or equipment that require excessive maintenance and operations should be avoided or minimized. Examples include fire rated walls or assemblies and corridors that require excessive use of fire/smoke dampers, rated doors, magnetic hold-opens, and rated overhead coiling doors.

AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES FOR BUILDINGS AND FACILITIES (ADAAG)

The Americans with Disabilities Act (ADA) is a civil rights act governing a broad scope of services, facilities, and situations, many of which do not relate to the built environment. Much of the ADA is subject to interpretation and in many cases opposing views may be inferred from the same section of text. The following review is an interpretation based on our professional opinion.

The provisions of the ADA require that public entities must make reasonable accommodation to avoid discriminating against individuals with disabilities. This may include modification of rules, policies or practices; removal of architectural, communication, or transportation barriers; or the provision of auxiliary aids and services.

Based on our current understanding of the project, we recommend the following levels of compliance with the ADAAG:

- The administrative staff and public portions of the Administration/Crew Center (second floor as currently shown) should be designed to fully comply with the ADAAG, including provisions for an accessible route from accessible parking to all staff and public spaces.

- It is our understanding that the crew portions of the Administration/Crew Center (first floor as currently shown) will be used and operated by able-bodied individuals only. Although fully accessible design is not therefore indicated, we do recommend design and construction of the stairway connecting the two floors and toilet rooms to fully comply with the ADAAG. It should be noted that PML&P will be required to accommodate the known disability of any job applicant or employee who is otherwise capable of fulfilling a given job description.

- It is our understanding that Power Plant will be used and operated by able-bodied individuals only. Although fully accessible design is not therefore indicated, we do recommend design and construction of offices, toilet rooms, and similar spaces to fully comply with the ADAAG. It should be noted that PML&P will be required to accommodate the known disability of any job applicant or employee who is otherwise capable of fulfilling a given job description.

ZONING

Both sites are owned by The City of Petersburg. Zoning and planning requirements within the City of Petersburg are mandated by the City. Lot coverage, building setback and parking requirements will be independently determined by the City of Petersburg during the Schematic Design Phase.

Acquisition of additional land for the Administration/Crew Center, if required, would have to be coordinated with City requirements, including any required platting changes. Utility Right-of-Ways and/or easments for the new building site utilities and modifications to the distribution line could be required. These tasks would be coordinated during the Schematic Design Phase.

PETERSBURG POWER PLANT RELOCATION
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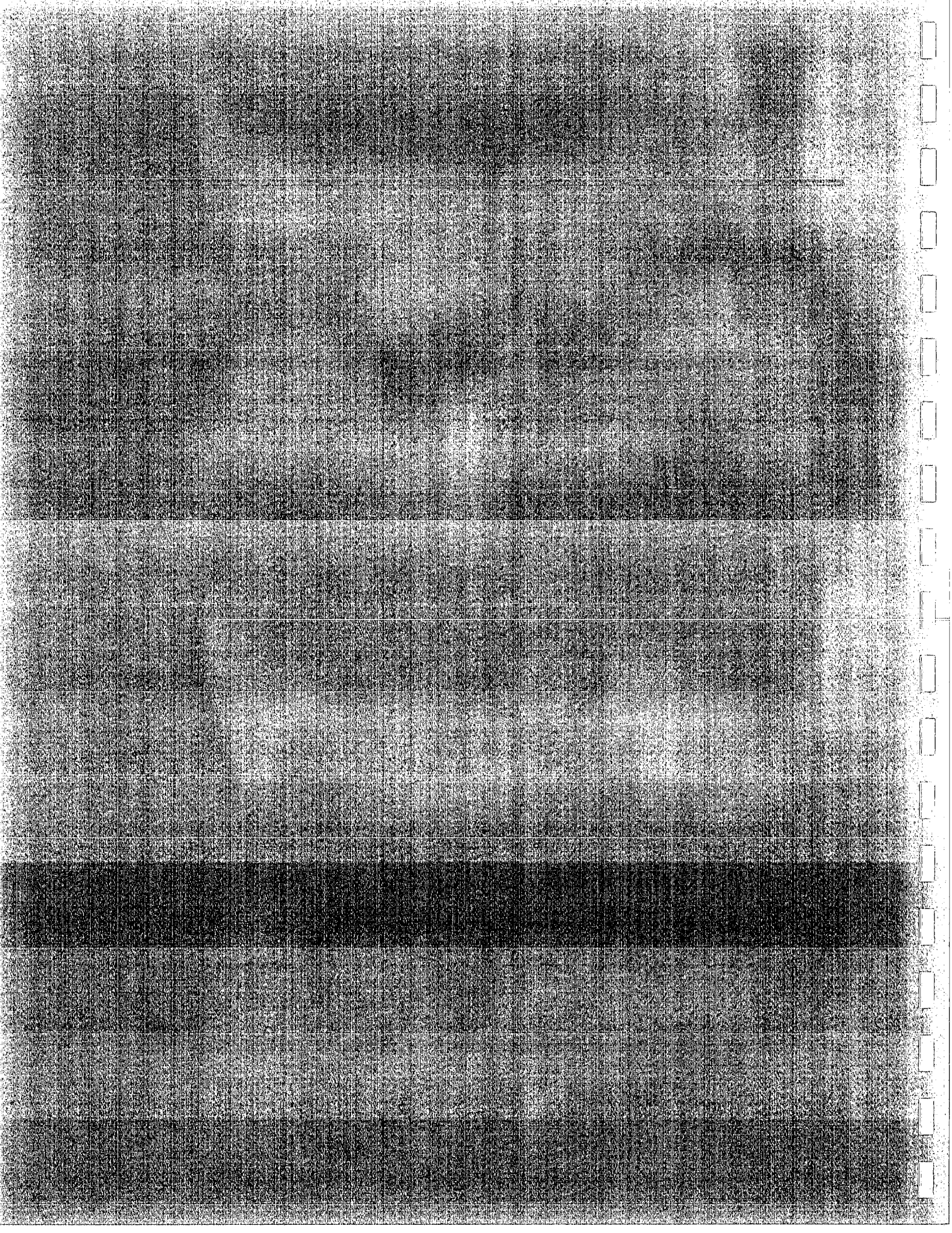
CHAPTER FOUR
SCHEDULE AND BUDGET



PETERSBURG POWER PLANT RELOCATION
MASTER PLAN AND PROGRAM

CONSTRUCTION AND OPERATIONS PHASING

Phasing the construction of the Power Plant and Administration/Crew Center, procurement and installation of the power generation and distribution equipment, and demolition of the existing power plant facilities will be a critical part of this project. Listed here some of the critical elements of construction phasing. A more comprehensive study of the order of phasing will be necessary once project design commences.

- Procurement of additional land at the Administration/Crew Center site to allow for a sufficient parking area and area for crew apron on Mitkof Highway side of the center.
- Completion of required permitting for construction.
- Additional studies including hazmat and geotechnical.
- Platting and surveying.
- Construction of new Power Plant on upper site.
- Installation of new generation sets.
- Tie-in to sub station.
- Relocate existing generation sets.
- Construction and finishing of yard storage and accessory facilities at upper site.
- Construction of new Administration/Crew Center, parking, and apron on lower site.
- Removal of hazardous materials from existing power plant facilities.
- Demolition and of existing power plant facilities.
- Re-development of existing power plant site.

Although the above list illustrates key phasing issues, actual phasing cannot be fully determined until the City of Petersburg decides what equipment will be new and what equipment will be relocated from the existing facility. The arrival and installation of new equipment will be a large determining factor in the phasing of construction and the timing for the relocation of existing equipment.

PROJECT SCHEDULE

The following schedule has been prepared using Microsoft Project to illustrate potential task sequences and phasing. Much of the detail is speculation at this time, but is included in this document to generate discussion prior to the beginning of schematic design.

PRELIMINRY PROJECT BUDGET

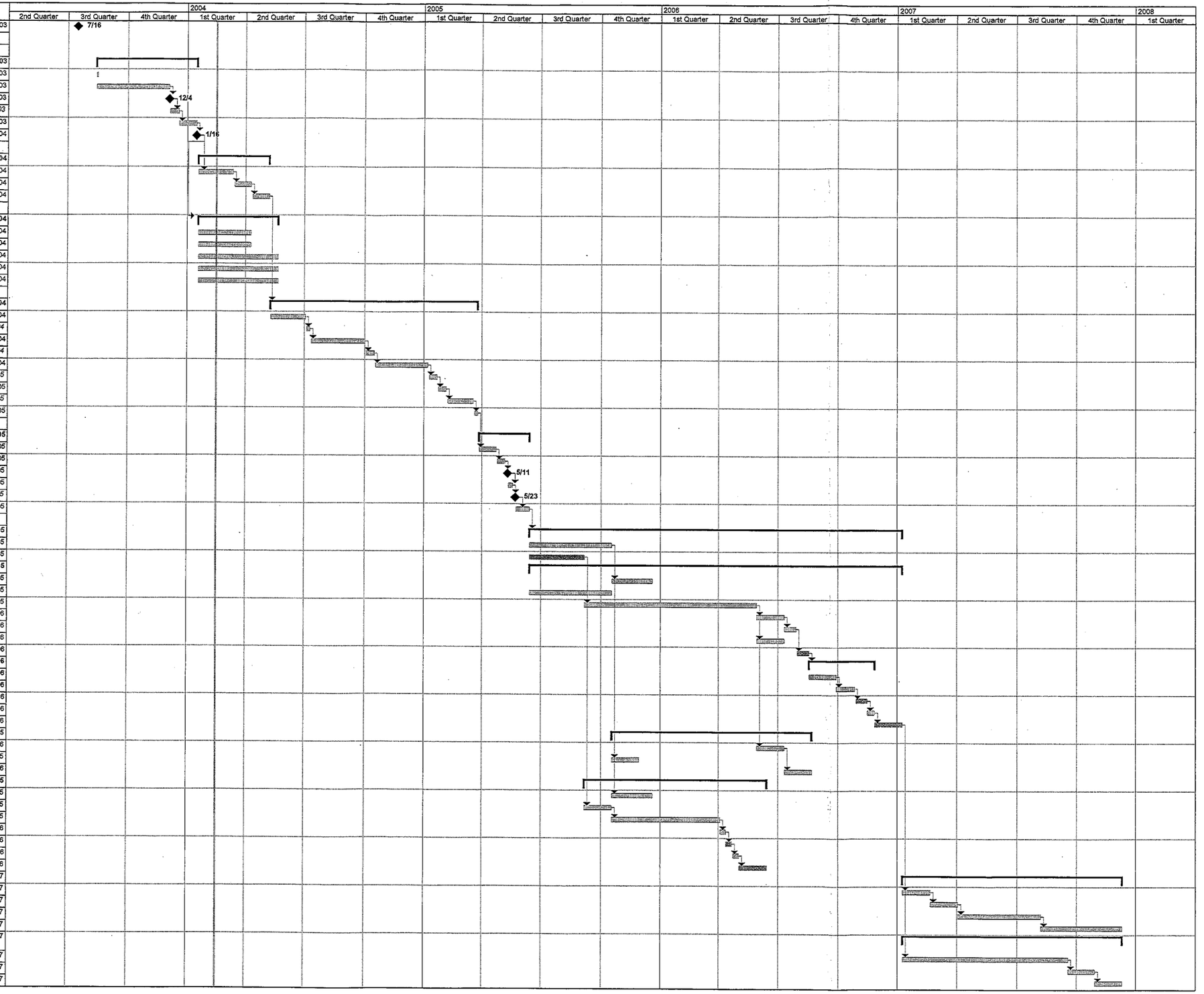
A preliminary project budget has been included in this chapter to illustrate the probable cost impact of constructing new power plant facilities with three new 3 MW generation sets and 2 existing 2,500 kV EMD generation sets. The budget will change if a different power generation scenario is chosen by the City of Petersburg. Reasonable assumptions have been used to calculate indirect costs based on estimated construction cost. Indirect costs are 28% of this total project budget. This is appropriate given this level of project development.

(Note – construction cost estimates for buildings and site work will be prepared by HMS, Inc. after submittal of this first draft, and will be included in the final draft)

PETERSBURG POWER PLANT RELOCATION

MRV 0315

ID	Task Name	Duration	Start
1	**Project Contract Signed and NTP**	1 day	Wed 7/16/03
2			
3			
4	**MASTER PLANNING AND PROGRAMMING**	112 days	Thu 8/14/03
5	Site Trip and meet with PMP&L	2 days	Thu 8/14/03
6	Work on draft master plan & programming	80 days	Thu 8/14/03
7	Submit first draft of study	1 day	Thu 12/4/03
8	*Owner review of first draft*	*2 wks*	*Fri 12/5/03*
9	Prepare final study	4 wks	Fri 12/19/03
10	Submit final study	1 day	Fri 1/16/04
11			
12	**PROCUREMENT OF FUNDING AND SERVICES**	80 days	Mon 1/19/04
13	Procure project funds	2 mons	Mon 1/19/04
14	Advertise for proposals for design services	1 mon	Mon 3/15/04
15	Select consultant and negotiate contract	1 mon	Mon 4/12/04
16			
17	**PRE DESIGN ACTIVITIES**	90 days	Mon 1/19/04
18	Procurement of additional land for Admin./Crew Center	60 days	Mon 1/19/04
19	Haz-Mat Study & Report for Existing Power Plant	60 days	Mon 1/19/04
20	Geotechnical Investigation & Report	90 days	Mon 1/19/04
21	Platting & survey of lots, R-O-W and Easements	90 days	Mon 1/19/04
22	Additional Reports or Studies (Tie-In, Distribution Lines, etc.)	90 days	Mon 1/19/04
23			
24	**DESIGN AND CONSTRUCTION DOCUMENTS**	230 days	Mon 5/10/04
25	Schematic Design	8 wks	Mon 5/10/04
26	*Review by Owner*	*1 wk*	*Mon 7/5/04*
27	Design Development	12 wks	Mon 7/12/04
28	*Review by Owner*	*2 wks*	*Mon 10/4/04*
29	95% Construction Documents	12 wks	Mon 10/18/04
30	*Review by Owner*	*2 wks*	*Mon 1/10/05*
31	100% Construction Documents	2 wks	Mon 1/24/05
32	*Agency approvals (Fire Marshal, etc.)*	*6 wks*	*Mon 2/7/05*
33	Print construction documents	1 wk	Mon 3/21/05
34			
35	**BIDDING AND NEGOTIATIONS**	56 days	Mon 3/28/05
36	Bidding period and prebid conference	4 wks	Mon 3/28/05
37	Addendum	2 wks	Mon 4/25/05
38	Bid opening	1 day	Wed 5/11/05
39	Evaluation of bids	1 wk	Thu 5/12/05
40	City Council action (special meeting)	*1 day*	*Mon 5/23/05*
41	Contract requirements, issue NTP	3 wks	Tue 5/24/05
42			
43	**CONSTRUCTION PHASE**	410 days	Tue 6/14/05
44	Long Lead Submittal Items	90 days	Tue 6/14/05
45	Contractor mobilization	60 days	Tue 8/14/05
46	**Power Plant Building**	410 days	Tue 6/14/05
47	Submittals for other items	45 days	Tue 10/18/05
48	Site work, footing & foundations	90 days	Tue 6/14/05
49	Construction building	190 days	Tue 9/6/05
50	Install new gensets	30 days	Tue 5/30/06
51	Testing & commissioning	14 days	Tue 7/11/06
52	Scow Bay Substation Tie-in	30 days	Tue 5/30/06
53	Substantial completion, punch list, CCO	14 days	Mon 7/31/06
54	**Relocate Existing Gensets (if required)**	72 days	Fri 8/18/06
55	Relocate existing gensets	30 days	Fri 8/18/06
56	Test and commission gensets	21 days	Fri 9/29/06
57	Substantial completion, punch list	14 days	Mon 10/30/06
58	Final inspection, Close-out	7 days	Fri 11/17/06
59	Owner final move-in	30 days	Tue 11/28/06
60	**Upper Yard**	220 days	Tue 10/18/05
61	Site work	30 days	Tue 5/30/06
62	Submittals for other items	30 days	Tue 10/18/05
63	Fence, lighting & storage sheds	30 days	Tue 7/11/06
64	**Administration / Crew Center**	201 days	Tue 9/6/05
65	Submittals for other items	45 days	Tue 10/18/05
66	Site work, footing & foundations	30 days	Tue 9/6/05
67	Construction building	120 days	Tue 10/18/05
68	Testing & commissioning	7 days	Tue 4/4/06
69	Substantial completion, punch list	7 days	Thu 4/13/06
70	Final inspection, Close-out	7 days	Mon 4/24/06
71	Owner move-in	30 days	Wed 5/3/06
72	**"Old" Power Plant Site - Preparation for Community Center**	240 days	Tue 1/9/07
73	Complete Removal of Equip. & Supplies	30 days	Tue 1/9/07
74	Prepare for Haz-mat Abatement	30 days	Tue 2/20/07
75	Haz-mat Abatement & Removal of old City Power Plant	90 days	Tue 4/3/07
76	Demolition of buildings, Substation to remain	90 days	Tue 8/7/07
77	**PMP&L 25kV Distribution Upgrade & Removal of Downtown Substation Projects**	240 days	Tue 1/9/07
78	New 25kV Distribution line tie-in from Scow Bay Substation	180 days	Tue 1/9/07
79	Demolition of Downtown Substation	30 days	Tue 9/18/07
80	Complete site for new construction	30 days	Tue 10/30/07



PETERSBURG POWER PLANT RELOCATION
PRELIMINARY PROJECT BUDGET

FEBRUARY 02, 2004

ITEM	QUANTITY	UNITS	$/UNIT	SUBTOTAL
ESTIMATED CONSTRUCTION COSTS				
Site work - Power Plant	1	LS	445,901	445,901
Admin./Crew Center Building (including retaining walls)	1	LS	1,698,847	1,698,847
Power Plant	1	LS	9,098,036	9,098,036
General Conditions	1	LS	3,256,769	3,256,769
Contingencies	1	LS	2,331,963	2,331,963
SUBTOTAL				16,831,516
ESTIMATED INDIRECT COSTS				
Permits and fees	2	%		336,630
City of Petersburg project management	2	%		336,630
A/E fees	12	%		2,019,782
Advertising, printing, bidding	1	LS	50,000	50,000
Construction management and inspection	4	%		673,261
FF&E	2	%		336,630
Project contingency (10%)	10	%		1,683,152
Inflation to November 2005	6	%		1,009,891
SUBTOTAL				6,445,976
TOTAL ESTIMATED PROJECT COST				**$23,277,492**

ADDITIONAL RELATED PROJECTS (VERY ROUGH ESTIMATES AT THIS TIME)	QUANTITY	UNITS	$/UNIT	SUBTOTAL
Distribution system to support new power plant	1	LS	1,500,000	1,500,000
Existing distribution system changes, 2,400 V to 24.9 kV	1	LS	350,000	350,000
Modifications to Four Dam Pool Agency Substation	1	LS	500,000	500,000
PMP&L Hydro Plant Modifications for SCADA System	1	LS	250,000	250,000
Existing Site demolition	1	LS	1,711,939	1,711,939
Purchase of additional Admin/Crew Center Property (unknown)	1	LS		
SUBTOTAL				4,311,939

PETERSBURG POWER PLANT RELOCATION
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CHAPTER FIVE
EXISTING FACILITIES AND SITE

PETERSBURG POWER PLANT RELOCATION MASTERPLAN AND PROGRAM

INTRODUCTION

The various buildings, structures, sheds, and trailers located at the existing downtown site currently house the full Petersburg Municipal Power and Light administrative offices, line crew facilities, and all generation sets. General outdoor storage for poles, transformers, wire, insulators, and other materials and equipment is located at a separate fenced storage area approximately 1.5 miles from the downtown site. The downtown site has several serious deficiencies.

- There is no ADA accessible access to administrative spaces, including public use spaces. Further, it could be technically infeasible to provide access by constructing an elevator because of site and building space constraints.
- Public and staff parking at the site is inadequate. There appears to be no reasonable option to add parking due to existing site limitations.
- Future expansion is limited or impossible due to site constraints. Further, existing facilities and other site uses are unreasonably packed together.
- Existing buildings are old and poorly insulated.
- Many building components throughout the site including roofing, siding, windows, doors, finishes, mechanical equipment, electrical equipment, etc., are at or near the end of any reasonable useful life and should be replaced.
- Existing structures and equipment may contain hazardous materials including asbestos, lead paint, and PCB's. There is also the possibility of soil contamination. Further study is required to confirm the presence and/or extent of hazardous materials. See separate narrative at the end of this chapter for additional information.
- Operation of large generation sets in downtown Petersburg is problematic because of the noise and diesel fumes created. The downtown area is not an appropriate location for a power plant facility.
- The City of Petersburg has plans to use the site for a proposed community center including library, museum, city offices, and lease space. This facility cannot be built until Petersburg Municipal Power and Light facilities are relocated to another site.
- Many staff spaces and areas are inadequate to support efficient and safe operations. A few notable examples include the following: 1) Office spaces, due to location directly above generation sets, are uncomfortably noisy when generators are running; 2) Lighting in office spaces is poor in some areas; 3) Line crew spaces are cramped and inefficient; 4) There are no drying areas for line crew equipment and clothing; 5) Ventilation is inadequate in many areas.

EXISTING POWER PLANT AND POWER GENERATION EQUIPMENT

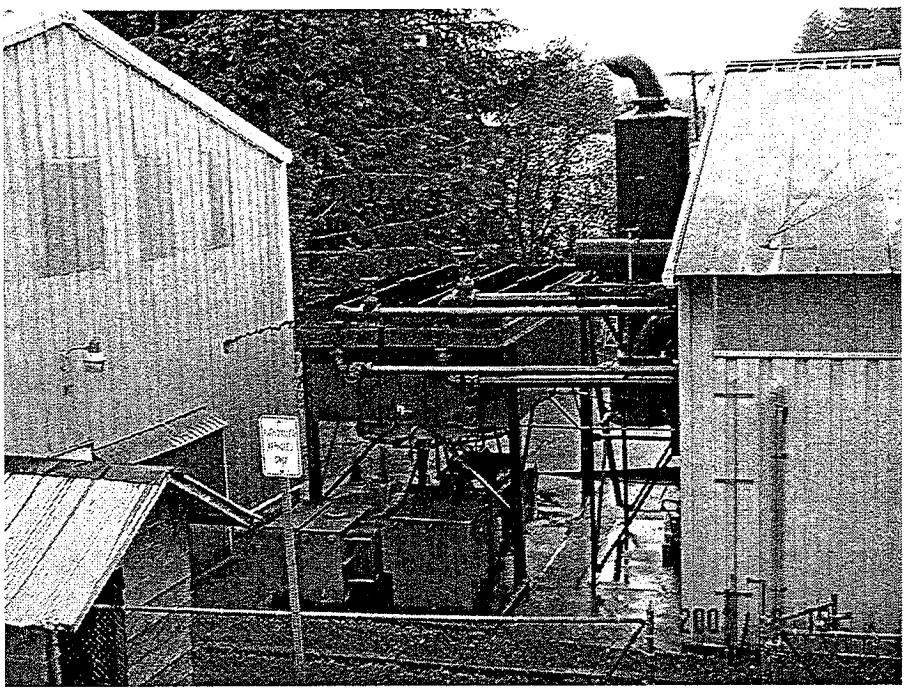
The existing downtown diesel plant is severely capacity deficient. The load forecast found in the 20 year study period[1] indicates that the City may reach 15MW of peak demand by the end of the study. The existing plant site would need four additional 3,500 kW units to supply this demand. Since the site could accommodate only one additional unit, the purchase of additional costly downtown land would be required to construct additional units to meet the forecast future demand. Thus it has been determined that the current Power Plant and downtown location are not adequate for continued expansion. Following is a table summarizing existing power generation equipment.

Unit	Manuf.	Year	Cyl.	kW Rating	Stroke	Cond.	Volts	PMP&L Remarks
1250	Superior	1956	8	1250	4	good	2400	some oil leakage
D398	Cat	1981	12	600	4	bad	2400	needs rebuilt - $40K, worth $20K
D399	Cat	1981	16	800	4	fair	2400	
16V71	Detroit	1970	16	350	2	good	2400	portable in trailer, black start unit
EMD-16	GM	1972	16	2100	2	fair	2400	rebuild scheduled 2003/4, $50K
EMD-20	GM	1972	20	2500	2	good	4160	has been rebuilt
EMD-21	GM	1977	20	2500	2	good	4160	has been rebuilt

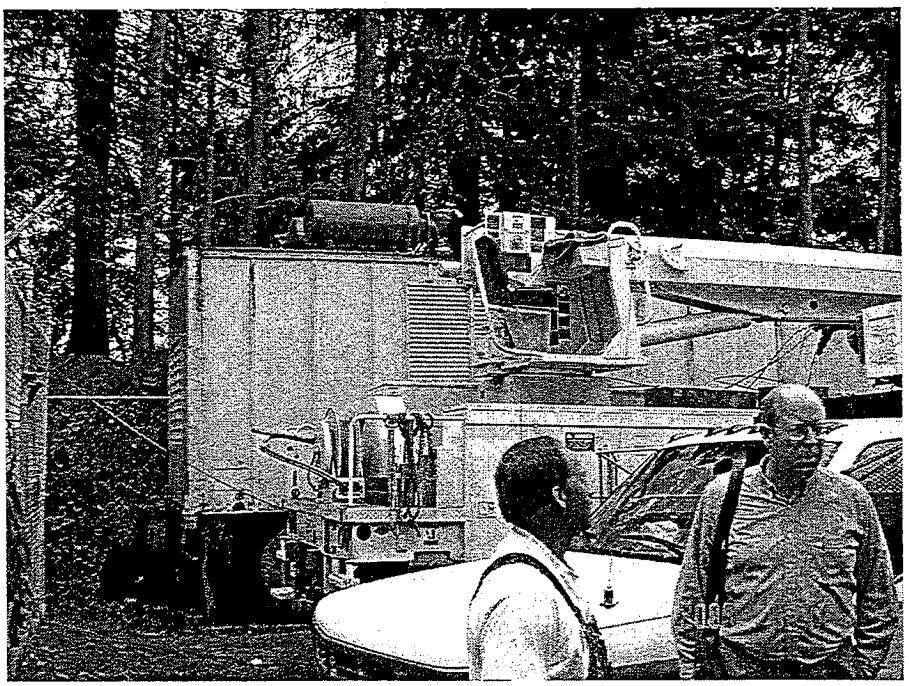
EXISTING POWER PLANT PHOTOGRAPHS

The following photographs are included in this chapter to provide a general sense of existing site and facilities. A complete selection of photographs, as well as the ones included in this chapter, can be found in the Appendix.

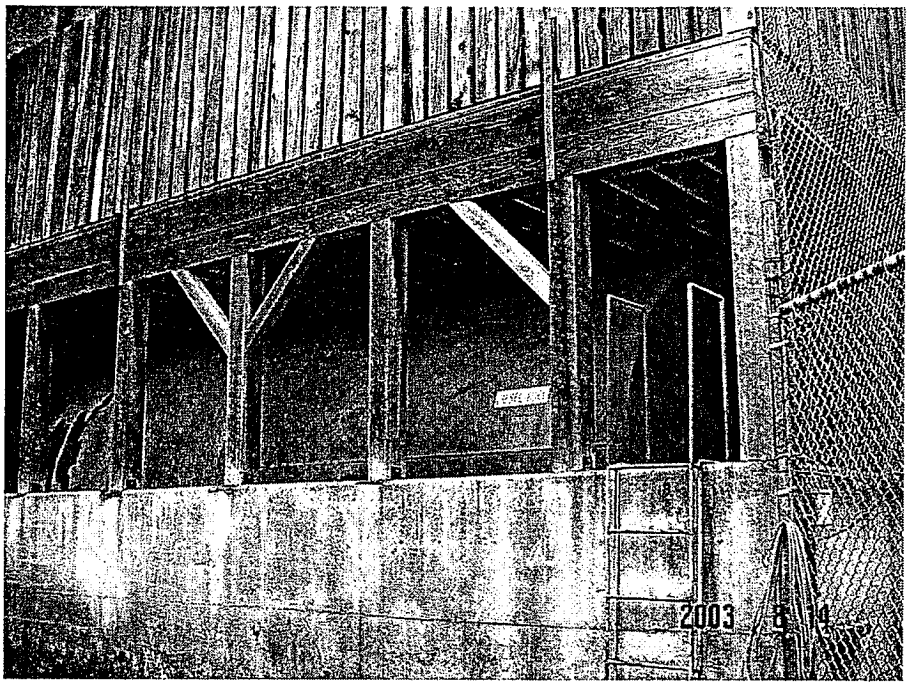
[1] Petersburg Power and Light, 20 Year Plan Draft Report; Ron Beazer, P.E., Jeff Mann



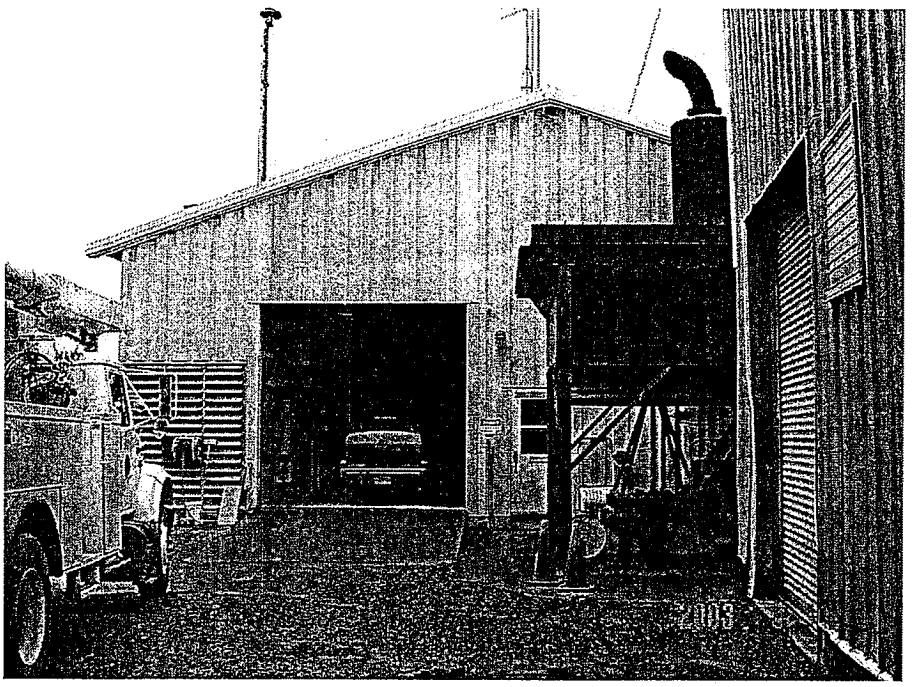
Existing Generator Buildings



Existing black start unit trailer



Fuel Storage Building



Existing Generator Buildings

HAZARDOUS MATERIALS NARRATIVE

Introduction

It is our understanding that the entire existing Petersburg power plant facility at Haugen Drive and Main Street will be demolished once the new power plant is on line. The city plans to construct a new community center on the site once the old plant is gone. The existing facility includes the following main elements:

- a two-story wood-frame office/shop building,
- a steel-framed metal building housing two 2,500 KW gensets powered by V-20 EMD diesels,
- a steel-framed metal building housing one 2,100 KW genset powered by a V-16 EMD diesel,
- a steel-framed metal building housing a control room, restrooms, and three gensets: a 1,250 KW generator powered by an8 cylinder White Superior diesel, an 800KW generator with a V-16 Cat diesel, and a 600KW generator with a V-12 Cat diesel,
- a 40 foot chassis-mounted conex housing a self-contained 350 KW emergency genset powered by a V-16 Detroit diesel,
- a 15,000 gallon horizontal welded-steel fuel storage tank mounted inside a concrete covered containment,
- a wood-framed shed housing an in-ground oil-skimmer facility,
- an above-ground waste oil tank mounted adjacent the oil-skimmer shed,
- various underground pipelines, including fuel supply, lube oil drain, and waste oil drain,
- a fenced-in substation that includes a main transformer and a recloser switch.

Demolition of Existing Facility

The demolition project needs to include removal of any hazardous materials before demolition occurs, or in some instances appropriate handling and disposal during demolition. Materials noted during the field visit that may be hazardous include:

- Possible asbestos containing materials (ACM), including 12" x 12" floor tile, gypsum wall board (GWB), window caulking, and building paper beneath siding and roofing,
- Fluorescent tubes and possible PCB ballasts in older light fixtures,
- Lead based paint (LBP), often found on equipment, structural steel, architectural elements such as hand rails, soffits etc.,

Normally we would also suspect PCB insulating oil in transformers and switches associated with power generation, but Petersburg Municipal Power & Light employees have indicated that all electrical components with PCBs have long since been replaced. Records are available to confirm the work.

The various gensets may well be coated with LBP, and it is possible that asbestos exists in gaskets and thermal system insulation (TSI) on such things as exhaust systems. Based on conversations with Power & Light employees, however, it seems reasonable to expect that the various gensets will be sold and shipped away. Assuming that will be the case, there is no need to include them in a pre-demolition hazardous materials investigation.

For this facility, then, we would recommend a pre-design survey for ACM, LBP, and other hazardous materials to ensure that the demolition contract documents identify all hazardous materials for removal prior to actual demolition. We would exclude gensets, transformers, and switches from the investigation.

At some point the project must address the possibility of contaminated soil being encountered. Sometime around 1974 there was a spill of about 150 gallons in the vicinity of the cooler for the White Superior genset, and stained soil was noted here and there around the property during our site visit. It is not uncommon for facilities such as this to have suffered leaks or spills that, over time, result in significant contamination.

There is no requirement for the owner to investigate for soil contamination prior to demolition activities or even before new construction begins. If contamination is found during a project, however, the owner *is* obligated to report it to the Alaska Department of Environmental Conservation (ADEC). Once contamination has been reported, the owner must do whatever ADEC determines appropriate to address the issue. Encountering unexpected contamination in the middle of a new construction project is not a desirable circumstance. It therefore makes sense to investigate the site for contamination after all existing structures are gone, but before new construction begins.

In summary, we recommend a pre-demolition survey for ACM, LBP, and other hazardous materials, and a post-demolition investigation to characterize the site for soil contamination

Hazardous Materials

Although several structures on the site are basic steel buildings with fiberglass TSI, it is important to know whether ACM exists in the wood-framed structures as well as on mechanical systems related to power generation. Suspect building materials include GWB, floor tile, window glazing, and building paper. Federal regulations require that virtually all ACM be removed prior to demolition.

Much of the structural steel visible in the steel-framed buildings is coated with red paint, and such coatings are often LBP. Likewise, it is not uncommon to find LBP on large pieces of

industrial equipment or architectural elements like tanks, doorframes, steel stairs, hand railing, silencers, and coolers. Demolition can occur with coatings on these items left in place, but the contractor must follow certain procedures to ensure worker safety, and sometimes disposal issues must be addressed.

Other materials with hazardous components that might impact demolition include fluorescent tubes and PCB ballasts in fluorescent fixtures, and mercury thermostats.

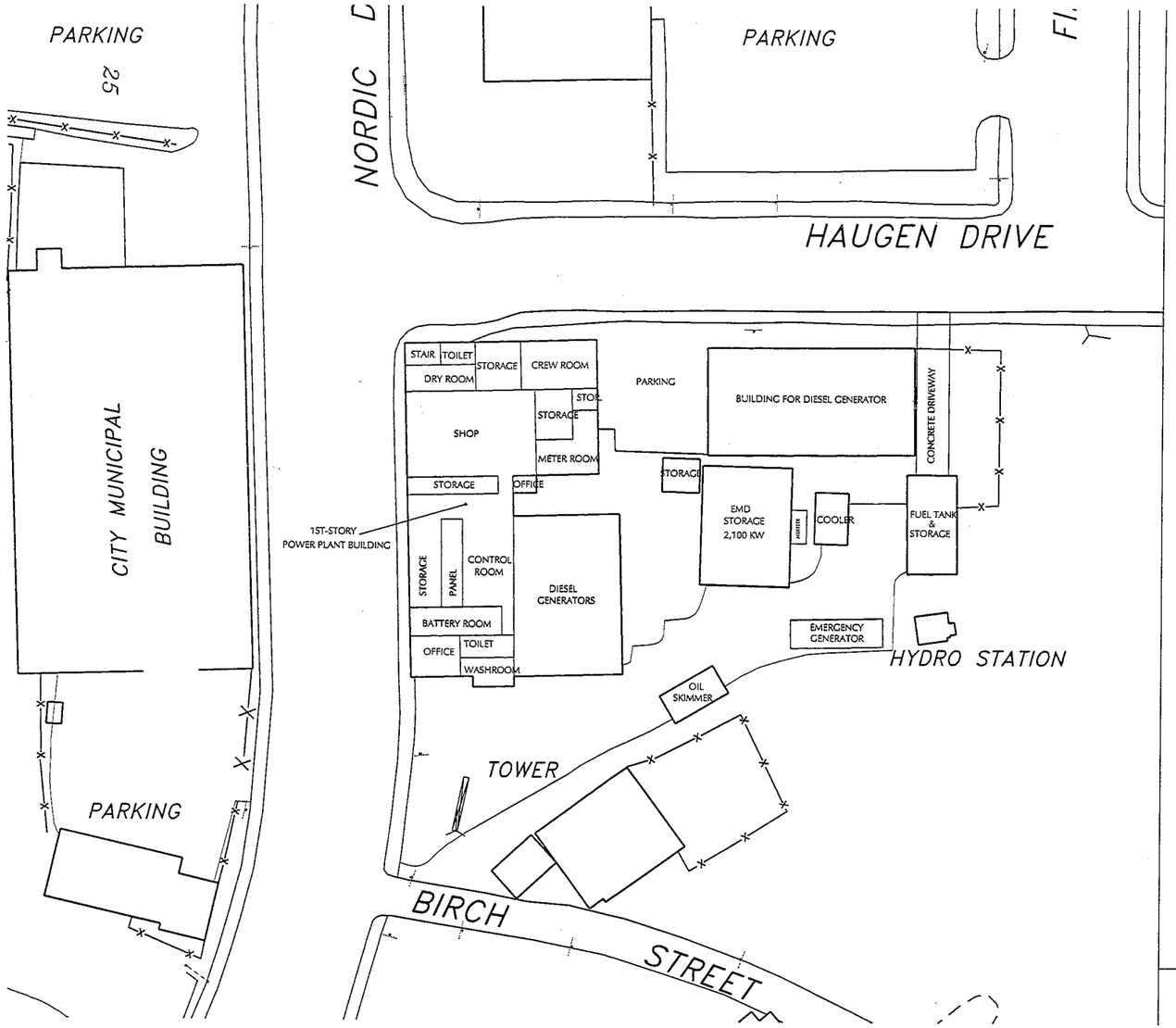
All of these items need to be identified prior to the development of demolition contract documents.

The possibility of contaminated soil is a real concern at a facility such as this one. It is recommended that the demolition contract documents specify procedures for dealing with contamination if it is encountered, including:

- procedures for environmental oversight to determine when soil is contaminated above acceptable limits,
- procedures for stockpiling contaminated soils, and
- procedures for confirmation sampling to prove all contaminated soil has been removed.

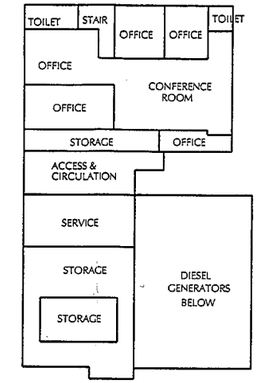
We would recommend that the post-demolition site assessment to characterize soil contamination (if it is encountered) be carried out by an environmental consultant independent of the demolition contract. Such a site investigation is more appropriately carried out as a professional services contract on a time and expenses basis, primarily because of the unknown nature of the work.

The consultant should be familiar with state regulations for contaminated sites, and ideally should have a strong working relationship with state regulators. There are a number of options for addressing contaminated sites, ranging from complete removal (and shipping it away for disposal), to establishment of alternate cleanup levels that allow it to remain in place.



LOWER LEVEL

EXISTING PETERSBURG POWER PLANT FACILITY



POWER PLANT BUILDING
UPPER LEVEL

FILE

50 25 0 100 200'

SCALE: 1" = 50'

\0315.09 SITE PLAN

MRV
MINCH RITTER VOELCKERS ARCHITECTS
800 GLACIER AVENUE #A
JUNEAU, ALASKA 99801
907-586-1371
FAX 907-463-5544
mrv@mrvarchitects.com

MRV # 0315.09

MASTERPLAN

PETERSBURG POWER PLANT RELOCATION STUDY

FOR THE CITY OF PETERSBURG

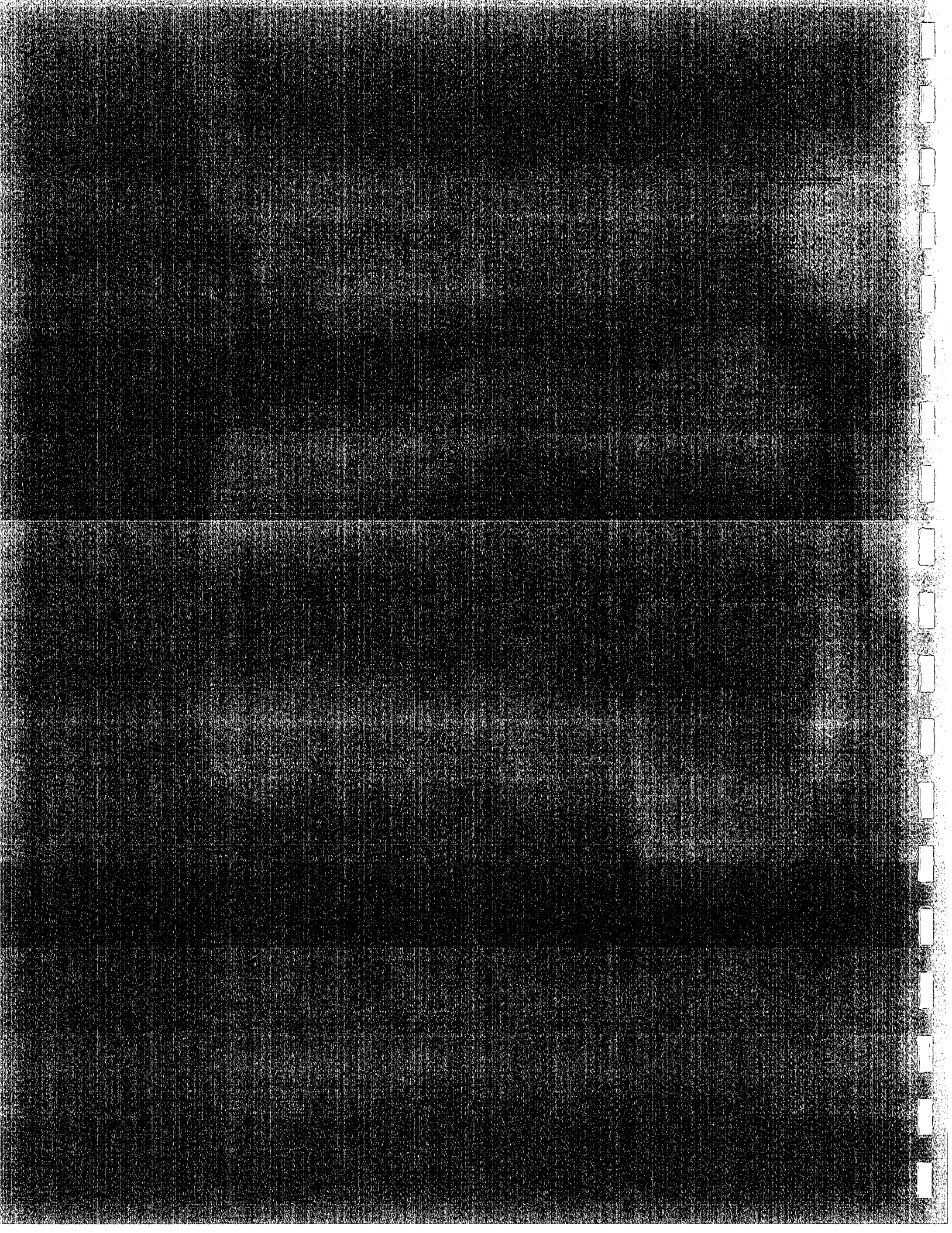
SHEET TITLE:
EXISTING POWER PLANT SITE

DATE: DECEMBER 2003
SCALE: NONE
DRAWN: MPA
CHECKED: RR

SHEET NO.
A3

PETERSBURG POWER PLANT RELOCATION
MASTER PLAN AND PROGRAM

CHAPTER SIX
MASTER PLANS



PETERSBURG POWER PLANT RELOCATION
MASTER PLAN AND PROGRAM

INTRODUCTION

The primary purpose of this project is to plan for the relocation of Petersburg Municipal Power and Light facilities from its congested and inadequate current site, that is poorly located in the center of town to a more appropriate location, to recommend upgrades or alternatives for existing inadequate equipment, to recommend approaches to modernization of systems, and ultimately to consolidate all power and light operations including buildings and yard storage into a single location with sufficient space and access. The master plans included in this chapter therefore illustrate the construction of a new Power Plant with yard storage, new Administration/Crew Center, and associated facilities for Petersburg Municipal Power and Light at two adjacent sites located near Scow Bay. The master plans assume that existing downtown facilities will be completely removed after relocation is complete to allow for other development planned by the City of Petersburg.

The specific project sites are located on Mitkof Highway, north of the Reid Brothers Maintenance Shop and south of the Alaska Power Substation. The sites are adjacent and connected by a gravel road. The smaller lower site is adjacent to the power substation and abuts and is roughly level with Mitkof Highway. The larger upper site is accessed via a new gravel roadway just to the south of the lower site. See the civil engineering narrative in Chapter 8 for more detailed information about the two sites.

The master plans both illustrate two new buildings. Construction at the larger upper site will include the power plant building, several accessory structures, and yard storage - both open and covered. Construction at the smaller lower site will include the Administration/Crew building, public and staff parking, and vehicle apron. The size and layout of all buildings shown in the master plans are derived from the programming information included in Chapter 7 and the power generation assumptions included in Chapter 9.

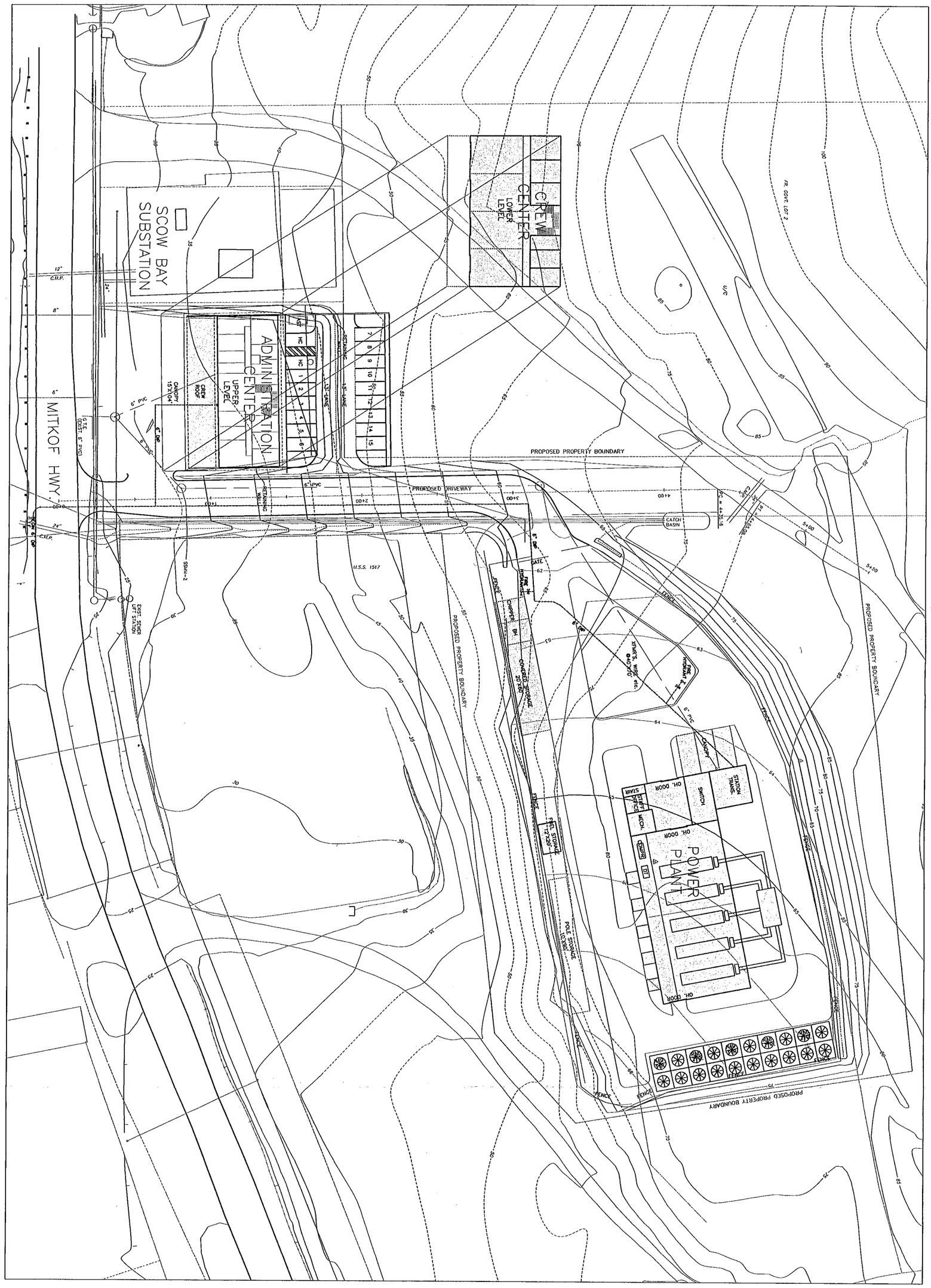
ALTERNATIVES EXPLORED

The City of Petersburg explored various properties before making the purchase of the site presented in this master plan. The City concluded that the congested existing downtown site was inadequate for further expansion without the purchase of additional prime downtown property. After consideration of the various alternatives the City selected the site adjacent to the existing Four Dam Power Pool Substation located in Scow Bay. The partially developed site was used as a basis of study for the different PMP&L relocated functions. Acquisition of additional adjacent land, if required, should be minimal and relatively inexpensive.

MASTER PLANNING ASSUMPTIONS

Although not an exhaustive list, the master planning assumptions below were developed and used during preparation of the two master plans included at the end of this chapter. These assumptions should be reconfirmed, expanded as necessary, and used again for any future master planning efforts. See Chapter 7 for a list of recommended programming assumptions.

- The layout of facilities, equipment, and other features at the Power Plant site shall facilitate efficient access and circulation by vehicles and personnel.
- The exterior perimeter of the Power Plant site shall be secured with an appropriate fence and one point of access and security devices as recommended.
- Consider future purchase of additional land for second means of egress from the Powe Plant site.
- Clearances around Power Plant and related equipment shall be sufficient to allow easy maintenance and replacement.
- Although there are some space limitations at the sites, the facilities should be organized to allow for future expansion to the extent possible.
- Provide locations for dumpsters that are convenient and shielded from public view.
- Public access to the Administration/Crew Center shall be convenient and safe.
- Provide reasonable landscaping at the Administration/Crew Center parking areas and building entries. Landscaping is not required at the Power Plant site.
- At the Administration/Crew Center avoid circulation traffic conflicts between staff and the public to the greatest extent possible.
- At the Administration/Crew Center and the Power Plant, use multi-floor building schemes to reduce the overall building footprints.
- Utilize multi-level storage units at Power Plant and site to the extent possible to reduce building footprint.
- Locate noise-producing equipment away from Mitkof Highway and away from the Administration/Crew Center to greatest extent possible.
- Locate underground utilities to maximize access for easy maintenance and future replacement.
- Provide public bus stop and conveniant pedestrian route to Administration/Crew Center public entry.
- Avoid pedestrian routes with slopes greater than 12%. Accessible routes should be 5% maximum slope.
- Avoid vehicular routes with slopes greater than 6%.
- Maximize safe public and staff ingress and egress at Mitkof Highway.
- Consider snow removal and storage in the layout and design of all facilities and parking areas.



MASTERPLAN

PETERSBURG POWER PLANT RELOCATION STUDY

FOR THE
CITY OF PETERSBURG

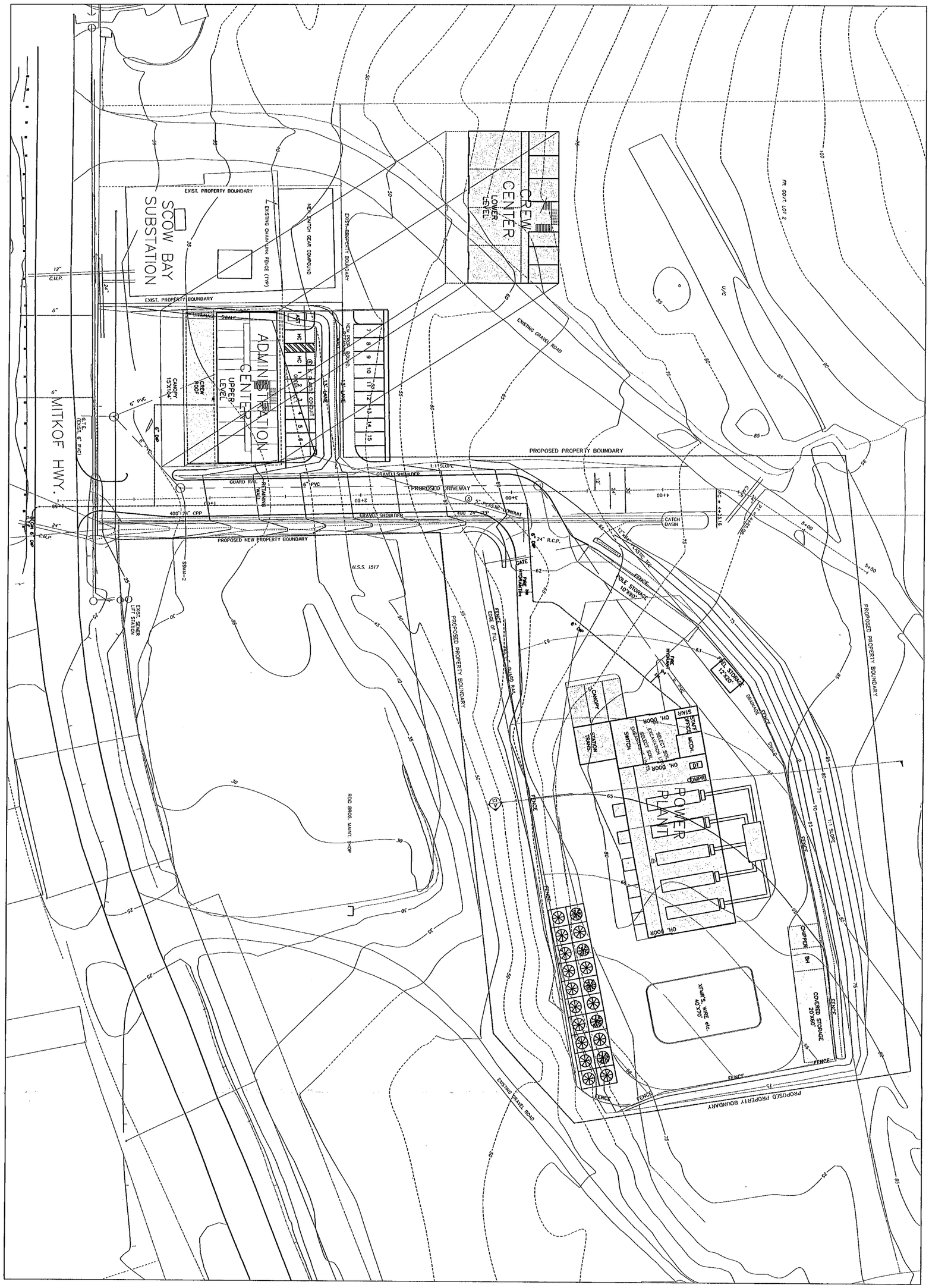
MRV # 0315.09

SHEET TITLE: MASTERPLAN SCHEME ONE

DATE: FEBRUARY 2004
SCALE: 1:30
DRAWN: MPA
CHECKED: RR

SHEET NO. A1

MRV
MINCH RITTER VOELCKERS ARCHITECTS
800 GLACIER AVENUE #A
JUNEAU, ALASKA 99801
907-586-1371
FAX 907-463-5544
mrv@mrvarchitects.com



MASTERPLAN

PETERSBURG POWER PLANT RELOCATION STUDY

FOR THE
CITY OF PETERSBURG

MRV # 0315.09

SHEET TITLE: MASTERPLAN SCHEME TWO

DATE: FEBRUARY 2004
SCALE: 1:30
DRAWN: MPA
CHECKED: RR

SHEET NO. A2

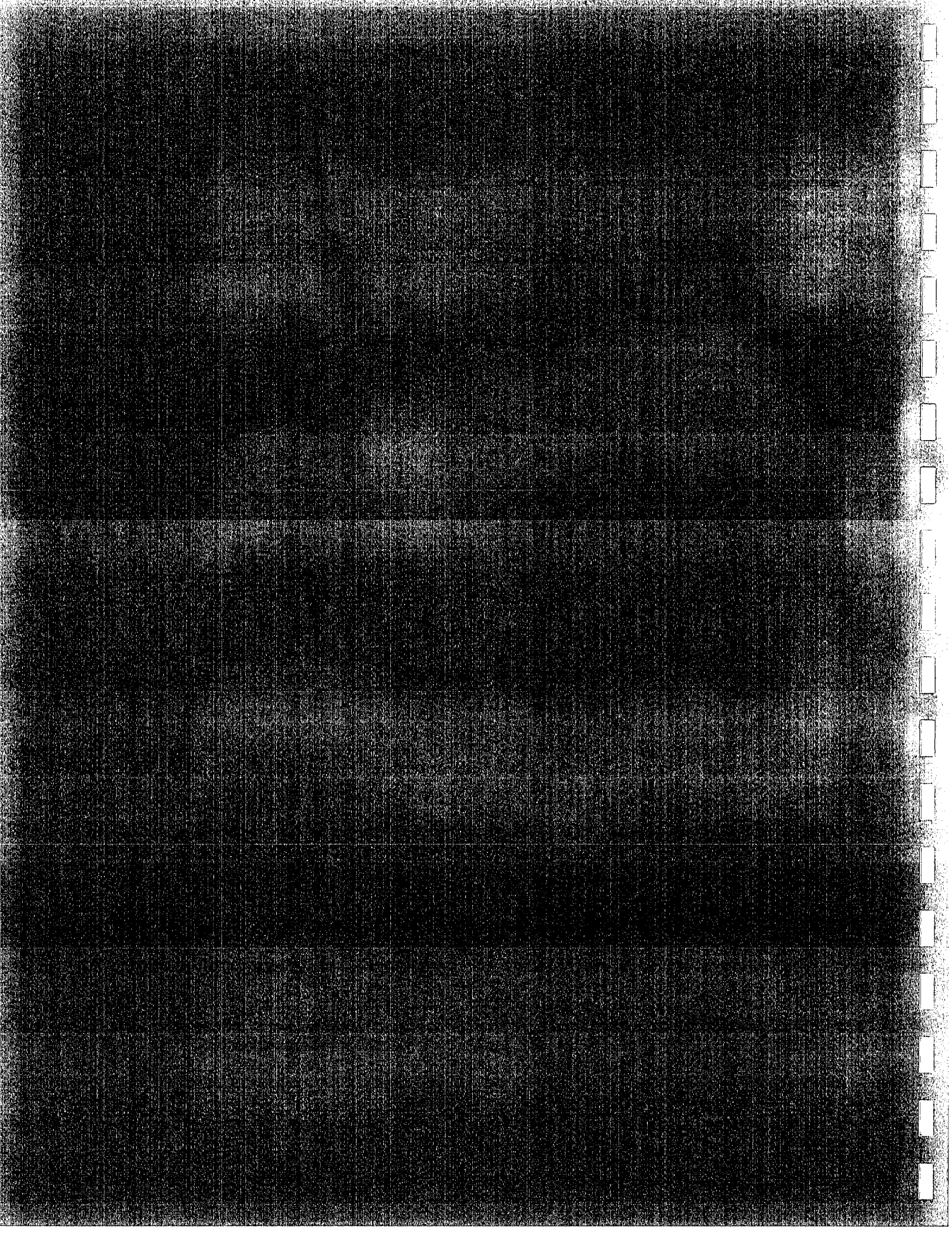
MRV
MINCH RITTER VOELCKERS ARCHITECTS

800 GLACIER AVENUE #A
JUNEAU, ALASKA 99801

907-586-1371
FAX 907-463-5544
mrv@mrvarchitects.com

PETERSBURG POWER PLANT RELOCATION
MASTER PLAN AND PROGRAM

CHAPTER SEVEN
PROGRAM



PETERSBURG POWER PLANT RELOCATION
MASTER PLAN AND PROGRAM

INTRODUCTION

The development of the following programming assumptions, space requirements, and adjacencies was a collaboration between the consultant team and Petersburg Municipal Power and Light staff. The information included in this chapter should be used as recommendations or guidelines during the design process. For example, it is not anticipated that the exact areas noted in the space requirements will be achievable in all cases. The need to organize spaces efficiently and neatly during schematic design will sometimes require areas to be larger or smaller than actually indicated. The same is true of the illustrated adjacencies. These should be considered as no more than recommendations, and will likely be adjusted as well to allow flexibility during the design process.

PROGRAMMING ASSUMPTIONS – POWER PLANT

- Consider staff safety in the location and organization of all equipment and spaces.
- Provide sufficient height access from exterior into repair shop.
- Provide sufficient height access from repair shop to generator spaces.
- Provide adequate sound separation construction between the generator room and the other occupied spaces.
- Height and width of vehicle bay doors shall be sufficient for the vehicles served but also operable by one person during a power outage.
- Provide sufficient maintenance space around all generators an other equipment.
- Assume the repair shop will not be used for vehicle maintenance or repair.
- Provide sufficient location and area for the safe storage of oxygen bottles.
- Provide direct access to natural light and ventilation at all office and similar spaces.
- Provide appropriate location and sufficient space for mechanical ventilation equipment. Do not rely on operable windows for code required building ventilation.
- Provide adequate width in hallways for persons with tools to pass comfortably.
- Provide separate exterior doors at office, shop and generator equipment area to allow efficient ingress and egress by staff.

PROGRAM ASSUMPTIONS - ADMINISTRATION/CREW CENTER

- Ingress and egress of service trucks and other vehicles should be located and designed to avoid conflicts with nearby intersections to the extent possible.
- Provide a minimum 55 foot paved parking apron in front of vehicle bays.
- Utilize retaining walls at first floor to maximize use of the site.
- Provide sufficient height in vehicle bays to park all PMP&L vehicles.
- Provide truck bays for line truck, bucket truck, flatbed truck, and service truck. Provide a fifth vehicle bay to accommodate a future purchase, if possible.
- Consider provisions for equipment and vehicle washing in one of the bays.
- Provide sufficient walk-around area and equipment handling space at all vehicle bays.
- Locate the foreman's office to allow supervision of vehicle bays and convenient access by staff.
- Provide continuous work benches at the end of all vehicle bays to the extent possible.
- Provide centrally located interior stairway to allow efficient and safe access between administration and crew areas.
- Assume all vehicle repair work will be performed at a separate motor pool – no work will occur in vehicle bays.
- Locate the fresh air intake as far away as possible from possible fumes of idling trucks.
- Provide radio base room if required.
- Administrative and office spaces for customer service and support staff should have access to outside views and light.
- Assume staff will share common coffee/break areas, copy & printer equipment, and conference room.
- Provide adequate width in main corridors for persons to pass comfortably. A minimum clear width of 6 feet is recommended.
- Locate mechanical room with boilers and air handlers at the second floor to allow easy access to combustion and ventilation air.
- Provide sufficient space in Break Room for small standard kitchen, vending machines, and round tables with chairs.
- Provide sufficient space in Copy Room for large copier, fax, paper storage, and layout of documents.

POWER PLANT SPACE REQUIREMENTS

SPACE	QUANTITY	NSF	SUBTOTAL (NSF)
FIRST FLOOR AREA			
MECHANICAL BOILER	1	260	260
SWITCHGEAR ROOM	1	600	600
BATTERY ROOM	1	60	60
REPAIR SHOP	1	1000	1000
SHOP OFFICE	1	150	150
GENERATOR AREA (N1)	1	7500	7500
TOILET ROOM, SHOWERS (N2)	1	80	80
SECOND FLOOR AREA			
OFFICE	1	120	120
CONTROL ROOM (SCADA)	1	225	225
METER MAINTENANCE	1	225	225
JANITOR	1	50	50
TOILET	1	60	60
SUBTOTAL			10330
NON-ASSIGNABLE (Assume 90% efficient)			1,148
MECHANICAL/ELECTRICAL (included above)			
CIRCULATION			
STRUCTURE/WALLS			
TOTAL AREA (GSF)			**11,478**

NOTES:
N1 - Area includes circulation around generators.
N2 - Assume 1 shower.

POWER PLANT YARD SPACE REQUIREMENTS

SPACE OR AREA	QUANTITY	NSF	SUBTOTAL (NSF)
3 VEHICLE COVERED STORAGE	1	975	975
FUEL STORAGE	1	240	240
POLE STORAGE (N1)	1	900	900
TRANSFORMERS/WIRE STORAGE (N1)	1	2800	2800
COVERED STORAGE-GENERAL (N2)	1	1200	1200
BACK HOE STORAGE (N2)	1	300	300
CHIPPER STORAGE (N2)	1	300	300
RADIATOR EQUIPMENT AREA (N3)	1	1770	1770
SUBTOTAL			8485
NON-ASSIGNABLE (Assume 20% +/-efficient)			33,940
MECHANICAL/ELECTRICAL (Incl. above)			
CIRCULATION (Primary space requirement)			
STRUCTURE/WALLS (none)			
TOTAL AREA (GSF)			**42,425**

NOTES:
N1 - Open area accessible on minimum one side.
N2 - Shed roof with open sides acceptable.
N3 - Verify maximum distance from power plant building during design.

ADMINISTRATION SPACE REQUIREMENTS

SPACE	QUANTITY	NSF	SUBTOTAL (NSF)
PUBLIC AREAS			
PUBLIC ENTRY	1	80	80
PUBLIC RECEPTION	1	120	120
PUBLIC RESTROOMS (N1)	2	162	324
STAFF AREAS			
SUPERINTENDENT'S OFFICE	1	220	220
MANAGER'S OFFICE	1	200	200
SPARE OFFICE	1	200	200
MAPPING ROOM	1	250	250
CONFERENCE ROOM (N2)	1	350	350
CUSTOMER SERVICE AREA	1	330	330
COPIER AND FAX ROOM (N3)	1	180	180
MISCELLANEOUS			
STORAGE	1	200	200
BREAK ROOM (N4)	1	160	160
JANITOR	2	50	100
NETWORK ROOM	1	150	150
ELECTRICAL ROOM	1	125	125
SUBTOTAL			2989
NON-ASSIGNABLE (Assume 73% efficient) MECHANICAL/ELECTRICAL (N5) CIRCULATION STRUCTURAL/WALLS			1,106
TOTAL AREA (GSF)			**4,095**

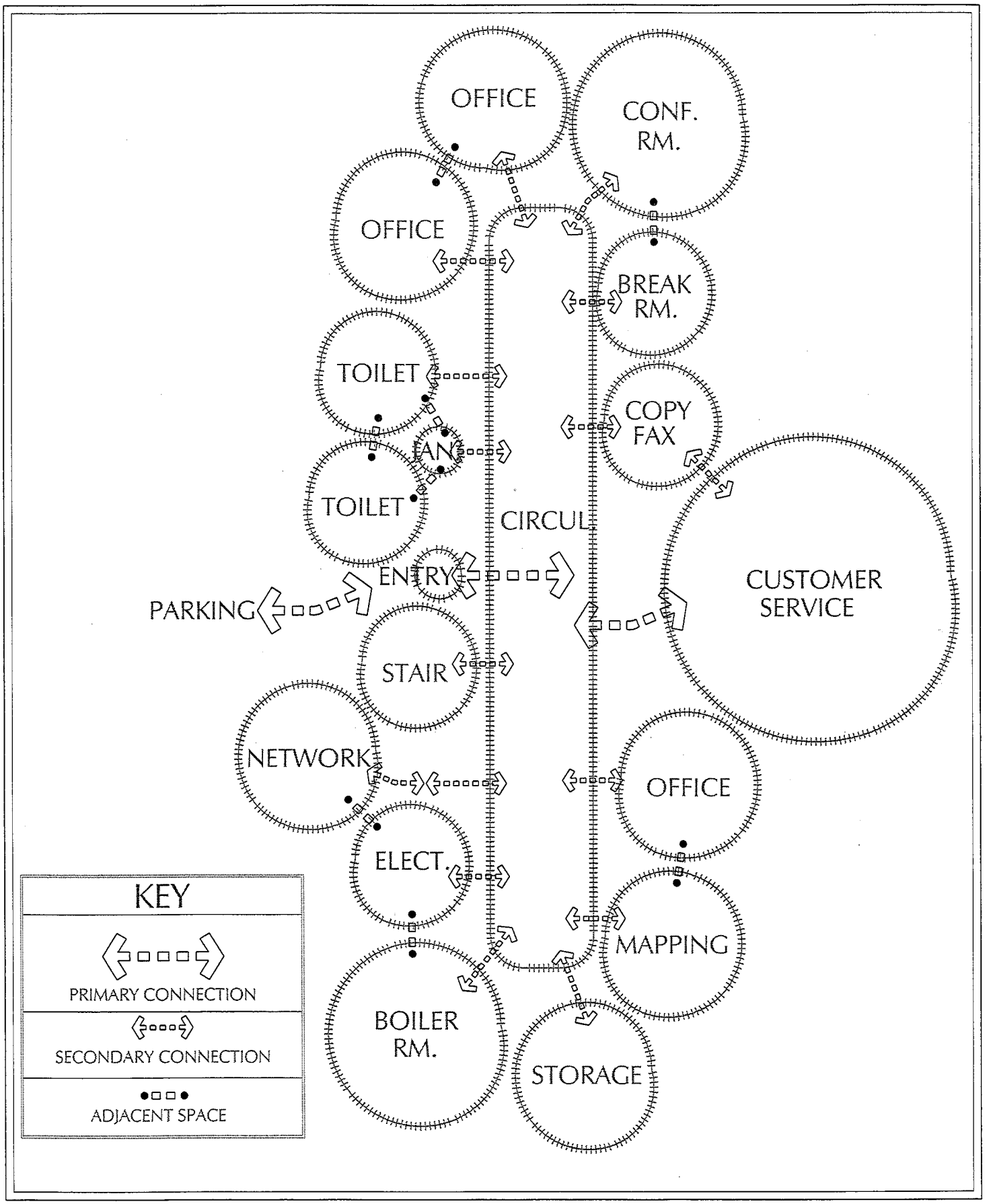
NOTES:
N1 - Single use.
N2 - Provide seating for 15 persons.
N3 - Includes paper and supplies storage.
N4 - Provide seating for 8 persons.
N5 - Except as included under assignable spaces above.

CREW SPACE REQUIREMENTS

SPACE	QUANTITY	NSF	SUBTOTAL (NSF)
CREW AREAS			
VEHICLE BAY (N1)	4	875	3500
DRY STORAGE	1	120	120
STORAGE	1	320	320
FOREMAN'S OFFICE	1	250	250
EQUIPMENT ROOM	1	240	240
MISCELLANEOUS			
BREAK ROOM (N2)(N4)	1	275	275
JANITOR	1	50	50
LOCKER/SHOWER (N3)	1	275	275
SUBTOTAL			5030
NON-ASSIGNABLE (Assume 84% efficient)			958
MECHANICAL/ELECTRICAL			
CIRCULATION			
STRUCTURE/WALLS			
TOTAL AREA (GSF)			**5,988**

NOTES:

N1 - Largest vehicle is boom truck.
N2 - Provide seating for 10 persons.
N3 - Provide 2 showers and 12 full-height lockers.
N4 - Provide area for radio base communication station if required.



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PROJECT: PETERSBURG POWER PLANT	AMC Engineers 701 East Tudor Road, Suite 250 Anchorage Alaska 99503-7457 T: 907-257-9100 F: 907-257-9191	SCALE: NO SCALE	CAD FILE: 0315	
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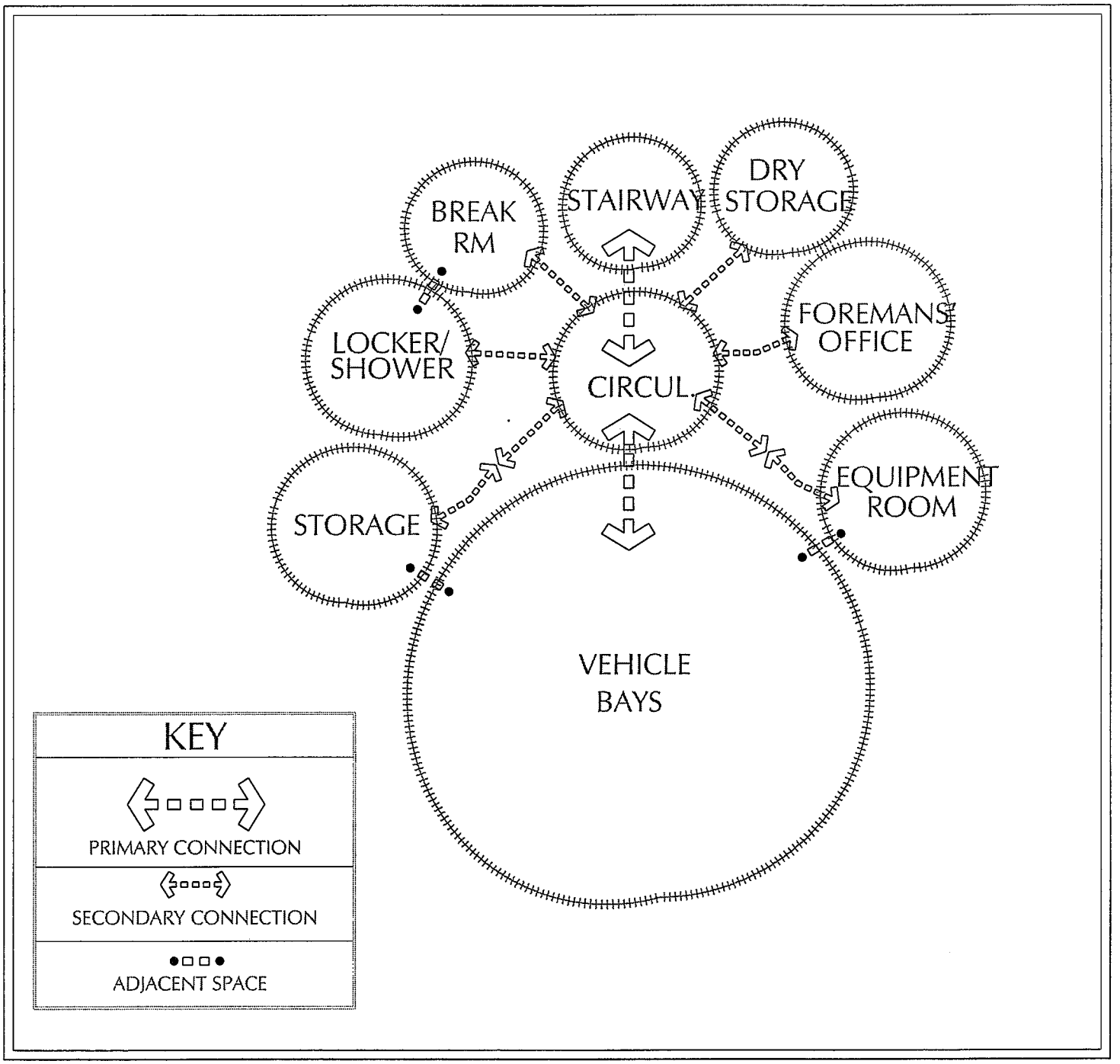

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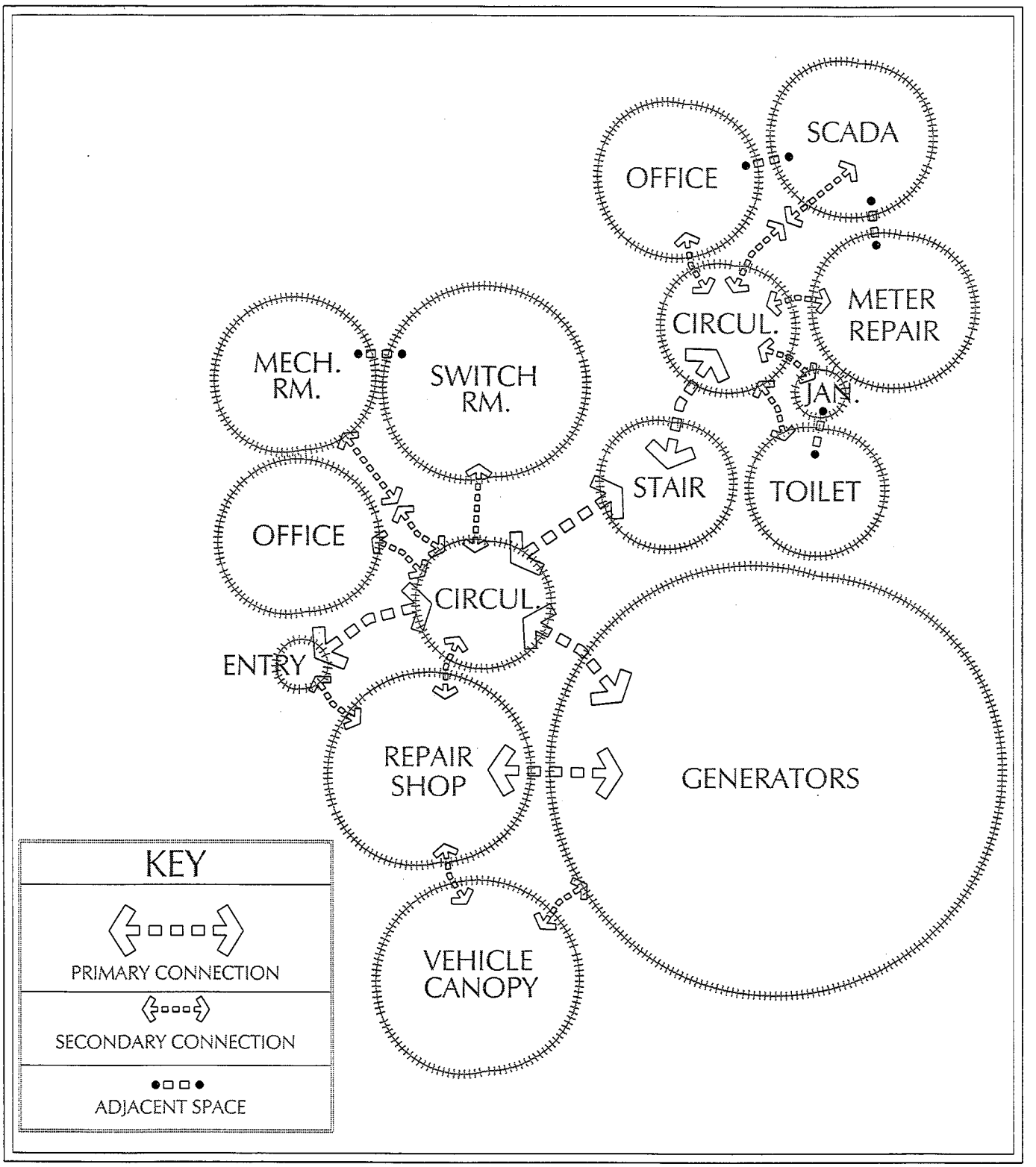
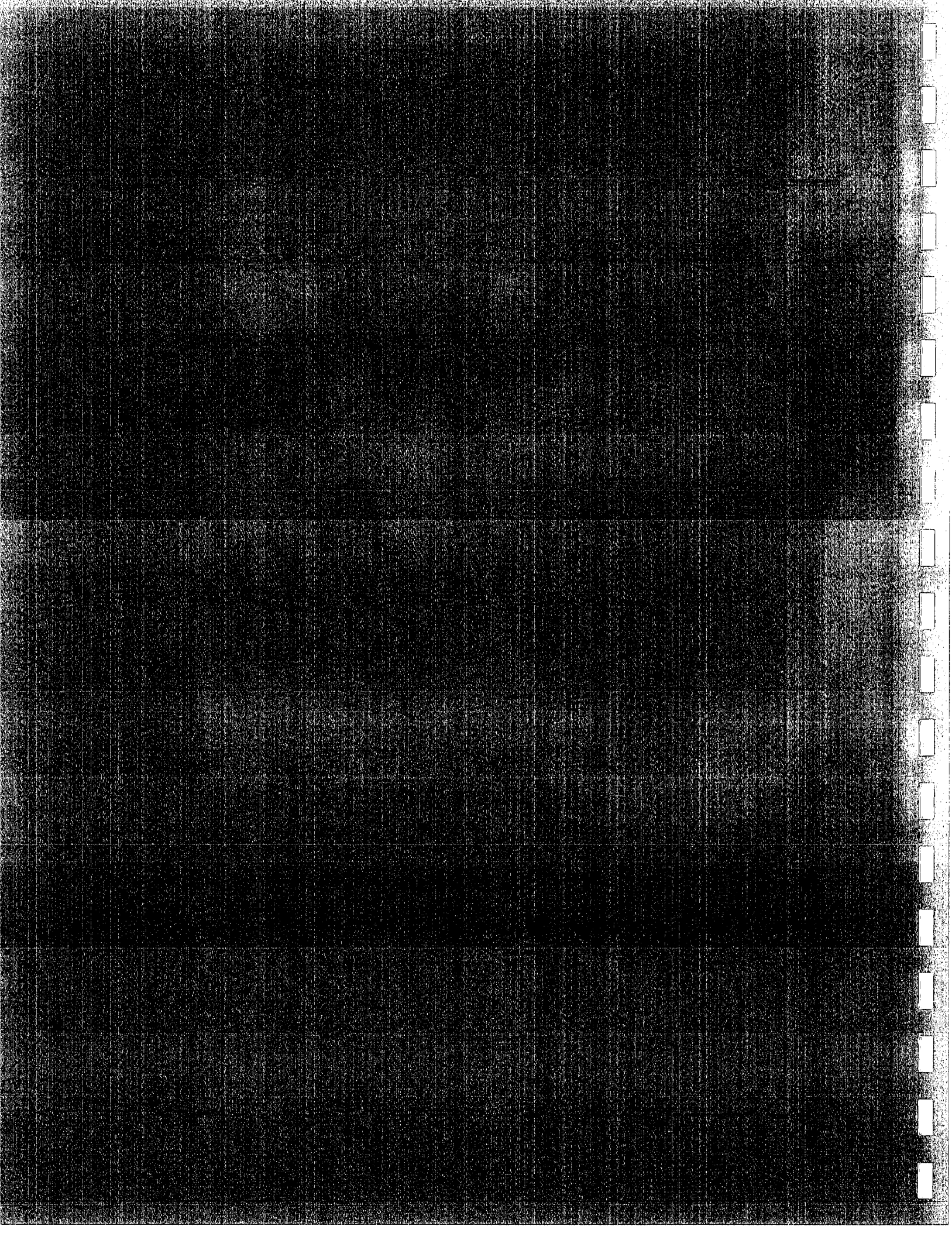
PROJECT: PETERSBURG POWER PLANT	AMC Engineers 701 East Tudor Road, Suite 250 Anchorage Alaska 99503-7457 T: 907-257-9100 F: 907-257-9191	SCALE: NO SCALE	CAD FILE: 0315	A-2
RELOCATION MASTERPLAN AND PROGRAM		DRAWN: MPA	CHECKED: RR	



TITLE: ADJACENCIES FOR POWER PLANT BUILDING	MRV MINCH RITTER VOELCKERS ARCHITECTS 800 Glacier Avenue #A Juneau Alaska 99801 T: 907-586-1371 F: 907-463-5544	DATE: 12-31-03	MRV NO.: 0315	SHEET NO.: A-1
PROJECT: PETERSBURG POWER PLANT	AMC Engineers 701 East Tudor Road, Suite 250 Anchorage Alaska 99503-7457 T: 907-257-9100 F: 907-257-9191	SCALE: NO SCALE	CAD FILE: 0315	
RELOCATION MASTERPLAN AND PROGRAM		DRAWN: MPA	CHECKED: RR	

PETERSBURG POWER PLANT RELOCATION
MASTER PLAN AND PROGRAM

CHAPTER EIGHT
DESIGN NARRATIVES



PETERSBURG POWER PLANT RELOCATION MASTERPLAN AND PROGRAM

POWER PLANT AND YARD STORAGE DESIGN NARRATIVES

CIVIL ENGINEERING NARRATIVE/ GEO-TECHNICAL NARRATIVE

INTRODUCTION

- Per Minch Ritter Voelckers Architects (MRV) notice to proceed, R & M Engineering, Inc. (R&M) has prepared a civil engineering/geotechnical narrative for the proposed City of Petersburg Power Plant facility. This property is owned by the City of Petersburg. MRV provided R&M AutoCAD site drawings on November 11, 2003 to assist in preparing the master plan narratives.

- The project site is located at 3.5 mile Mitkof Highway. The property is currently zoned RR (Residential Reserve) by the City of Petersburg. The legal description of the property is Lot 2B, Power Plant Subdivision.

- The master plan includes two development schemes for construction of a Crew/Administration Center and Power Plant building and yard storage facility. Both facilities will have the need for domestic water, sanitary sewer, storm drain, vehicle and truck parking, and yard materials storage areas. The following narrative will describe civil engineering and geotechnical site improvements for each.

SITE UTILITIES

- Sewer and water services for the Power Plant Building will connect to the existing City of Petersburg public utilities located within Mitkof Highway.

- Power, telephone and television cable are located above ground along the east side of Mitkof Highway with aerial crossings to the west side for service drops. Limited street lighting exists on the timber utility poles in this area.

WATER SERVICE

- The 6" DIP water service that supplies the Administration/Crew Center would be extended further uphill to where a 6" tee and gate valves would be installed for branching off with a 6" DIP water line to supply a fire hydrant assembly. From the tee location the water line would be routed to the Power plant to provide water service to the Power Plant building. It is assumed that a 6"DIP water line would be installed to

the Power Plant building for supplying the toilet room, break room and repair shop area. Two fire hydrants will be provided - one on the upper and one on the lower site.

SANITARY SEWER SYSTEM

- An existing 6" PVC sanitary sewer line exists where a former residential dwelling was located on this property. The City of Petersburg Public Works Department indicates that this existing sewer line could be used for collecting wastewater from the development of the Administration/Crew Center as well as the Power Plant and Storage Yard area.

- The Power Plant building sanitary sewer would begin at the first sanitary sewer manhole where the line from the Administration/Crew Center connects. From this location the 6" PVC sewer line would head southeast toward the existing gravel road where another sanitary sewer manhole would be located. At this point the 6" PVC sanitary sewer line would be extended uphill to an angle point where another sanitary sewer manhole would be installed. The 6" PVC sewer line would then be extended toward the Power Plant building and a sanitary cleanout would be installed 5' from the building wall. Collection of wastewater from the Power Plant building will discharge by gravity methods through 6" PVC piping.

STORM WATER SYSTEM

- Storm drainage around the Power Plant and Yard Storage area will sheet flow away from the power plant building toward the open drainage ditches along the uphill side of the site. Roof gutter downspouts and foundation drains would be routed to the also connect to the underground system and be routed to the highway open ditch.

- The existing storm drain system consists of combination open drainage ditching and underground storm drain piping. Record drawings indicate a 24" CPP storm drain pipe on the south side of the gravel access road. This storm drain pipe discharges to the open ditch system along Mitkof Highway and then to tidewater. It is assumed that the surface storm water will continue to sheet flow along gravel access roads and graded areas to the open drainage ditches and be piped downhill through existing storm system.

SITE ACCESS/PARKING LOT

- Access to the Power Plant and Yard Storage area will be via the existing 30' wide two lane gravel roadway that begins at the intersection of Mitkof Highway as indicated by record drawings. Road grades vary from 1% to 18% per record drawings. Gravel surfaced parking pads exist at the Power Plant building site and record drawings indicate graded to existing drainage ditches. A metal guardrail is installed on the downhill side of the upper parking pad area. It is assumed that the access road and the Power Plant area will not be asphalt surfaced. The existing gravel surfaced areas will

be regraded to allow positive drainage away from the buildings toward the existing drainage ditches.

GEOTECHNICAL

- The Power Plant and Yard Storage site is located on a slightly sloping area that has been graded to drain to an open drainage ditch. Interviews with the City of Petersburg indicate that a U. S. Army Corps of Engineers permit was issued for this site. Record drawings indicate test pits had been excavated on the site. The approximate depth of organic peat (muskeg) and sawdust overburden varied from 4' to 22' in the test pits. The record drawings indicated that these materials were excavated from the site until firm gray til materials were encountered. The site was then backfilled with shot rock and the surface capped with 6" of crushed aggregate rock material. Existing site conditions have not been verified with an on-site geotechnical investigation. It is recommended that this be performed in the next phase of the project to determine allowable soil bearing pressures, ground water levels and foundation preparation recommendations for the Power Plant building.

REQUIRED DEVELOPMENT PERMITS

- The following is a list of development permits that most likely will be required from the City of Petersburg to construct the Power Plant facility;
    - City of Petersburg Conditional Use Permit
    - City of Petersburg Building Permit
    - City of Petersburg Zone Change Request (if property is zoned RR and not Industrial)

ARCHITECTURAL NARRATIVE

POWER PLANT EXTERIOR

- It is anticipated that the power plant be constructed using a pre-engineered metal building system. The pre-engineered metal building system manufacturer shall be American Institute of Steel Construction, Category MB certified.

- The spacing of structural bays shall be designed to allow for installation of generators after the construction of the building is substantially completed.

- The exterior wall panels in the generator space shall be removable in order to allow for future removal of generators.

- The building exterior envelope including roofs, walls, windows, doors, etc., shall be capable of resisting a combined wind and rainstorm of 70 mph and 2 inches per day. Metal flashings, materials and systems with a mechanical overlap shall be used to the

greatest extent possible to achieve required weather resistance. The use of sealant joints shall be minimized to the greatest extent possible, and shall be avoided where a mechanical overlap flashing is a reasonable alternative.

ROOFS:

- In general, exterior roofs shall be designed and constructed utilizing the "Drainage Plane" concept as described in Appendix I of the *Builder's Guide – Cold Climates*, 2000 Edition, published by the Energy Efficient Building Association. Refer to Figure I.12 for a graphic illustration of this concept.

- Roof Slope: The minimum slope of any roof shall be 4 in 12.

- Overhangs: The size of overhangs shall be not less than 18 inches measured from face of wall finish to drip line. Larger overhangs are encouraged.

- Thermal Performance: Roofs shall have a nominal "R" value of at least 30. At pitched roofs, compression of insulation at the outside building walls is permitted to allow for a minimum of one-inch ventilation space under the roof.

WALLS:

- Exterior walls shall have a nominal "R" value of at least 19. Exterior wall construction utilizing metal studs shall include a continuous thermal break with a nominal "R" value of at least 3. Glazing shall have an "R" value of at least 4. Glazing frames fabricated from metal shall be thermally broken.

SIDING:

- Exterior walls shall be designed and constructed utilizing the "Water Managed Wall Rain-Screen System (Drainage Plane with Drainage Space)" as illustrated in Figure I.9 in the *Builder's Guide – Cold Climates, 2000 Edition*, published by the Energy Efficient Building Association. The air space behind exterior siding shall 0.25 to 0.75 inches wide, and shall be created utilizing rot-resistant vertical wood furring (cedar, redwood, or pressure-treated) or an approved pre-manufactured system. Spacing and attachment of furring or pre-manufactured systems shall be sufficient to resist minimum 100 mph winds. Siding shall be further designed and constructed to allow drainage at bottom and ventilation at top of wall.

FOUNDATION WALLS:

- Slab on grade floors of conditioned spaces shall be provided with perimeter insulation with a nominal "R" value of 10. Such insulation shall be of waterproof materials, shall extend from the top of the slab to the top of the footing, and shall be protected where exposed to view with non-corrosive metal flashing or other pre-manufactured system.

OTHER THERMAL:

- Plumbing Protection: Hydronic and domestic water piping located outside conditioned areas shall be protected with insulation with a nominal "R" value of at least 4.

- Vapor Barriers: Vapor barriers shall be placed continuously on the warm side of exterior wall and roof insulation, and shall have a minimum permeability rating equivalent to 6 mil polyethylene sheet.

MISCELLANEOUS:

- Provide a minimum of three exterior hose bibs.

- Provide bollards at exterior overhead doors and around exterior equipment.

POWER PLANT BUILDING INTERIOR

Two levels of finish are anticipated for the interior of this building. The majority of the building will be finished to a standard "warehouse" level. The remainder will have a higher degree of Architectural finishes and include offices, toilets, break room, hallways, SCADA center, and the meter repair room.

- Warehouse type finishes will comprise of the following: Interior metal stud walls, sound insulation, 5/8" Type "X" Gypsum Wall Board, taped and painted, acoustical roof deck with exposed ceilings, and concrete floors with concrete hardener.

- Architectural type finishes will comprise the following: Interior metal stud walls, sound insulation, 5/8" type "X" gypsum wall board, taped and painted, suspended acoustic or gypsum wall board ceilings, commercial grade VCT flooring over concrete, rubber base, wood trim at windows and doors, plastic laminate countertops, solid polymer partitions in toilet rooms, stainless steel toilet accessories and mirror frames, corner guards at hallway corners and a durable wainscot in hallways.

CIRCULATION

- Primary Circulation: Primary Corridors shall not be less than 60 inches clear width. Stairways shall not be less than 54 inches clear width.

STRUCTURAL NARRATIVE

CODES AND STANDARDS

- Building design will conform to the requirements of the International Building Code (IBC) 2000 Edition

DESIGN LOADS

The following are minimum uniformly distributed loads for various occupancies and structural elements:

Floor loads	50 psf plus 20 psf partitions
Mechanical Rooms	125 psf or the weight of the equipment
Roof snow load	121 psf uniform roof snow load 150 psf ground snow load, I = 1.15, C_e = 0.9, C_t = 1.0 Snow drift per ASCE 7 Section 7 Chapter 16

LATERAL LOADS

Wind Load

Basic wind speed	110 mph, 3 second gust wind speed
Exposure	B
Importance factor	1.15

SEISMIC LOAD

S_s	0.40
S_1	0.25
Site Class	D
Seismic Use Group	III
Seismic Design Category	D
Importance factor	1.50

STRUCTURAL MATERIALS- NEW CONSTRUCTION

Concrete foundations and slab on grade	4,000 psi
Reinforcing steel	ASTM A615, Grade 60
Structural tube sections	ASTM A500 Grade B
Rolled Steel Sections	ASTM A572, Grade 50

STRUCTURAL SYSTEMS

There will be two separate structures. One is the Power Plant and the other the Administration/Crew Building. It is assumed that both will be designed as Essential Facilities.

The Power Plant will be a pre-engineered steel building with a bridge crane to be used in the installation and maintenance of the generator sets. The design and fabrication of that structure will be by a pre-engineered steel building supplier.

This building will be supported on concrete spread footings. The perimeter foundation will be a concrete foundation wall. The interior slab is a concrete slab on grade. Significant concrete foundations will be cast for the generator set foundations.

MECHANICAL NARRATIVE

MECHANICAL DESIGN APPROACH

The mechanical scope would include the heating, ventilating and air-conditioning, HVAC, plumbing, fire protection system, fuel system and building automation system designs for the facility. The system recommendations would be based on standard quality commercial grade components and packaged systems. Each system would be designed to be safe, comfortable and efficient, using proven techniques and modern technology. Mechanical system designs would focus on logical equipment placement, ease of operation, and accessibility for both preventative and corrective maintenance. Mechanical system would be in accordance with the Uniform Plumbing Code, UPC, International Building Code, IBC, International Mechanical Code, IMC, International Fire Code, IFC, and other locally adopted amendments or Codes.

AUTOMATIC FIRE PROTECTION SYSTEMS

- **Fire Sprinkler System**

Fire water would be supplied by the local utility to a direct buried fully restraint ductile iron combination fire and domestic water line. Preliminary water information indicates that adequate water supply exists and that a fire pump would not be necessary. The fire protection connection to the water service would include a double check backflow

preventer. Flow from the sprinkler system would initiate a local alarm and remote notification at a constantly attended location.

The building would be fully protected with an automatic wet pipe sprinkler system, except where special piping is required in cold spaces and electrical or computer rooms. The majority of the facility would be protected by a wet type sprinkler fire protection system with quick response sprinkler heads in accordance with the latest requirements of NFPA 13. The fire department connection location would be coordinated with the local fire department. An electric alarm bell would be used.

Dry sprinkler heads are recommended on a limited basis in areas subject to freezing, such as entry vestibules, exterior entry soffits and covered parking. Extended coverage side wall sprinkler systems are recommended for the covered parking area. Depending upon the final design the area of the covered parking, it may require a dry pipe sprinkler system or a glycol filled wet pipe system.

Pre-action systems may be used in equipment sensitive areas such as control room, battery area and switchgear room. Pre-action systems require positive detection of a fire condition via smoke detectors or heat detectors before water is allowed into the normally dry sprinkler piping system. This condition along with the opening of a sprinkler head, via temperature, must occur before water is discharged.

Sprinkler heads would be selected for their environment, coverage area and type of system. Consideration in selection of sprinklers would include corrosion resistance in battery areas, high temperatures in boiler room and around heat producing equipment, dry heads for areas subject to freezing, sidewall and other extended coverage type sprinkler heads where coverage from overhead may be impaired. Wet system pipe would be any product UL listed for the service, with a minimum corrosion resistance ratio, CRR, of 1. Mechanical couplings would be permitted. Dry Pipe Systems: Piping if required would be galvanized Schedule 40 pipe. Mechanical couplings would be permitted.

High piled storage and stand pipes are not anticipated. If it is determined that the oil and lubricant storage area must be considered an "H" occupancy, then the area must be designed to contain a spill from the largest vessel plus the design flow volume of the sprinkler system for a flow period of 20 minutes, IFC 2704.2.2.3.

- **Clean Agent Fire Protection System Considerations**

Clean agent, Halon replacements, systems are not required, but may be considered in areas where pre-action or dry pipe systems are deemed inadequate. Areas to consider would include the control and switch gear rooms.

Items for consideration for an enclosed area clean agent system include provision of heat detection system to activate, redundant sprinkler (wet, dry or preaction sprinkler system) automatic closers for doors, duct dampers, control and alarm system. False discharge of agent and availability of agent replacement.

PLUMBING SYSTEMS

- **Water Supply**

Domestic water would be supplied by the local utility to the a common direct buried ductile iron water line combined domestic and fire water service entry. Provision for a meter furnished by the water utility would be allowed. Preliminary water information indicates that adequate water supply and pressure exists and that a domestic water pressure pump is not necessary. Water would be routed to all areas of the building requiring plumbing fixtures.

- **Plumbing Piping**

Domestic water piping would be type L copper. Solder would be 95-5 tin-antimony or 430 silver solder. Lead-tin (50-50) solder would not be allowed. All domestic water piping would be insulated to prevent heat loss and condensation. All domestic water piping shall be sized for a maximum pressure drop of 5 psi/100 ft of piping and a maximum velocity of 8 fps. Valves shall be all bronze ball or gate type with a minimum pressure rating of 150 psi.

- **Plumbing Fixtures**

Plumbing fixtures would be high quality commercial or institutional grade. Combination eyewash/showers may be required in a number of locations. The shower/eyewashes would comply with current OSHA requirements, and would be provided a mixing valve to temper hot and cold water to an acceptable tempered water temperature (85 Degrees F. is recommended) and located such that distance to travel (without doors or obstacles is within 75 feet from any point. The showers would be provided with a minimum flow rate of 20 GPM for a minimum of 15 minute. A floor drain is recommended at the shower location.

The drains in the battery room would be furnished with an acid neutralizing tank to protect the downstream piping. Exterior hose bibbs would be the non-freezing, automatic draining type. Exterior hose bibbs would have accessible interior isolation valves for seasonal isolation.

- **Domestic Hot Water**

Hot water would an indirect hot water generator and storage tank with double wall heat exchange served from the hydronic system is recommended. Water would be stored at 120°F for delivery to areas of the building. Tempering valve would be required at each eyewash or emergency shower station. The emergency shower water has the largest demand for hot water. Hot water temperature would be maintained at remote fixtures by hot water circulation system with a pump located in the mechanical room.

- **Wastewater**

All drains in the building would flow by gravity to an anticipated nearby manhole which is connected to the City sewer system. Drainage from the shop and main floor would flow through an exterior oil/water separator and join the domestic wastewater line before the manhole. A lift station is not anticipated.

Trench drains would be located in the shop and main floor. Covered piping trench system connecting the generators would connect to floor drain system to remove and spilled fluids from the pipe trench. Option of combining floor area drainage and pipe trench may be reviewed during the design phase. The waste collection system interior piping would be service weight cast iron no hub with hubless joints and stainless steel bands. Piping serving the Battery Storage Room would be cast iron, acid waste type to the acid neutralization tank

The plumbing vent system would be cast iron with no hub couplings. The venting system shall terminate at a point near the peak of the roof to prevent ice damage and shall extend 12 inches above roof surface. Vent piping serving the Battery Storage Room would be acid waste type upstream of the acid neutralization tank and would be vented directly outside.

- **Oil/water Separator**

An oil/water separator would be required for the floor drain systems serving the main floor, POL storage and shop areas. A unit with a discharge of 10 parts per million hydrocarbon concentration is recommended. It is recommended that only those detergents recommended by the oil/water interceptor manufacturer to limit the emulsification of the oil be used in the building. Sand trap would be installed ahead of the oil/water separator. The oil/water separator would be buried double walled tanks with removable coalescing plates. The oil containment would be limited so separate oil draw-off tank would not be required. The oil/water separator would be equipment high level alarm and leak detection.

- **Roof Drainage**

Roof drains may be required based upon the final the roofing design and slope. Roof drain systems would drain to drywells with overflow to grade during severe rainfalls or if underground pipe is blocked. Underground pipe would be connected to the civil site drainage system. Pitch roofs without roof drains would allow rainfall to be site sheet flow to be collected and discharged by the site drainage system.

FUEL OIL STORAGE SYSTEM

A skid mounted, double-walled, above ground fuel oil storage tank would be located exterior to the building and would serve as the facilities fuel source. Tank volume would be approximately equal to the existing power plant 15,000 tank. The tank would include a small spill containment sump with fill hose connection and drop tube with

integral overflow limiter. Normal and emergency venting and tank level indication would also be provided. Tank size would be selected based on final boiler and generator selections and the local fuel distributor's delivery schedule.

A day tank with double-walled spill containment and packaged tank level controls would be provided to serve the boilers and generators. The day tank would be located inside the main generator area.

All fuel piping would be welded schedule 40 black steel with socket weld fittings. Steel bodied valves would also be used to limit fuel leakage. Fuel piping would be painted black and properly labeled. Fusible link and oil safety valves (OSVs) would be provided in accordance with NFPA-31 and the IMC.

A used oil burner, unit heater, is an option to use some of the on-site generated waste oil.

SHOP AND MAINTENANCE AIR SYSTEMS

Compressed air would be piped to the shop and main floor areas requiring compressed for maintenance equipment and tools. A tank mounted duplex air compressor would be located in the main room. The compressor would be equipped with automatic controls and automatic condensate drains. A desiccant dryer would be provided so the dew point of the compressed air is less than 20 degrees F.

Outlets would be equipped with combination air regulators/filters and hose reels with quick disconnect couplers. Coupler would be determined to fit the requirements of the air tools that would be connected. Oilers would be installed at individual work stations as required.

This compressed air system would be independent of compressed air system used for stating generators. HVAC controls would be electric so a dedicated controls compressed air system would not be required. If a dry pipe sprinkler system is required, it would have its own dedicated air compressor and dryer.

HEATING

The recommended mechanical systems would be designed to support the new power plant building. The recommended major equipment (i.e. boilers and air handling units, etc.) would be sized to meet the needs of the facility, including a 20% design safety factor. Heating degree days of 8,400 is recommended for review of heating system. It is assumed that any major future addition to the facility would require the addition of dedicated heating, ventilating and air-conditioning equipment to support the addition. Alternate heat source using heat pumps with electric back-up should be reviewed. Ground temperatures and water flow, fuel and heat generation costs and electric rates for heat pumps are major variables to consider.

- **Boilers/heat Generation**

Hydronic heat for the building would be generated by two identical, forced draft, fuel oil fired, cast iron boilers. Each boiler would be sized for 60% of the gross heating load. Each boiler would include an independent flue gas exhaust stack. Stacks would be insulated pre-engineered systems rated for minimum clearance requirements.

The boilers, with their dedicated blending pumps would be connected in a parallel arrangement. The primary boiler loop would be connected to the secondary building heating loops using a primary/secondary bridge piping arrangement. Secondary building heating loop supply temperature would vary following an adjustable reset schedule from 140° F to 190° F based on outside air temperature. Supply temperature would be set at 140°F when outside temperature falls to 60°F (Heating system start-up temperature). Reset temperature would ramp up linearly to 190° F and remain constant at outdoor temperatures less than or equal to 0°F.

- **Heating Terminal Devices**

Terminal heating devices would be provided throughout the facility to maintain space temperatures. The devices would include unit heaters, cabinet unit heaters, and heating coils. Finned tube baseboard would be used in office and small areas. Heating in office and ventilated areas and would include some heat from the heating coils in the ventilation system. Utility areas would be heated with hydronic unit heaters. Radiant heat system would not be anticipated.

Oil fired unit heaters are not recommended. Disposal of on-site generated waste oil using a unit heater design for burning waste oil is an option. Cleaning and tuning the unit maybe labor intensive.

VENTILATION AND AIR CONDITIONING SYSTEMS

- **General Arrangement:**

Ventilation air would be supplied to all normally occupied areas of the building to provide indoor air quality, cooling, odor control, and heating air circulation. The office/administrative and other normally occupied areas would be provided with ventilation air available during all occupied periods to meet the requirements of ASHRAE Standard 62, "Ventilation for Acceptable Indoor Air Quality" and as required by Mechanical Code. The central air handling unit, AHU, would be a packaged unit, complete with mixing box, control dampers, filters, hydronic heating coil, and supply air fan.

In addition to the primary air handling systems noted above, numerous exhaust systems would be provided. Areas requiring exhaust; battery room, Lube/Oil/Fluid Room/Area, and toilet rooms. Many of these exhaust systems are needed to remove potentially hazardous or flammable vapors.

The facility would not be operational 24 hours per day and the capital costs for heat recovery equipment makes the use of a heat recovery system probably not economical. All ducts would be galvanized steel installed per SMACNA Standards. All air filters would be 30 percent.

- **Generator Area Ventilation**

Ductwork would be used to distribute outside air, heating air and cooling air to different areas. The height limitations caused by the bridge crane minimizes ductwork distribution options in the main floor area. Main floor temperature setpoint would be maintained lower that occupied room temperatures when maintenance or other functions are not required. During periods of generation operations, the room temperature would be regulated by wall louvers located at generator level and exhaust fans located opposite of the generators, on the radiator side of the building, to provide adequate cooling of the space. Each generator would have a corresponding outside air lover and wall exhaust fan. The outside air modulating damper and louver would be located in the wall panel that could be removed for major installation or removal of each genset. Ceiling mounted destratification fans could provide mixing during periods when the generators are not operating.

HVAC CONTROLS

The building HVAC Controls would be microprocessor based using a Direct Digital Control (DDC) building automation system (BAS). All HVAC systems would be controlled by the HVAC control system, with the exception of unit heaters operating with local line voltage thermostat. Boilers would be controlled by their standard packaged controls (Lo-Hi-Lo) provided by the boiler manufacturer. Boilers would be monitored by the BAS system

ELECTRICAL SCHEMATIC DESIGN NARRATIVE

GENERAL

Our staff will also work closely with the staff of the Petersburg Municipal Power and Light to solicit important input to the design.

The following information outlines only key portions of the design and does not include all details or systems which will be addressed.

Electrical system concepts, requirements and schematic design features are further described in the individual system narratives below. Special considerations for selected specific rooms may also be found within the system narratives.

BASIC MATERIALS AND METHODS

Conduit approved for use on this project will be of the following types:

a) Galvanized rigid steel conduit - GRC

b) Intermediate metal conduit - IMC

c) Rigid copper-free aluminum conduit

d) Electrical metallic tubing - EMT

e) Flexible metallic conduit

f) Liquid-tight flexible metallic conduit - LT

g) Types specifically identified on the drawings or in the specifications

Indoor conductors will have Type THHN/THWN insulation. Outdoor conductors will have Type XHHW insulation.

Panelboard assemblies will be enclosed in steel cabinets. The panelboard interior assembly will be dead front with panelboard front removed. Square D product will be the basis of design and included as the required product for base bid. Manufacturers with equal product will be allowed to bid their product as an additive/deductive alternate to the contract amount.

Spare conduits, ¾" minimum, will be stubbed into accessible ceiling space from all flush mounted panels.

Molded case circuit breakers will be suitable for individual as well as panelboard mounting. Bolt-in type only. No breakers designated "plug-on" type.

All motors will conform to the governing NEMA Standards and ASA Form C-50 for rotating machinery. High efficiency electric motors will be specified for energy conservation. Solid-state or variable-speed motor starters will be examined during the design and included where we feel it is appropriate.

H.O.A. switches and pilot lights will be provided for all starters for interface to the building automation system.

All device faceplates will be stainless steel.

All power wiring will be in raceways.

All service, feeder and branch circuit conductors throughout the project secondary electrical system will be color coded per NEC.

An equipotential plane for the grounding system at the service entrance equipment will be specified. The raceway system will be bonded in conformity with NEC requirements to provide a continuous ground path. A grounding conductor will be provided in all raceways and sized in conformity with Table 250.122 of NEC.

ELECTRICAL SERVICE AND POWER DISTRIBUTION

- **Incoming Service:** The building will be served at 208Y/120 volts, 3 phase, 4 wires by Petersburg Municipal Power and Light. The incoming service will be underground from a utility designated location to a pad mounted transformer. From the transformer the service will run underground to a CT can be located on the building with the meter located adjacent to it. A service entrance rated main disconnect breaker with shunt trip capability will be located in the main electrical room. A shunt trip pushbutton in a lockable enclosure will be provided on the exterior of the building (near the utility meter) so that power to the building can be shut off without entering the building.

- **Main Distribution:** The Main Distribution Panel (MDP) will be panelboard construction rated at 400A, 208Y/120 volts. All panelboards will be based on Square D.
  A readily accessible emergency-power-off button will be provided in the shop rooms to shut off power to all of the equipment.

  The Owner will furnish a UPS connected to a receptacle at each workstation. The UPS should be sized to provide one half hour of standby power for computer equipment.

  Each telecom rack will be provided with an on-line rack mounted 2000VA UPS sized for one-half hours of continuous operation.

  Each SCADA system rack will be provided with an on-line rack mounted 2000VA UPS sized for two hours of continuous operation.

  Exterior receptacles for engine heaters will be provided for mobile generators and crew vehicles at the Power Plant Building and the Yard Storage Shed.

- **On-site Generation System:** The requirements for the generation system will be coordinated with the consultant engineers during design. Since the emergency capabilities for this system is unknown at this time, the emergency and standby lighting for this building is not intended to be connect to this system.

LIGHTING SYSTEMS

Lighting will be furnished in accordance with the IES Lighting Handbook, 9th Edition. Lighting in administration and offices will be lensed 3-lamp or 4-lamp fluorescent grid troffers. The lighting will be laid out to meet an average 75 footcandle level and will be switched from a bank of two switches to provide uniform multi-level lighting. The switching will be designed to meet the individual room or area need. Multi-level switching will be provided to allow uniform multi-level lighting in offices and other areas as determined during design.

Emergency egress lighting will be provided by battery backed emergency lighting fixtures. Selected fixtures in the corridors will be connected as "nightlights" for continuous operation on the normal power system.

Occupancy sensors will be provided in normally unoccupied spaces such as storage rooms, etc. Occupancy sensors will not be provided in offices.

The lighting fixtures will be circuited to facilitate connection to a DDC System. This will allow selected lighting circuits, site lighting, or area lighting circuits to be switched off/on by the DDC (under program control or when a Fire/Security Alarm is received).

High efficiency electronic ballasts will be used. Ballast operating frequencies will be selected to avoid interaction with other equipment. Extraneous ballasts will be minimized as follows: A typical 3-lamp fluorescent lighting fixture has one 2-lamp ballast and one single lamp ballast (to provide for multi-level switching). Tandem wired fixtures eliminate the single lamp ballasts and replace them with one-half as many two lamp ballasts which are shared between two fixtures. Half the fixtures will have two 2-lamp ballasts and half will have one 2-lamp ballast. Cost savings are realized in the initial installation due to reduced ballast costs and reduced installation costs.

Lenses for recessed fluorescent fixtures will be 100 percent virgin acrylic with a nominal thickness of 0.125".

Fluorescent lamps will be T8 RE841 type with high color rendering and 4100 degree K color temperature.

The exterior lighting will utilize HID metal halide fixtures and be designed to support the site configuration. The exterior fixtures will be building mounted or pole mounted as determined during design. Pole assemblies will be specified to be capable of withstanding 110 mph winds with 143 mph gusts with no damage. Metal halide lamps will be coated for improved color rendering and color uniformity. Exterior fixtures will be vandal resistant.

TELEPHONE SERVICE AND TELECOMMUNICATION DISTRIBUTION

- **Incoming Service:** The incoming service will be underground from a utility designated location to the Main Distribution Frame (MDF) room in the Administration/Crew Center. See the Telephone section of the Administration/Crew Center narrative. Service to the Power Plant Intermediate Distribution Frame (IDF) Room will be underground from the Administration/Crew Center. One 2" conduit will be provided between the Administration/Crew Center and the Power Plant. The incoming service will be coordinated with the Petersburg Municipal Power and Light during design.

- **Phone Switch:** The phone switch will be located in the Administration/Crew Center.

- **Standards:** The building will be designed to EIA/TIA Enhanced Category 5 network performance using unshielded, twisted pair products. The system will be in accordance with the latest EIA/TIA standards for telecommunication. A uniform cabling plan will be designed for this facility- the function of the telecom jack will be determined at the telecom room location base on what system (telephone, data) it is patched into.

- **Overview:** The system will include outlets, conduit, cable trays, cables, terminations, specifying test documentation, "passive" components and "active" components. A partial system description includes:
    1. Telecommunication outlets in the offices and miscellaneous areas.
    2. Horizontal cabling from the outlets to the modular patch panels in the Power Plant IDF.
    3. Patch cables in the Power Plant IDF.
    4. Network switches, routers, etc.
    5. Backbone cabling (copper and fiber) between the Administration/Crew Center MDF and the Power Plant IDF.
    6. Telecommunication cabling will be run in conduit or cable tray.

- **Intermediate Distribution Frame (IDF) Room:** One IDF will be located in the administration area of the facility so that cable lengths will not exceed 90 meters (maximum length per standards). The IDF will contain the following:
    1. Data and Voice modular patch panels
    2. Fiber Optic Data Network distribution panel
    3. Data Network equipment
- **Telecommunication Outlet Locations:** Exact locations will be coordinated with the Petersburg Municipal Power and Light.

FIRE ALARM SYSTEM

An electrically operated, electrically supervised addressable fire alarm system will be provided that includes integrated addressable security (see security description below), including control unit, power supplies, alarm initiating and indicating devices, conduit, wire, fittings and all accessories required to provide a complete operating system. The system match existing standards for the Petersburg Municipal Power and Light since this will make training easier and spare parts common between different buildings. If the Petersburg Municipal Power and Light does not have a standard, we recommend a study to determine the optimal system standard for the Petersburg Municipal Power and Light to follow.

The system will comply with the applicable provisions of the current NFPA Standard 72 National Fire Alarm Code, local building codes, and meet all requirements by Underwriters Laboratories Inc. and/or the Factory Mutual System.

All wiring will be in accordance with Article 760 of the National Electrical Code and local electrical codes. All wiring will be in raceways.

The system will operate as a low voltage, non-coded general evacuation fire alarm system. Initiating circuits will be wired as two-wire, Class B.

The system will include as dialer to call and notify the fire department. In addition to Code required actions, alarms will signal the DDC system. Common area lights and site lighting will be energized (unless prohibited by photocell) upon alarm.

Alarms will be annunciated at the fire alarm alpha-numeric annunciator panel located in the main entry. A complete building floor plan showing all alarm zones oriented to the physical location of the panel including "You Are Here" notation will be provided at the annunciator location.

Manual fire alarm boxes (pull stations) will be provided at every exit from every level and additional pull stations will be provided as required to ensure the travel distance to the nearest pull station does not exceed 200 feet per the International Fire Code.

Both audible and visual alarms will be provided throughout the facility to meet the requirements of the International Fire Code and Authority Having Jurisdiction (AHJ) requirements. Audio-visual horn/strobe units with combination horn and flashing alarm strobe will be used.

Smoke and heat detection will be coordinated during the design.

Sprinkler Switches: Sprinkler flow and tamper switches will be monitored to indicate flow in any part of the system or a partial or complete shutdown of the system at the gate valves.

Required air handling units will be shut down and smoke/fire dampers will close upon alarm.

SECURITY SYSTEM

An integrated Fire alarm / Security system will be provided. The system will be based on Edwards EST3 3000 system. The system match existing standards for the Petersburg Municipal Power and Light since this will make training easier and spare parts common between different buildings. If the Petersburg Municipal Power and Light does not have a standard, we recommend a study to determine the optimal system standard for the Petersburg Municipal Power and Light to follow.

Detection: Door contacts will be provided on all exterior doors. Passive infrared motion detectors will be provided in corridors and other areas determined during design to detect entry into building. Glass breakage detectors will be provided in all areas with exterior glass at ground level.

The system will be zoned based on input from Petersburg Municipal Power and Light.

INTERCOM

The intercom headend equipment will be located in the Administration/Crew Center. See the Intercom section of the Administration/Crew Center narrative for descriptions of the system performance.

Zones will be coordinated with Petersburg Municipal Power and Light personnel during the design phase. Anticipated zones include the following; crew area, 1st floor administration, 2nd floor administration, power plant, and yard storage.

END OF POWER PLANT NARRATIVES

Design narratives for the Administration/Crew Center begin on the next page.

PETERSBURG POWER PLANT RELOCATION MASTERPLAN AND PROGRAM

ADMINISTRATION/CREW CENTER DESIGN NARRATIVES

CIVIL ENGINEERING NARRATIVE/ GEO-TECHNICAL NARRATIVE

INTRODUCTION

- Per Minch, Ritter, Voelckers Architects (MRV) notice to proceed, R & M Engineering, Inc. (R&M) has prepared a civil engineering/geotechnical narrative for the proposed City of Petersburg Power Plant facility. This property is owned by the City of Petersburg. MRV provided R&M AutoCAD site drawings on November 11, 2003 to assist in preparing the master plan narratives.

- The project site is located at 3.5 mile Mitkof Highway. The property is currently zoned RR (Residential Reserve) by the City of Petersburg. The legal description of the property is Lot 2B, Power Plant Subdivision.

- The master plan includes two development schemes for construction of a Power Plant and yard storage facility and an Administration/Crew Center. Both facilities will have the need for domestic water, sanitary sewer, storm drain, vehicle and truck parking, and yard materials storage areas. The following narrative will describe civil engineering and geotechnical site improvements for the Administration/Crew Center.

SITE UTILITIES

- Sewer and water services for the Administration/Crew Center will connect to the existing City of Petersburg public utilities located within Mitkof Highway.

- Power, telephone and television cable are located above ground along the east side of Mitkof Highway with aerial crossings to the west side for service drops. Limited street lighting exists on the timber utility poles in this area.

WATER SERVICE

- An existing 12" DIP water main is located within Mitkof Highway. An existing 6" DIP water service is stubbed off of the 12" DIP water main as reported by City of Petersburg Public Works Department. The location of the 6" DIP water service is near the main entrance to the site of Lot 2B. Domestic and fire protection water supply is required to the Administration/Crew Center. It is assumed that the 6" DIP water line would be extended up the existing gravel roadway and a 6" tee installed with a gate valve to provide a 6" water service to the Administration/Crew Center.

SANITARY SEWER SERVICE

- An existing 6" PVC sanitary sewer line exists where a former residential dwelling was located on this property. The City of Petersburg Public Works Department indicates that this existing sewer line could be used for collecting wastewater from the development of the Administration/Crew Center as well as the Power Plant and Storage Yard area. The existing 6" sanitary sewer line would be extended toward the Administration/Crew Center and a sanitary manhole installed. From this location the line would continue toward the Power Plant sewer service. A sanitary sewer cleanout would be installed 5' from the building line. Collection of wastewater from the Administration/Crew Center will discharge by gravity methods through 6" PVC piping.

STORM WATER SYSTEM

- Storm drainage around the Administration/Crew Center will sheet flow in the parking lots and apron to catch basins and then underground piping to the open drainage ditch along Mitkof Highway. Roof gutter downspouts and foundation drains would also connect to the underground system and be routed to the highway open ditch.

- The existing storm drain system consists of combination open drainage ditching and underground storm drain piping. Record drawings indicate a 24" CPP storm drain pipe on the south side of the gravel access road. This storm drain pipe discharges to the open ditch system along Mitkof Highway and then to tidewater. It is assumed that the surface storm water will continue to sheet flow along gravel access roads and graded areas to the open drainage ditches and be piped downhill through existing storm system. At the Administration/Crew Center paved parking lot, a catch basin with 12" CPP piping may be installed to connect to the 24" CPP piping.

SITE ACCESS/PARKING LOT

- Access to the Crew apron area will be off Mitkof Highway for accessing the truck bays. Staff and visitor parking for the Administration area would be via travel over the existing gravel access road to where a driveway with 11' wide lanes would be located to access the parking area. Both areas are currently gravel surfaced. It is assumed that the parking areas for the Administration/Crew Center would be asphalt surfaced. The apron for crew truck use should be 3" thick asphalt pavement with 9" depth of compacted base course, grading D-1. Existing gravel material should be proof rolled to ensure proper compaction is obtained. The Administration asphalt parking area should have a minimum of 2" asphalt pavement and 6" depth of base course grading D-1. Parking stalls should be delineated with disability/parking striping and areas signed with appropriate traffic control signs for parking and disability use.

- Due to the elevation change on the site retaining walls or foundation/retaining walls will be necessary to allow development of the two-story building. Concrete walls have been shown in the master plan along the north side of the site between the existing electrical substation and the proposed building. Retaining walls are assumed to vary in height from 3' to 1' in height and be cast in place concrete walls. The foundation/retaining wall on the south side would also require a concrete type retaining wall.

GEOTECHNICAL

- The Administration/Crew Center site is located on a fairly level graded area adjacent the existing City of Petersburg electrical substation. A timber framed dwelling was previously located on this property which has since been removed. The utilities have been capped off and the site regarded to drain toward Mitkof Highway. Back slopes of the cut slopes have been rocked with 6" minus shot rock as an erosion control measure. The difference in elevation from the Mitkof Highway to the top of the existing cut slope is approximately 20' as indicated in record drawings. Organic peat soils (muskeg) were reportedly removed on the site until firm gray til material was encountered and then backfilled with shot rock material. The shot rock was then capped with 6" of crushed aggregate rock material. Existing site conditions have not been verified with a on-site geotechnical investigation. It is recommended that this be performed in the next phase of the project to determine allowable soil bearing pressures, ground water levels, retaining wall design parameters and foundation preparation recommendations.

REQUIRED DEVELOPMENT PERMITS

- The following is a list of development permits that most likely will be required from the City of Petersburg to construct the Administration/Crew Center,

    - City of Petersburg Conditional Use Permit
    - City of Petersburg Building Permit
    - City of Petersburg Zone Change Request (if property is zoned RR and not Industrial)

ARCHITECTURAL NARRATIVE

ADMINISTRATION/CREW CENTER EXTERIOR

It is anticipated that the Administration/Crew Center will be constructed as a steel framed building with architectural grade exterior finishes.

The building exterior envelope including roofs, walls, windows, doors, etc., shall be capable of resisting a combined wind and rainstorm of 70 mph and 2 inches per day. Metal flashings, materials, and systems with a mechanical overlap shall be used to the

greatest extent possible to achieve required weather resistance. The use of sealant joints shall be minimized to the greatest extent possible, and shall be avoided where a mechanical overlap flashing is a reasonable alternative.

ROOFS:

- In general, exterior walls shall be designed and constructed utilizing the "Drainage Plane" concept as described in Appendix I of the *Builder's Guide – Cold Climates*, 2000 Edition, published by the Energy Efficient Building Association. Refer to Figure I.12 for a graphic illustration of this concept.

- A metal roof will be appropriate for this building.

- Roof Slope: The minimum slope of any roof shall be 4 in 12.

- Overhangs: The size of overhangs shall be no less than 18 inches from face of wall finish to drip line. Larger overhangs are encouraged.

- Thermal Performance: Roofs shall have a nominal "R" value of at least 30. At pitched roofs, compression of insulation at the outside building walls is permitted to allow for a minimum of one-inch ventilation space under the roof.

WALLS:

- Exterior wall finish may be metal, wood siding, composite siding, or a combination of these or other durable materials

- Exterior walls shall have a nominal "R" value of at least 19. Exterior wall construction utilizing metal studs shall include a continuous thermal break with a nominal "R" value of at least 3: Glazing shall have an "R" value of at least 4. Glazing frames fabricated from metal shall be thermally broken.

SIDING:

- Exterior walls shall be designed and constructed utilizing the "Water Managed Wall Rain-Screen System (Drainage Plane with Drainage Space)" as illustrated in Figure I.9 in the *Builder's Guide – Cold Climates, 2000 Edition*, published by the Energy Efficient Building Association. The air space behind exterior siding shall 0.25 to 0.75 inches wide, and shall be created utilizing rot-resistant vertical wood furring (cedar, redwood, or pressure-treated) or an approved pre-manufactured system. Spacing and attachment of furring or pre-manufactured systems shall be sufficient to resist minimum 100 mph winds. Siding shall be further designed and constructed to allow drainage at bottom and ventilation at top of wall.

FOUNDATION WALLS:

- Slab on grade floors of conditioned spaces shall be provided with perimeter insulation with a nominal "R" value of 10. Such insulation shall be of waterproof materials, shall extend from the top of the slab to the top of the footing, and shall be protected where exposed to view with non-corrosive metal flashing or other pre-manufactured system.

OTHER THERMAL:

- Plumbing Protection: Hydronic and domestic water piping located outside conditioned areas shall be protected with insulation with a nominal "R" value of at least 4.

- Vapor Barriers: Vapor barriers shall be placed continuously on the warm side of exterior wall and roof insulation, and shall have a minimum permeability rating equivalent to a 6 mil polyethylene sheet.

MISCELLANEOUS:

- Provide a minimum of two exterior hose bibs.

- Provide bollards at exterior overhead doors and around exterior equipment.

ADMINISTRATION AND CREW BUILDING INTERIOR

LEVEL OF FINISH:

- Two levels of finish are anticipated for the interior of this building. The vehicle bays, electrical room, equipment room and boiler room of this building will be finished to a standard "warehouse" level. The remainder will have a higher degree of Architectural finishes and include conference room, offices, mapping room, toilet and shower rooms, Janitor, break room, copy/fax room, hallways, stairways and the storage room.

- Warehouse type finishes will comprise of the following: Interior metal stud walls, sound insulation, 5/8" type "X" gypsum wall board, taped and painted, exposed ceilings, and concrete floors with concrete hardener.

- Architectural type finishes will comprise of the following: Interior metal stud walls, sound insulation, 5/8" type "X" gypsum wall board, taped and painted, suspended acoustic or gypsum wall board ceilings, durable commercial grade VCT flooring or carpet as appropriate, rubber base and wood base, interior wood trim at windows and doors, plastic laminate countertops, solid polymer partitions in toilet rooms, stainless steel toilet accessories and mirror frames, corner guards at hallway corners and a durable wainscot in hallways. Architectural grade cabinetry shall be provided in the customer service area as well as the copier/fax room, break room, mapping room and conference room.

- Electrical room, Boiler room and Network room will require ¾" plywood on the walls for hanging equipment and cabling.

CIRCULATION:

- Primary Circulation: Primary Corridors shall not be less than 60 inches clear width. Stairways shall not be less than 54 inches clear width.

- Secondary Circulation: Secondary circulation includes circulation internal to open office areas and shall not be less than 44 inches clear width assuming 12 feet +/- clear width for open office systems and furnishings

ACOUSTICS:

- Corridor Walls: Wall construction shall achieve a minimum STC of 50.

- Walls Between Open Office Areas: Wall construction shall achieve a minimum STC of 45.

- Open Office Areas: Open office areas should be designed and constructed to minimize disturbances between workstations including employee talking, employee meetings, confidential and general telephone calls, use of personal radios, use of printers and plotters, and traffic flow between workstations.

- Second Floor: The second floor construction between lower and upper levels shall achieve a minimum STC of 50.

CEILING HEIGHTS

- General: The minimum clear ceiling height at any space shall be 8'-0".

- Corridors: The minimum clear ceiling height at corridors shall be 8'-0".

- Open Office Areas: The minimum clear ceiling height at open office areas shall be 8'-6".

- Conference Room: The minimum clear ceiling height at the Conference Room shall be 8'-6".

STRUCTURAL NARRATIVE

CODES AND STANDARDS

- Building design will conform to the requirements of the International Building Code (IBC) 2000 Edition

DESIGN LOADS

The following are minimum uniformly distributed loads for various occupancies and structural elements:

Floor loads	50 psf plus 20 psf partitions
Mechanical Rooms	125 psf or the weight of the equipment
Roof snow load	121 psf uniform roof snow load 150 psf ground snow load, I = 1.15, C_e = 0.9, C_t = 1.0 Snow drift per ASCE 7 Section 7 Chapter 16

LATERAL LOADS

Wind Load

Basic wind speed	110 mph, 3 second gust wind speed
Exposure	B
Importance factor	1.15

SEISMIC LOAD

S_s	0.40
S_1	0.25
Site Class	D
Seismic Use Group	III
Seismic Design Category	D
Importance factor	1.50

STRUCTURAL MATERIALS- NEW CONSTRUCTION

Concrete foundations and slab on grade	4,000 psi
Reinforcing steel	ASTM A615, Grade 60
Structural tube sections	ASTM A500 Grade B
Rolled Steel Sections	ASTM A572, Grade 50

STRUCTURAL SYSTEMS

There will be two separate structures. One is the Power Plant and the other the Administration/Crew Building. It is assumed that both will be designed as Essential Facilities.

The Administration/Crew Center will be a two story building with at-grade entrances at both levels. The lower level will include garages. The administrative spaces will be on the second floor. This building will be a braced steel frame structure. The second floor will be concrete filled steel deck supported by wide flange beams and girders. The roof framing will be steel deck supported by open web steel joists and wide flange girders.

This building will be supported on concrete spread footings. The perimeter foundation will be a concrete foundation wall. The interior slab is a concrete slab on grade. Significant concrete foundations will be cast for the generator set foundations. At the Administration/Crew Center there will be story height concrete retaining walls on two sides.

MECHANICAL NARRATIVE

MECHANICAL DESIGN CRITERIA: The mechanical systems for the Administration/Crew Center will be designed and constructed in accordance with the following codes:

2000 International Building Code
2000 International Mechanical Code
2000 Uniform Plumbing Code
2000 International Fire Code
National Fire Protection Association
ASHRAE 62-2001 Ventilation Standard

HEATING VENTILATION, AND AIR CONDITIONING

- **Heating System**

The heating plant will consist of a single oil fired cast-iron sectional boiler, 1100 gallon fuel tank, primary and secondary circulating pumps, and terminal heating units.

Building heating will be provided by perimeter finned pipe convectors, unit heaters, and cabinet unit heaters. The boiler will be sized to meet the design heating load for the Air Handling Unit (AHU) ventilation system, building heat loss, and domestic hot water requirements. Perimeter offices, locker rooms, toilet rooms, and other small perimeter spaces will be heated with finned pipe convectors. Unit heaters will supply heating to the vehicle bays, while a cabinet unit heater will provide heating for the main entrance of the building.

Fuel oil will be supplied to the boiler from a 1,100 gallon oil tank. Either aboveground or below ground installation is possible for the tank and will be determined based on site conditions, operation, and cost estimates.

Heating piping will be type L copper throughout. Shutoff valves will be provided at each heating unit.

A primary/secondary pumping system will distribute heating water throughout the building. A constant speed primary pump will circulate heating water as needed through its boiler. A secondary pump will provide heating water to the AHU heating coil and terminal heating units, such as perimeter finned pipe heating units and unit heaters. Another secondary pump will provide heating water flow to an indirect hot water maker.

- **Ventilation System**

The ventilation system will consist of a central air handling unit (AHU). A cabinet exhaust fan (CEF) will be used for general building exhaust and a wall exhaust fan (WEF) will be used for the vehicle bays. The AHU will be an internally isolated air foil fan with an outside air damper, mixing box, filter, and heating coil sections. The CEF will be an internally isolated air foil fan. Constant speed motors will control the AHU, WEF, and CEF motors. The AHU system will not have mechanical cooling capability; however, it will provide natural cooling to the building utilizing outside air.

The air handling system will provide ventilation to the building, with the exception of the vehicle bays. The ventilation air will be heated to 65°F by the AHU heating coil and delivered to the occupied spaces. The ventilation system will operate only during occupied times.

The ductwork system will consist of sheet metal ducts with flexible ducts connected to supply diffusers and sheet metal ducts directly connected to return/exhaust grilles. Supply diffusers will be centrally located in each room for even distribution of ventilation air to all areas of room. Each room except the toilet, locker/shower, break, and janitor room will have a return grille to recirculate the ventilation air to the AHU. The toilet, locker/shower, break, and janitor rooms will have exhaust grilles to remove room air to the CEF and out of the building.

Outside air for ventilation and natural cooling will be brought into the building though a wall mounted intake louver. Relief and exhaust air will be discharged through wall mounted louvers. The exact location and construction of these features will be further refined to meet aesthetic considerations. It is understood that the vehicle bays will not be used for welding or other hazardous uses and thus will not require a specialized ventilation system.

- **Plumbing System**

A 6" domestic water service will provide water to the sprinkler system and 2" domestic water header. Domestic hot water will be supplied by an indirect hot water maker heated by the boiler. Type L copper piping will be used for cold and hot water piping. Shutoff valves will be provided at each set of plumbing fixtures. There will not be a hot water circulating pump as the plumbing fixtures are located near the domestic water heater. The sanitary sewer system and vents will be composed of cast-iron pipe and No-Hub fittings. Water closets, urinals, and lavatories will be vitreous china, sinks will be stainless steel, and service sinks cast-iron. Fixtures and faucets will meet ADA requirements. Showers will be provided with low-flow type heads and all fixtures will be the water saving type.

Trench type floor drains, located within the vehicle bays, will drain into an oil interceptor inside the building. A 4" cast-iron sewer pipe will then connect to the city system.

- **Automatic Fire Suppression**

A 6" cold water main will serve both the domestic water and automatic sprinkler system for the building. The sprinkler header will be located in the Boiler Room and will consist of a double check backflow preventer and a wet alarm valve. The wet alarm valve will serve a wet system for all interior portions of the building with dry recessed pendent heads protecting entry ways and canopies. The Fire Department pumper connection and alarm bell will be located on the exterior Boiler Room wall. Piping will be schedule 40 black steel for piping 2-1/2" and under. Piping 3" and over will be schedule 10.

- **Automatic Controls**

The automatic control system will be an electric/electronic control system. The system will provide automatic control, and sequencing of the building mechanical system. The AHU and CEF will operate according to the time clock for occupied time. The WEF will be operated by a wall mounted control switch.

In each room, thermostats will control their respective heating unit automatic valve as needed to maintain setpoint. The entrance cabinet unit heater fan and automatic valve will be controlled by its respective thermostat. Heating pumps will be controlled by their respective equipment thermostats and building heating requirements.

The AHU heating coil modulating valve will be controlled by an averaging bulb thermostat located downstream of the coil, set at an adjustable 65°F. A low limit thermostat will shut off the AHU and open the heating coil automatic valve when sensing 40°F or lower temperature. A differential pressure gage will be installed across the filter section.

ELECTRICAL SCHEMATIC DESIGN NARRATIVE

GENERAL

Our staff will also work closely with the staff of the Petersburg Municipal Power and Light to solicit important input to the design.

The following information outlines only key portions of the design and does not include all details or systems which will be addressed.

Electrical system concepts, requirements and schematic design features are further described in the individual system narratives below. Special considerations for selected specific rooms may also be found within the system narratives.

BASIC MATERIALS AND METHODS

Conduit approved for use on this project will be of the following types:

a) Galvanized rigid steel conduit - GRC

b) Intermediate metal conduit - IMC

c) Rigid copper-free aluminum conduit

d) Electrical metallic tubing - EMT

e) Flexible metallic conduit

f) Liquid-tight flexible metallic conduit - LT

g) Types specifically identified on the drawings or in the specifications

Indoor conductors will have Type THHN/THWN insulation. Outdoor conductors will have Type XHHW insulation.

Panelboard assemblies will be enclosed in steel cabinets. The panelboard interior assembly will be dead front with panelboard front removed. Square D product will be the basis of design and included as the required product for base bid. Manufacturers with equal product will be allowed to bid their product as an additive/deductive alternate to the contract amount.

Spare conduits, ¾" minimum, will be stubbed into accessible ceiling space from all flush mounted panels.

Molded case circuit breakers will be suitable for individual as well as panelboard mounting. Bolt-in type only. No breakers designated "plug-on" type.

All motors will conform to the governing NEMA Standards and ASA Form C-50 for rotating machinery. High efficiency electric motors will be specified for energy conservation. Solid-

state or variable-speed motor starters will be examined during the design and included where we feel it is appropriate.
H.O.A. switches and pilot lights will be provided for all starters for interface to the building automation system.

All device faceplates will be stainless steel.

All power wiring will be in raceways.

All service, feeder and branch circuit conductors throughout the project secondary electrical system will be color coded per NEC.

An equipotential plane for the grounding system at the service entrance equipment will be specified. The raceway system will be bonded in conformity with NEC requirements to provide a continuous ground path. A grounding conductor will be provided in all raceways and sized in conformity with Table 250.122 of NEC.

ELECTRICAL SERVICE AND POWER DISTRIBUTION

- **Incoming Service:** The building will be served at 208Y/120 volts, 3 phase, 4 wires by Petersburg Municipal Power and Light. The incoming service will be underground from a utility designated location to a pad mounted transformer. The service will run underground from the transformer to a CT can located on the building with the meter located adjacent to it. A service entrance rated main disconnect breaker with shunt trip capability will be located in the main electrical room. A shunt trip pushbutton in a lockable enclosure will be provided on the exterior of the building (near the utility meter) so that power to the building can be shut off without entering the building.

- **Main Distribution:** The distribution panelboard will be rated at 200A, 208Y/120 volts. The panelboard will be based on Square D.
  The Owner will furnish a UPS connected to a receptacle at each workstation. The UPS should be sized to provide one half hour of standby power for computer equipment.

  Each telecom rack will be provided with an on-line rack mounted 2000VA UPS sized for one-half hours of continuous operation.

  Exterior receptacles for engine heaters will be provided for crew vehicles.

LIGHTING SYSTEMS

Lighting will be furnished in accordance with the IES Lighting Handbook, 9th Edition.

Lighting in administration and offices will be lensed 3-lamp or 4-lamp fluorescent grid troffers. The lighting will be laid out to meet an average 75 footcandle level and will be switched from a bank of two switches to provide uniform multi-level lighting. The switching will be designed to meet the individual room or area need. Multi-level switching will be provided to allow uniform multi-level lighting in offices and other areas as determined during design. The lighting for the conference room will be designed for video conferencing equipment.

Emergency egress lighting will be provided by battery backed emergency lighting fixtures. Selected fixtures in the corridors will be connected as "nightlights" for continuous operation on the normal power system.

Occupancy sensors will be provided in normally unoccupied spaces such as storage rooms, etc. Occupancy sensors will not be provided in offices.

The lighting fixtures will be circuited to facilitate connection to a DDC System. This will allow selected lighting circuits, site lighting, or area lighting circuits to be switched off/on by the DDC (under program control or when a Fire/Security Alarm is received).

High efficiency electronic ballasts will be used. Ballast operating frequencies will be selected to avoid interaction with other equipment. Extraneous ballasts will be minimized as follows: A typical 3-lamp fluorescent lighting fixture has one 2-lamp ballast and one single lamp ballast (to provide for multi-level switching). Tandem wired fixtures eliminate the single lamp ballasts and replace them with one-half as many two lamp ballasts which are shared between two fixtures. Half the fixtures will have two 2-lamp ballasts and half will have one 2-lamp ballast. Cost savings are realized in the initial installation due to reduced ballast costs and reduced installation costs.

Lenses for recessed fluorescent fixtures will be 100 percent virgin acrylic with a nominal thickness of 0.125".

Fluorescent lamps will be T8 RE841 type with high color rendering and 4100 degree K color temperature.

The exterior lighting will utilize HID metal halide fixtures and be designed to support the site configuration. The exterior fixtures will be building mounted or pole mounted as determined during design. Pole assemblies will be specified to be capable of withstanding 110 mph winds with 143 mph gusts with no damage. Metal halide lamps will be coated for improved color rendering and color uniformity. Exterior fixtures will be vandal resistant.

TELEPHONE SERVICE AND TELECOMMUNICATION DISTRIBUTION

- **Incoming Service:** The incoming service will be underground from a utility designated location to the Main Distribution Frame (MDF) room. One 2" conduit will be provided for the utility cabling. The incoming service will be coordinated with the Petersburg Municipal Power and Light during design.

- **Phone Switch:** The phone switch will be furnished and installed by the owner. The phone switch will be integrated with the intercom system.

- **Standards:** The building will be designed to EIA/TIA Enhanced Category 5 network performance using unshielded, twisted pair products. The system will be in accordance with the latest EIA/TIA standards for telecommunication. A uniform cabling plan will be designed for this facility- the function of the telecom jack will be determined at the telecom room location base on what system (telephone, data) it is patched into.

- **Overview:** The system will include outlets, conduit, cable trays, cables, terminations, specifying test documentation, "passive" components and "active" components. A partial system description includes:

  1. Telecommunication outlets in the offices and miscellaneous areas.
  2. Horizontal cabling from the outlets to the modular patch panels in the MDF.
  3. Patch cables in the MDF.
  4. Network switches, routers, etc.
  5. Backbone cabling (copper and fiber) between the Administration/Crew Center MDF and the Power Plant IDF. See the Telecom section of the Power Plant electrical narrative
  6. Phone Switch/Service and associated service cabling (owner furnished and installed).
  7. Telecommunication cabling will be run in conduit or cable tray.

- **Main Distribution Frame Room:** The MDF will serve as the main hub for the communications systems for the facility and will contain the following:
  1. Telephone service entrance
  2. Telephone switch
  3. Data and Voice modular patch panels
  4. Fiber Optic Data Network distribution panels
  5. Voice riser terminations
  6. Data Network switches
  7. Data Network equipment

  The MDF will be the homerun location for all of the intercom cabling.

- **Telecommunication Outlet Locations:** Exact locations will be coordinated with the Petersburg Municipal Power and Light.

FIRE ALARM SYSTEM

An electrically operated, electrically supervised addressable fire alarm system will be provided that includes integrated addressable security (see security description below), including control unit, power supplies, alarm initiating and indicating devices, conduit, wire, fittings and all accessories required to provide a complete operating system. The system match existing standards for the Petersburg Municipal Power and Light since this will make training easier and spare parts common between different buildings. If the Petersburg

Municipal Power and Light does not have a standard, we recommend a study to determine the optimal system standard for the Petersburg Municipal Power and Light to follow.

The system will comply with the applicable provisions of the current NFPA Standard 72 National Fire Alarm Code, local building codes, and meet all requirements by Underwriters Laboratories Inc. and/or the Factory Mutual System.

All wiring will be in accordance with Article 760 of the National Electrical Code and local electrical codes. All wiring will be in raceways.

The system will operate as a low voltage, non-coded general evacuation fire alarm system. Initiating circuits will be wired as two-wire, Class B.

The system will include as dialer to call and notify the fire department. In addition to Code required actions, alarms will signal the DDC system. Common area lights and site lighting will be energized (unless prohibited by photocell) upon alarm.

Alarms will be annunciated at the fire alarm alpha-numeric annunciator panel located in the main entry. A complete building floor plan showing all alarm zones oriented to the physical location of the panel including "You Are Here" notation will be provided at the annunciator location.

Manual fire alarm boxes (pull stations) will be provided at every exit from every level and additional pull stations will be provided as required to ensure the travel distance to the nearest pull station does not exceed 200 feet per the International Fire Code.

Both audible and visual alarms will be provided throughout the facility to meet the requirements of the International Fire Code and Authority Having Jurisdiction (AHJ) requirements. Audio-visual horn/strobe units with combination horn and flashing alarm strobe will be used.

Smoke and heat detection will be coordinated during the design.

Sprinkler Switches: Sprinkler flow and tamper switches will be monitored to indicate flow in any part of the system or a partial or complete shutdown of the system at the gate valves.

Required air handling units will be shut down and smoke/fire dampers will close upon alarm.

SECURITY SYSTEM

An integrated Fire alarm / Security system will be provided. The system will be based on Edwards EST3 3000 system. The system match existing standards for the Petersburg Municipal Power and Light since this will make training easier and spare parts common between different buildings. If the Petersburg Municipal Power and Light does not have a standard, we recommend a study to determine the optimal system standard for the Petersburg Municipal Power and Light to follow.
Detection: Door contacts will be provided on all exterior doors. Passive infrared motion detectors will be provided in corridors and other areas determined during design to detect entry into building. Glass breakage detectors will be provided in all areas with exterior glass at ground level.

The system will be zoned based on input from Petersburg Municipal Power and Light.

INTERCOM

The intercom headend equipment will be a Dukane system. The exact configuration and model will be coordinated with Petersburg Municipal Power and Light personnel during the design phase. The system shall match existing standards for the Petersburg Municipal Power and Light since this will make training easier and spare parts common between different buildings. If the Petersburg Municipal Power and Light does not have a standard, we recommend a study to determine the optimal system standard for the Petersburg Municipal Power and Light to follow.
Corridors, hallways, lavatories, building exterior areas, etc., will have speakers without call-in provisions. These speakers will distribute all announcements. Zones will be coordinated with Petersburg Municipal Power and Light personnel during the design phase. Anticipated zones include the following; crew area, 1st floor administration, 2nd floor administration, power plant, and yard storage.

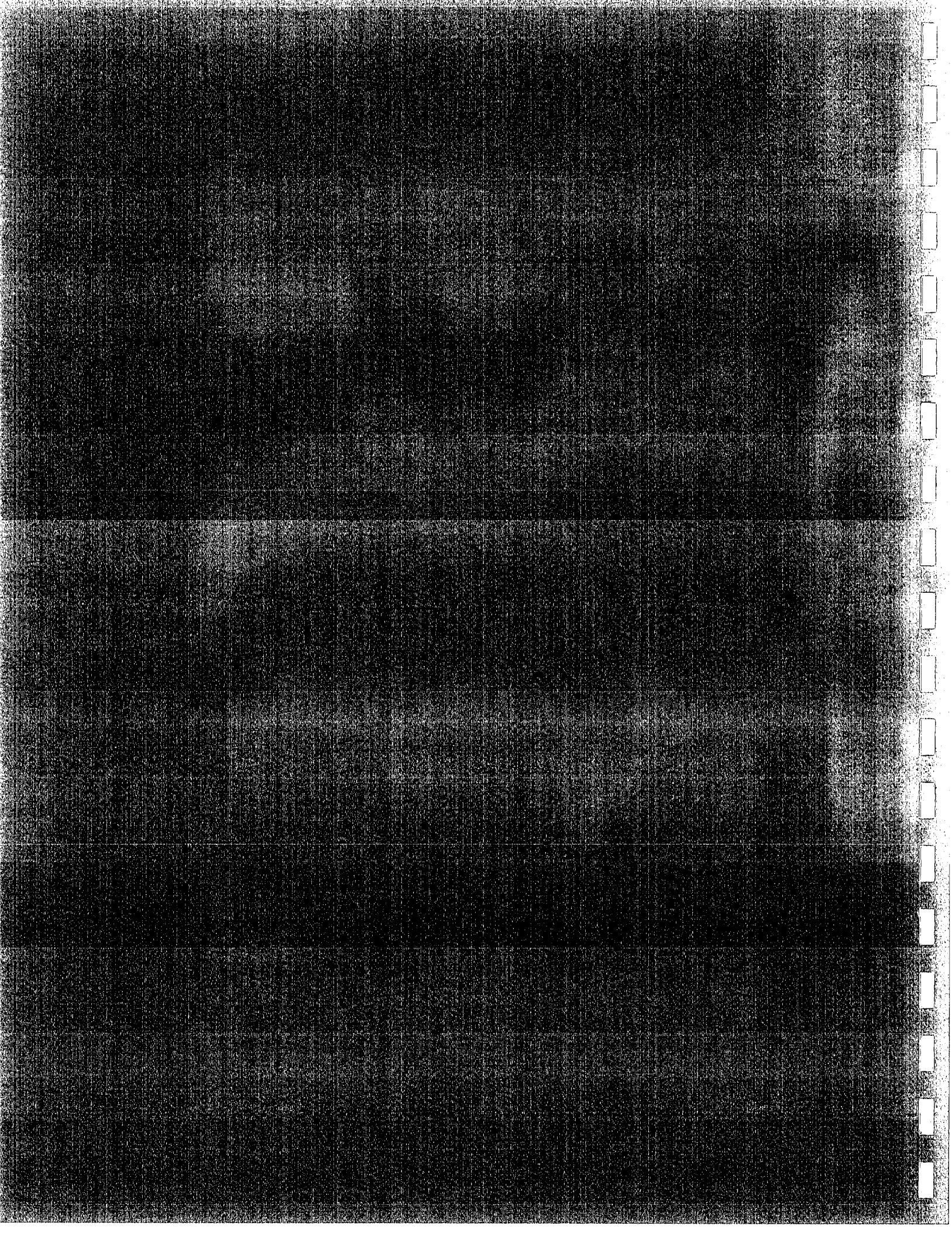
The system will amplify and distribute telephone system sources.

The intercom system and the telephone system may be functionally integrated. The level of integration will be determined during design.

END OF ADMINISTRATION/CREW CENTER NARRATIVES

PETERSBURG POWER PLANT RELOCATION
MASTER PLAN AND PROGRAM

CHAPTER NINE
POWER GENERATION



PETERSBURG POWER PLANT RELOCATION MASTERPLAN AND PROGRAM

POWER REQUIREMENTS

Petersburg's peak system demands were 8.18 MW in the July 2002 to June 2003, and 8.88 MW in the July 2001 to June 2002 reporting periods. Rounding to 9 MW, this is within one MW of the Peak Demand forecast (10 MW) for 2003, in the 1997 *Petersburg 20 Year Plan Report*, and is approximately one MW greater than the peak demand in 1997. Based on the 20 Year Plan, and current peak demands, a power plant capable of delivering 9 MW of firm power is required.

Additionally, for a power generation facility such as Petersburg's, it is recommended practice that the utility is still able to supply peak power demand with the loss of the largest single generation unit (due to failure, maintenance, overhauls, etc.). Based on the subsequent Generation Set Characteristics discussion following, the power plant facility new gen sets would nominally be sized as 3 MW each. Therefore, Petersburg's power generation facility should have at least 12 MW capacity installed. As is subsequently discussed, if two of the existing EMD series 645 units – nominally rated at 2,500 kW each – are utilized in the new power plant, with 9 MW of new units, the power plant would have an ultimate capacity of 14 MW. Five units are not required. Four units are recommended, as long as the fourth unit is equal in capacity to the largest unit to provide supply capability with the loss of the largest unit. Five units are currently depicted to represent three new units and the two existing EMD units. If four new units are desired, the fifth depicted space could be used as blackstart space if determined this is needed, as subsequently discussed. If only new units are desired, Petersburg should not have too much difficulty in selling the EMD units for a reasonable price.

It must be noted that Petersburg currently baseloads the Crystal Lake hydro facility, and based on recent information, output is typically 1,100 kW to 1,800 kW. At this time, this output has not been included in the system capacity along with the diesel plant. The reason it has not been included is that the feed to the Scow Bay substation from the hydro units is a single circuit, and it will not have the redundancy of a second circuit as is recommended from the Scow Bay substation to downtown, and therefore is not viewed as reliable as the new diesel generation power plant will be. However, the baseload supply of 1,100 kW from Crystal Lake should be considered in gen set sizing and issues of flexibility in responding to changing loads, and in particular, low load conditions, as discussed in the following.

GENERATION SET CHARACTERISTICS

Based on the nominal 9 MW peak load, the selection of the capacity of the gen sets must take into account several factors such as spatial requirements, operational flexibility to meet load demand swings, and actual manufacturer offerings. However, although peak load values are well established and recorded, low load values have yet to be verified. Based on "Total kWh Sold" data, and making some assumptions with averages and peak durations, it is estimated that low load demand might be approx. 2,000 kW.

At least one potential supplier – Wartsila – has stated that they have no restrictions on running time at low loads provided the loading is at least 20% of the continuous rating. Loading at 5%-20% of continuous rating is permissible, only if the engine is loaded to 70% for at least an hour after that. Wartsila's continuous rating is 3,190 kW, and therefore, the minimum sustained output is 638 kW. Combined with the minimum base load output of 1,100 kW from Crystal Lake, total output is 1,738 kW. This is less than the estimated system low demand of 2,000 kW, and at least for this particular engine, selecting gen sets of 3 MW nominal capacity each satisfies all of the factors. Both CAT and EMD do not recommend extended operation below 50% continuous rating, although both indicate that operation at less loading is acceptable for limited time, provided a time period of heavier loading follows. In this case, if CAT or EMD were ultimately chosen as the suppliers, a smaller unit of 300-1,000 kW output would seem necessary to provide flexibility in load swing and transition from one to two or two to one main generator operation, *assuming* baseload contribution of 1,100 kW from Crystal Lake. With load demand beyond two unit operation, there is enough flexibility in the main units of any of the potential suppliers to transition.

The issues in low load operation – with any diesel engine – are, insufficient cylinder pressure, blowby, abnormal ring wear, and excessive carbon deposits. The end result is more frequent oil changes and less life from the engine before maintenance and overhauls.

Each potential supplier can provide equipment in their packages to allow blackstart (at an estimated cost of $3,000 to $10,000 per engine), although extended periods of low load operation are not recommended, outside of the limits as previously discussed. If the ultimate supplier selection requires a smaller unit for flexibility, that unit could also serve as the blackstart and station service unit instead of that capability on one or two of the primary units. However, it is not recommended that a primary gen set is set up to start automatically – those units should be a manned start. Also, it is not recommended that Crystal Lake be relied upon as a blackstart unit due to the potential failure of the distribution line from the hydro plant to the Scow Bay Substation.

It is recommended that Petersburg record low load data and document current normal operating scenarios prior to or in preliminary design before gen set supplier bid solicitation and selection tasks. In particular, actual daily load profiles and knowing operating habits would be useful in determining whether a smaller blackstart unit is warranted or desired, irregardless of which supplier might be ultimately chosen for the main gen sets. Additionally, Petersburg might consider two different modes of operation at the Crystal Lake hydro facility during outages. One, Crystal Lake could be used as the load transition unit aiding the bringing on-line or bringing off-line primary gen set units. Or two, Crystal Lake output could be curtailed entirely during outages, thus eliminating operation of the primary gen sets at low outputs, below their recommended turndown. The low demand load data, and Petersburg's possible willingness to operate Crystal Lake in a different mode are key to assessing the need for a 300 kW to 1,000 kW blackstart and load transition unit. If true low demand load were approximately 3,000 kW instead of the estimated 2,000 kW, any of the potential manufacturers have enough turndown capability to transition to or from multiple gen set operation, irregardless of Crystal Lake contribution. In this case, a small 50-100 kW station service gen set with automatic transfer switch would suffice.

Although frequency and voltage stability at low load conditions was expressed as a concern for gen sets of this size, experience with many installations comparable to the conditions at Petersburg indicate that such gen sets are able to adequately respond to changing load conditions and maintain frequency and voltage within normal parameters. Usually, frequency and voltage stability problems are associated with slower speed engines, and fewer cylinder engines, in which individual cylinder pulses become quite apparent.

Engine speed is also a consideration. There are gen sets available that operate at very low speed of 100 rpm's, and others that operate at 1800 rpm's, and still others that operate between these speeds such as 360, 720, 900, and 1200 rpms, among others. It should be noted that Petersburg currently has gen sets that operate at 360, 900, and 1800 rpm's. In general, because of mass of moving components, the larger the engine, the slower the operating speed, although fuel type is a factor as well. Also in general, the slower the operating speed, the less wear on the engine per hour of operation, although data suggests that there is not a linear relationship between engine speed and wear (an 1800 rpm engine will not wear twice as fast as a 900 rpm engine).

A pure emergency or standby generation plant most typically consists of multiple high-speed (1800 rpm) gen sets. Such gen sets are typically lower cost than medium or low-speed sets on a per kW basis, and initial cost basis. However, such gen sets have subsequent maintenance and rebuild costs that are higher because of more wear and higher frequency of repairs. They normally are not expected to be utilized, nor is the plant expected to last up to 20 years. Petersburg's power plant is viewed in a different set of circumstances in that the plant is known to have to operate during yearly scheduled maintenance outages on transmission lines, is isolated from more reliable power supplies, and is a long term investment expected to last 20+ years. For this reason, medium speed (700-1200 rpm) engines were chosen as the logical choice to pursue for the power plant. It should be noted that there are a considerable number

of 1800 rpm gen sets in the 500 kW to 2000 kW size range on the market, with low to medium hours, at reasonable prices. The somewhat high number of gen sets are partially a result of the Y2K issue, with the result that some gen sets were not used at all, and others minimally used, and owners are putting them up for sale after need was not realized. This supply of medium-to-high quality gen sets is diminishing and prices are normalizing. It might be tempting to obtain some of these gen sets at reasonable initial costs. However, we would recommend against this course, at least for the main gen sets (possibly blackstart unit if needed), due to warranty issues on used machines, expected diminishing supply (and likely higher prices) and ultimately, expected higher frequency and cost of maintenance on such gen sets.

STATION TRANSFORMER

The space currently depicted for the station transformer is assumed to be for one transformer. Occasionally, two transformers in parallel of lower capacity each might be configured for such an installation to provide some capacity in the event of failure of one of the transformers, or even 100% redundancy. Because the diesel generation plant is standby, not prime, a redundant transformer is not warranted (factors of failure for a transformer are less numerous than for the 3-mile distribution line(s) from the Scow Bay substation to downtown). Of more concern, space is a significant consideration for the plant. Two lower capacity transformers will consume more space than one full capacity transformer (approximately twice the space), due to separation and containment requirements. Additionally, even if normal separation is provided, it is questionable whether the other transformer would survive a catastrophic failure such as explosion or fire due to space limitations of the site. It is estimated that a single full capacity transformer will be slightly more expensive ($180k-$200k) than two partial capacity transformers ($150k - $180k). Multiple transformers for this installation are not recommended.

GEN SET BUDGETARY ESTIMATES, TECHNICAL DATA, & EVALUATION

Budgetary estimates from three gen set manufacturers were solicited to establish realistic costs for the new power plant gen set equipment. Various technical performance data was also solicited. The following table summarizes the supplied information:

Petersburg Municipal Power and Light
Potential Gen Set Package Suppliers Estimates
And Technical Data Summary

Description	Caterpillar	EMD	Wartsila
Model Number	3612	16-710G4B	9L32LN
Base Price, 3x3MW Gen Set Packages	$4,343,373	$3,365,000	$4,180,000
Switchgear, 5kV	$472,310 (1)	$665,000 (1)	Included (2)
Startup Spare Parts	$42,500	Included	$25,000
Remote Radiators, 3	Included	$153,900	Included
Exhaust Systems, 3	Included	$44,760	Included
Flexible Connectors, 3 sets	Included	$3,150	Included
Startup/Commissioning Assistance	Included (3)	Included	Included
Staff Ops Training (On-Site, 7 days)	Included	Included	$74,000
Delivery to Site	$89,225	Included	$150,000 (5)
Total Price (4)	**$4,947,408**	**$4,231,810**	**$4,429,000**
kW Rating, Continuous, Each	**3,300 kW**	**2,865 kW**	**3,190 kW**
$/kW, Continuous	**$500/kW**	**$492/kW**	**$463/kW**
kW Rating, Standby	3,630 kW	3,150 kW	3,509 kW (6)
$/kW, Standby	$454	$448	$421 (6)
Delivery Time to Site	6 months	8-9 months	7-8 months
Engine Speed (RPM)	900	900	720
Engine Cycle (stroke)	4	2	4
Fuel Consumption			0
100% Load, Cont. Rating gph / g/kwh	204.7/0.062	189.7/0.066	185.3/0.058
Exhaust Emissions			
Mass Flow, 100% Load, lb/hr / lb/kwh	49,067/14.87		57,937/18.16
Temperature, F, 100% Load	803	579	592
CO, g/bhp-hr, 100% Load	0.68	0.28	0.69
Nox, NO, g/bhp-hr, 100% Load	10.0	7.95	10.15

Notes:

1. Includes five units, two for the existing EMD gen sets.
2. Included 3 units only. Additional units estimated at $100,000 each, added to base price.
3. Includes 21 days total.
4. Delivered to site, uninstalled.
5. Estimated; not provided by vendor.
6. Wartsila does not publish or offer "standby" or "prime" ratings. The rating Wartsila offers is analogous to the "continuous" ratings of other suppliers. See the discussion in the report about this factor.

Reviewers should be cautioned that no decisions should be made at this time concerning particular suppliers. The information requested was for budgetary purposes, and is preliminary. Any of the potential suppliers could be favorable once a specific and detailed Request for Quotation is sent and responses are received. Some of the data has been supplied based on different assumptions and consistent comparisons cannot be made at this time.

Upon receiving firm proposals during a final design phase, Petersburg should actively participate in proposal evaluation and aid in assessing several important factors in addition to the obvious cost factor. At this preliminary stage, EMD has provided the lowest initial equipment cost. Wartsila has provided the lowest $/kW cost.

Petersburg has several model 645 EMD engines in current use at the downtown generation plant facility. It is anticipated at this time that two of these engines will be moved to the new power plant. EMD has stated that many of the maintenance part items for the model 645 are the same as those for the offered model 710's for the new plant. Familiarity of engine operation and maintenance is a factor to consider, although Petersburg should assess whether those personnel with that familiarity are truly a factor, or not (such as if any are close to retirement).

Gen set kW ratings require further discussion and consideration. There is not a set industry standard defining engine kW ratings. In general, manufacturers establish their "continuous" rating based on major maintenance and overhaul milestones, and how many hours of operation at such an output that the engines can be operated before those milestones are reached. These milestones could be 20,000 hours, 40,000 hours, or other for such necessary maintenance and overhauls. Other ratings, such as "Standby" and "Prime" originated in marine vessel applications in which engines might be temporarily pressed into higher output during emergency situations, and which decrease the number of hours the engine can be operated before those milestones are reached.

For Petersburg's power plant, the continuous rating is the most applicable rating to evaluate. However, Petersburg should be aware that even the continuous ratings from potential suppliers may not be based on equal criteria, and that for formal and firm proposals, the criteria must be known to be able to compare offerings fairly. While this information was requested in this preliminary effort, it was not supplied. In general, "prime" rating is 10% greater than continuous, and "standby" rating is 20% greater than continuous.

Of the three potential suppliers, the Caterpillar offering is the largest output engine at 3,300 kW continuous rating. EMD is the smallest output engine, at 2,865 kW continuous rating. Wartsila's offering is at 3,190 kW, and this rating is analagous to a continuous rating. It is interesting to note that Wartsila only provides this one rating. Therefore both Caterpillar and Wartsila easily achieve the 9 MW nominal capacity sought for the three new gen sets based on continuous ratings, while EMD achieves the 9 MW nominal capacity only on the standby rating of 3,150 kW each. This apparent deficiency should not cause too much concern as it is questionable that the new plant would be required to operate at approx. 9 MW output prior to the existing EMDs being moved from the existing plant, at which time the loss of the largest

single generator is no longer a concern, and the new gen sets would not be required to be operated above their continuous ratings, if EMD were the supplier ultimately chosen. These risks would seem to be acceptable risks. If the risk of possibly operating beyond the continuous rating is thought to be too great, or at least undesirable, EMD would be requested to offer the next higher capacity engine in their line, at 3,580 kW each, continuous rating.

Another factor to consider in choosing the gen set supplier is location of parts and service centers. Caterpillar has full parts, sales, and service facilities in Juneau, Anchorage, and Fairbanks, with various mechanics in Alaska that are factory certified, or qualified, to work on the offered CAT engines, and still more in a Tukwila, WA facility. Wartsila has service centers in Poulsbo (Seattle), WA, and in Long Beach, CA. EMD has main service and parts facilities in City of Industry (LA area), and Mira Loma, CA, and authorized service centers in Seattle and Anchorage. It appears that each potential supplier has adequate parts and service locations to meet Petersburg's needs, although CAT appears to have an advantage in proximity for rapid response.

POWER PLANT PERMITTING

The 1997 *20 Year Plan Report* identified permitting requirements for the different generation plant options presented in that report. Those requirements are still valid and for the chosen new plant option, all the listed permits are anticipated to be necessary. The most significant permit, and that which is anticipated to take the longest time to obtain, is the Air Quality Control Permit to Operate (AQCPO).

Petersburg's current AQCPO allows up to 47,227,000 kWh per year from the diesel generation plant, or 330,000 gallons of diesel fuel to be consumed. In the reporting period of July '02 to June '03, Petersburg generated only 716,921 kWh from the diesel generation plant. In the reporting period of July '01 to June '02, 633,766 kWh were generated. These are far below the permit limits.

Discussions with Alaska Department of Environmental Conservation personnel indicate that for a power generation facility such as Petersburg's –standby only and not baseloaded or continuous – enhanced pollution controls such as selective catalytic reduction (SCR) likely would not be required. In fact, discussions indicated that there were only two installation in Alaska with engines over 2,000 kW in which SCR was installed. Therefore, space allocations for ammonia storage and distribution and SCR components in the exhaust stream are not anticipated. However, the AQCPO will be based on the specific gen set that is ultimately selected, and the emissions characteristics of that engine. It is therefore recommended that the specific gen set manufacturer is selected as early as possible in the schematic or final design phase to allow progression of the application for the AQCPO.

If the two EMD20-645s are to be used in the new installation, as is currently depicted and assumed, it is probable that specific emissions testing on those engines would be required as part of the permitting process. Petersburg should be aware that there are engine modifications

and tuning (injectors and aftercooler) that result in more favorable emissions characteristics that very likely would avoid other more involved emissions controls, such as SCR. Such modifications and tuning usually result in lowering fuel efficiency, however.

See the following **permit matrix** that describes the AQCPO process.

PERMIT	ACTION	AGENCY	EST. TIME	Comments
1. Air Quality Permit to Construct	**Step 1** - Determine Project Classification, or whether a New Source Review NSR format is required, NSPS must be identified. 2003 NSR regulations just implemented-standards may be changed.	Alaska Department of Environmental Conservation (ADEC); Juneau, AK (907) 465-5108	15 days	Time frame accounts for notice of completeness and public notice if required. Classifications are in accordance with 18 AAC 50.300 Determine Project Classification, is it in an attainment or non-attainment area. Need Specific Diesel specifications from supplier.
	Step 2 – Determine Potential to Emit (PTE) calculations and obtain Actual Emissions.	Alaska Department of Environmental Conservation (ADEC); Juneau, AK (907) 465-5108	15 days	Calculate PTE and actual emissions for modifications for previous two years and take a permit limit to restrict hours of operation, TBD. Determine if pollution control devices will be utilized. Obtain Performance guarantees, vendor data or actual test data.
	Step 3 – Decide if requested limits will be used to avoid certain project classifications.	Alaska Department of Environmental Conservation (ADEC); Juneau, AK (907) 465-5108	15 days	Determine: Owner Requested Limits (ORL) 18 AAC 50.225 or Pre-Approved Limits (PAL) 18 AAC 50.230; Not advantageous if the limit would not avoid construction permit

				classifications for the project. Decide to request permit limits 18 AAC 50.305(a)(4) in the construction permit.
	Step 4 – Use permit application Checklists in Appendix B to determine required permit application forms	Alaska Department of Environmental Conservation (ADEC); Juneau, AK (907) 465-5108	15 days	Determination of PSD this is greater than 250 tons, Major or minor source. Major is greater than 100 tons. Construction other than site clearance, preparation, utilities and equipment delivery may not begin until the authorization is granted. Retainer Invoice depending upon classification; $2000 - $13000
	Step 5 – Complete all required Permit modeling for exceedances of thresholds	Alaska Department of Environmental Conservation (ADEC); Juneau, AK (907) 465-5108	30 days	PM-10 if > 15 tpy SO2 if > 40 tpy NOx if > 40 tpy Lead if > 0.6 tpy
	Step 6 – Complete all required Permit Application Forms in Appendix C.	Alaska Department of Environmental Conservation (ADEC); Juneau, AK (907) 465-5108	30 days	
	Step 7 - Determine Fees for a Permit by assessing which classification of 18 AAC 50.310 the project falls into.	Alaska Department of Environmental Conservation (ADEC); Juneau, AK (907) 465-5108	15 days	Mitkof Island City of Petersburg Generation Facility- Fees are determined based upon type of permit; PSD, Non Attainment, or New. They range from $13,000 to $4000.
2. Air Quality Permit to	**Step 8 – Complete testing of pollution devices.**	Alaska Department of Environmental Conservation	TBD	Testing per permit monitored by Regional personnel

Operate		(ADEC); Juneau, AK (907) 465-5108		
3. Diesel Electric Generator Facility Operating Permit		Alaska Department of Environmental Conservation (ADEC); Juneau, AK (907) 465-5108		GP-1 Application; fees are associated with a range of fuel consumption (section V, pg 12). Emissions fees are assessed at $5.07 per ton per pollutant.

GEN SET PROCUREMENT ISSUES

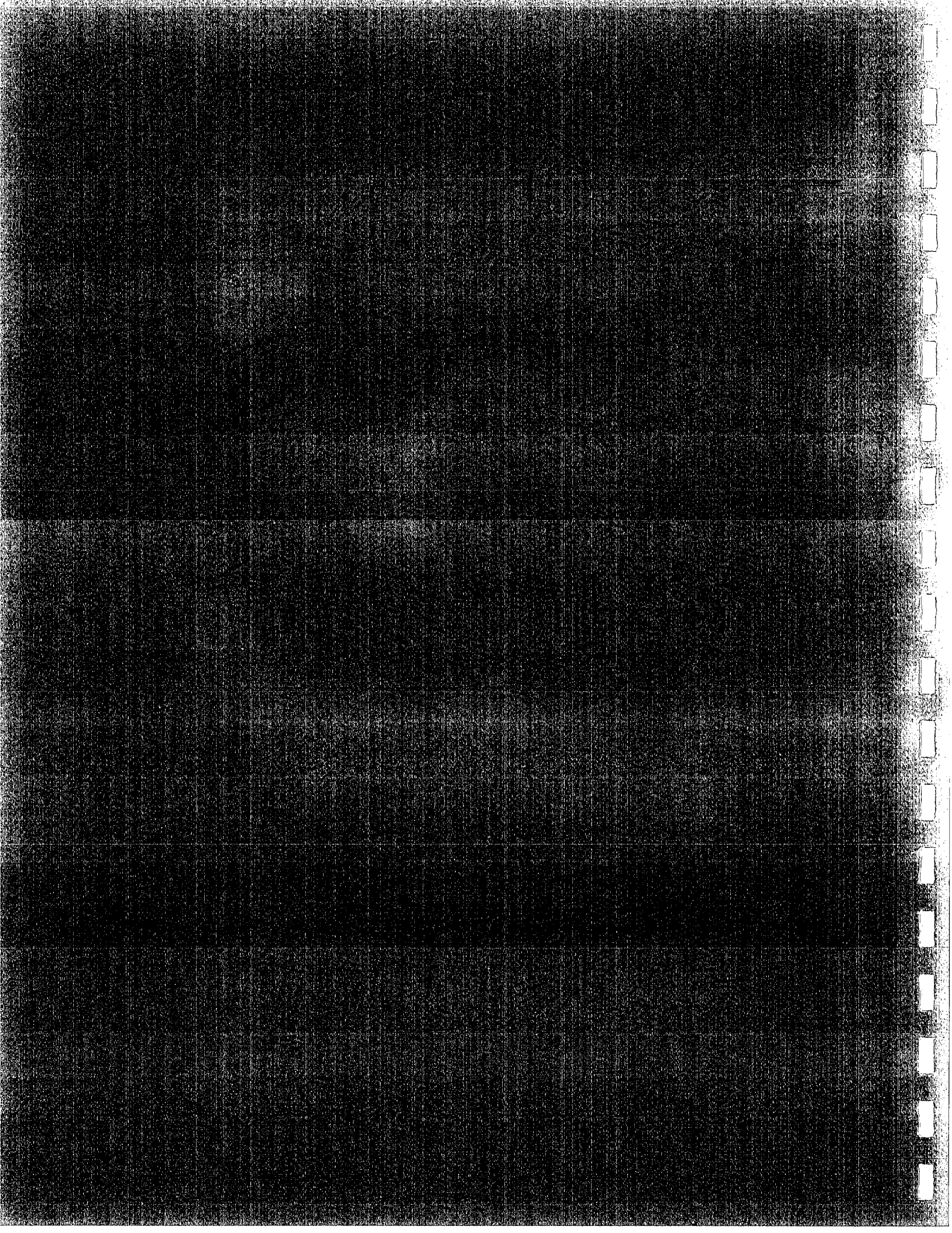
Once a formal gen set RFQ is issued, responses are received and evaluated, and a supplier is chosen, there are two options for gen-set procurement. Petersburg (or their A/E representative) can procure the gen sets, or the general contractor for the generation plant can procure the gen sets. Sequencing of tasks that permit project progress, and timing of gen set arrival are the main factors to consider between these two options. During this preliminary study, gen set suppliers estimated 6 months as the quickest delivery time, and 8-9 months as the longest delivery time to site.

Due to the lead time of the gen sets, the issuing of the formal RFQ for these should take place as early as possible. Design documents of sufficient detail to allow detailed and firm quotations are not available until the schematic design phase is complete. At a minimum, Piping and Instrumentation Diagrams (P&IDs) and Electrical One-Lines indicating scope of supply, and a site layout indicating layout constraints are necessary. It is estimated that once the RFQ is issued, 2-3 months should be allowed for response, clarifications, evaluation, and negotiations.

Final design cannot take place until the supplier is chosen and their equipment certified drawings are provided. Normally, a construction contractor will not be selected until final design documents are complete and construction bids are solicited and evaluated. Additionally, if the constructing contractor performed the task, there would be additional project cost incurred for the contractor to carry that financial burden and risk. In the interest of allowing project progress and logical task sequencing, it is recommended that Petersburg or their A/E representative undertake the gen set procurement task.

PETERSBURG POWER PLANT RELOCATION
MASTER PLAN AND PROGRAM

CHAPTER TEN
POWER DISTRIBUTION



PETERSBURG POWER PLANT RELOCATION
MASTER PLAN AND PROGRAM

DISTRIBUTION NARRATIVE

EXISTING SYSTEM

Petersburg Municipal Power and Light discussed their needs for integrating the new power plant with the City's power distribution system and plans reuse of the power plant area which includes removal of the existing City's substation. The existing distribution system is not adequate for the relocation of the City's power plant, adjacent to the existing Scow Bay substation, which is own by the Four Dam Pool Power Agency.

PMP&L has requested the Four Dam Pool Power Agency provide a 24.9 kV circuit and associated breaker at the Scow Bay substation, as well as their desires on how the new generation should be connected to their substation. Present interface for switching from Agency power to City generated power is via telephones, no SCADA system exists. Allowances for SCADA connections with the substation should be made to PMP&L SCADA system.

The City is in the process of modifying their existing distribution system from 2400V to 24.9 kV. This work needs to be completed before the removal of PMP&L substation at the existing power plant location. Distribution of 24.9kV to PMP&L's customers from the Four Dam Pool Power Agency substation near the new power plant will require additional distribution capacity to increase. The routing and capacity of the recommendations have to consider the phasing plan to remove the City's substation by the existing power plant and provide for increased capacity, reliability and expansion.

Majority of the distribution line between the two substations is routed overhead on single crossarm poles along Mitkof Hwy. The distribution line work can be done in parallel with the power plant equipment procurement and construction. Completion of this work before relocation of generation equipment to the new power plant will allow for unimpeded work on the power plant and removal of City's substation. The purpose of this review is to lay the ground work for proceeding with a detailed study, phasing and cost estimate for work on the City's power distribution.

DISTRIBUTION OPTIONS

Relocation of the power plant and planned reuse of the area will require power distribution changes. Different distribution options discussed with PMP&L included the following.

> **Option 1:** Replace existing conductors from the Scow Bay substation to the existing power plant's substation area. This option would include phasing of this work and upgrading existing poles as required, and would not provide additional redundancy.

Reliability would increase over the existing lines due to the new conductors, insulators and appurtenances.

Option 2: Add circuit, below existing circuit (underbuild). For this option, a new underbuild crossarm would be added to the existing pole. Reliability would increase over the existing lines due to the new conductors, insulators and appurtenances. Redundancy would be added with the new circuit. Line route would remain the same; limiting the potential for distribution system expansion and complete disruption of service to a single event. Damage to a single pole in this Option 2 or Option 1 above would have the potential for disabling service to the PMP&L's customers. Development is increasing in the Scow Bay area and potential for damage to poles and disabling the distribution line would be a contingency that PMP&L would have to include in their operational plans.

Option 3: Install buried conduit along the bike path that DOT is constructing along road to Scow Bay for future installation of conductors with the power plant relocation project. The DOT project is underway and installing conduit for the conductors is not probable at this time.

Option 4: Loop the power distribution from the Scow Bay substation, (southwest side of the Island) along the new Scow Bay single lane water line road to Sandy Beach Road, (northeast side of the Island) and tie into existing 24.9 kV circuit to complete the loop. This option allows for the increase reliability and redundancy for the City with a new distribution line, mainly underground, circling the majority of the Island population. Potential for future power service area expansion is allowed with this option. There are many unknown routing questions and details on this option, which need to be defined. Option 4 is the most ambitious of the options presented. Costs associated with installation of the cable continuously in conduit would be considerable. Direct bury of armored cable is a potential design and construction method that is acceptable to PMP&L.

RECOMMENDATION

Option 4 is recommended. The distribution line could the following route:

1. North along Mitkof Hwy. to Hungerford Road, 2nd overhead circuit on existing poles or "cross country" mainly following existing utility R-O-W to the Scow Bay water line road.
2. Along Hungerford Road to the Scow Bay water line road, re-conductor existing overhead circuit.
3. Along the water line road past the airport to the junction of Haugen Ave., underground.
4. Continue along Haugen Ave. to junction with Sandy Beach Road, underground, and tie to existing 24.9 kV circuit to complete loop.

The Scow Bay water line dirt road is a single lane, approximately 14' wide with turnouts. The water line is buried mostly on downhill side of the road. The power line would be buried on the opposite of the road, away from water line. Generally, the soil is stated to be mostly muskeg, little gravel and limited, if any, bedrock. The City may wish to convert the single lane road to a two lane road in future. A detailed study and preliminary routing for detailed cost estimate is needed. The option of obtaining separate funding for roadway improvements and combining road and distribution line work into a single project should be considered.

PETERSBURG POWER PLANT RELOCATION
MASTER PLAN AND PROGRAM

CHAPTER ELEVEN
SCADA

PETERSBURG POWER PLANT RELOCATION
CHAPTER 11: SCADA

THE EXISTING FACILITY AND SYSTEMS

The existing SCADA system is limited in functionality and scope. A Wonderware application is partially installed and implemented. The City's recent contract to upgrade the plant SCADA was not completed. PMP&L has just completed a Survey of the existing SCADA system.

SCADA & POWER PLANT CONTROLS ALTERNATIVES

Three basis alternatives were considered for integrating the proposed Power Plant SCADA and existing SCADA system. The alternatives are, reuse the existing system, hire a single equipment vendor to provide a proprietary system, or engage an engineering firm to design and specify an open architecture system that would be implemented by a system integrator.

1. **Reuse of the Existing System:** In this scenario, the utility could build a new power plant that is fundamentally run in a manual mode with the generating equipment operated in a stand alone mode. The existing SCADA platform would be moved to the new facility once the proposed plant is on-line. This system would have limited monitoring capability and remote interface capability. Re-using the existing SCADA host would be problematic; software and operating systems are not current. There would likely be reliability and compatibility issues. The systems would be difficult to support in the future. Upgrading the software would likely require an upgrade to the SCADA hardware.

2. **Single Equipment Vendor Solution**: This alternative is often attractive to utilities that do not have an in-house, resident SCADA Engineer. The utility or a consultant for the utility develops a simple performance based specification. The utility goes out to bid, and the low bidder provides a system.
   This solution provides equipment that is sometimes not the best for the application. The vendor has a special interest in providing equipment their firm manufactures and for services they provide. No single vendor has the best equipment for all applications in the plant. The plant would be "locked-in" to the specific manufacturer and vendor for replacements, upgrades and service. The life span of a SCADA system is nominally 15 years, shorter than the life span of the plant. It is possible for the SCADA system product line to be discontinued before the system has completed its life cycle. This may force the utility to perform a complete SCADA system replacement prematurely, due to the proprietary nature of the system. Frequently the cost of future upgrades and equipment replacement for a sole source system are extremely high.

3. **Open Architecture System:** Open systems are designed by a consulting engineering firm to provide a design and specify equipment that best fits the plant's applications. The specified equipment and systems are from an assortment of manufacturers. It is important that the overall SCADA system have an open architecture. Different systems and protocols are integrated to provide a seamless system. The operating systems, protocols and field equipment are engineered to optimize the plant's operations now and the future. As the system ages, various components and software can be replaced with new components having similar function, but provided by different manufacturers. A modular, scalar design easily supports expansion and upgrades in the future. The total cost of ownership is lower over the life cycle of the system and flexibility is provided.

RECOMMENDATIONS FOR THE SCADA SYSTEM

AMC recommends that the SCADA system be based on an open architecture; which will allow systems and packaged equipment from multiple vendors to interface readily. The system would be implemented using industry standard practices and equipment. Proprietary systems, communication protocols and equipment would be avoided. The controls and monitoring of the proposed power plant should be integrated with the SCADA system, which would use a new, upgraded version of Wonderware. Supplemental software modules provided by Wonderware would be used in the implementation to provide the functionality required.

- **Power Plant Monitoring & Control:** The design intent is to purchase packaged equipment, completely integrated, as skid mounted engine/generators units with integral, local control panels. The local controllers are responsible for normal operation and shutdowns of the engines and generators. These integrated units would be purchased with an onboard programmable controller capable of communicating with the plant SCADA system, using an industry standard communication protocol. The local control system would be capable of sending equipment status, and receiving operational setpoints and commands from the SCADA system. Relocated generator units should have the existing relay control systems replaced with compatible programmable controllers similar to the new generator units. Some typical parameters monitored and controlled by the SCADA system are:

    1. Engines
        a. Engine speed
        b. Engine temperature
        c. Oil temperature and pressure
        d. Runtime
    2. Generators
        a. Excitation
        b. Synchronization
        c. Generator temperature

3. Supporting Infrastructure: Miscellaneous support equipment would be monitored and controlled by the SCADA system. Some possible systems may include:
   a. Lubrication system
   b. Makeup water for cooling
   c. HVAC monitoring
   d. Oil – Water separator
   e. Security System (future)
   f. Fire Alarm System
   g. Low Voltage Switch Gear – 480V (DeviceNet)
4. Incorporate SCADA Upgrade Scope - June 6, 2002: Additionally the SCADA system would complete remaining elements of implementation of the SCADA Upgrade Scope - June 6, 2002 project.

- **Hydro Plant Operation Monitoring & Control:** The SCADA system will interface with the existing Hydro Plant RTU and communication network, providing an interface for monitoring and control of the Hydro plant from the main control room in the proposed power plant at Scow Bay. Elements to be monitored may include:

  1. Generators
  2. Lake Level Control
  3. Hydro Plant Switchyard

- **Distribution Monitoring and Switching:** The SCADA system will provide an interface to the distribution equipment. The intent will be for the new switchgear to be purchased with intelligent multifunction protective relays. The interface to the protective relays and motorized switchgear will be by an industry standard, serial protocol, such as Modbus. Existing distribution and switching RTU's, reclosers and communication network equipment will be integrated into the SCADA system. Elements to be monitored are:

  1. System Voltage, Current, Phase
  2. Scow Bay Substation
  3. Hatchery Site
  4. Petersburg Sectionalized Line Switches, (4 Locations)
  5. Plant Bus
  6. Feeders
  7. Transmission
  8. Intertie
  9. Reclosers

- **Protective Relay Monitoring:** Protective relays represent the largest group of I/O for the SCADA system. AMC recommends the implementation of intelligent multifunctional relays. Using this type of relays may provide a tremendous cost savings, reduce maintenance, increase reliability and provide enhanced flexibility. Typically, a single device will provide the functions of many individual relays. Equipment that is well suited

to the application of multifunction relays are:

1. Generators
2. Transformers
3. Breakers
4. Phase, Frequency & Sequence

- **Report Generation:** Modern SCADA systems are capable of automatic report generation, which can provide enhanced reliability and accuracy over traditional, manual reports, while reducing labor. The information storage and retrieval will be from the data historian server. AMC recommends that data be stored in an industry standard database, and not a proprietary data storage format. The use of a standard data base will enable the future implementation of third party analysis and reporting software.
  1. Initial Reporting
     a. EPA – Emission reports
     b. Fuel usage reports
     c. Trending of operational parameters
  2. Future Systems
     a. Predictive Maintenance
     b. Efficiency Reports

- **Maintenance Support by the SCADA System:** The SCADA system can provide critical equipment alarm and status information for the remote sites, as well as the proposed power plant. Equipment that is not purchased with resident PLC's can be monitored by traditional I/O interfaced to the Miscellaneous Support Equipment PLC, (See Proposed SCADA Architecture Drawing). Possible maintenance applications SCADA can support are:
  1. Equipment Alarms
  2. Operational Hours
  3. Sequencing or cycling equipment

- **As-Built of Existing Systems & Equipment:** The utility recently procured SCADA system survey. It is the intent to incorporate the existing remote nodes "as is" into the upgraded SCADA host, proposed by this study. AMC recommends that a complete system Process and Instrumentation Diagram, P&ID, be developed as a preliminary step of the proposed power plant and SCADA integration design phase. The following equipment and facilities will require additional as-built prior to design to ensure system integration.
  1. Crystal Lake Hydro
  2. Hatchery Site
  3. Scow Bay Substation
  4. Tyee Instruments & Switch Gear

5. Protective Relays
6. Petersburg Substation
7. Scow Bay Substation

SCADA ARCHITECTURE

The SCADA system will be designed to maximize reliability and ease of use, while minimizing both initial capital and long-term cost. This would be achieved by using a scalar technology appropriate for the application. AMC recommends an open architecture that will provide a modular system, which will allow for addition of new devices, or later replacement of equipment, and not be bound to a single manufacturer.

- **Backbone Communications:** AMC proposes the use of a redundant Ethernet backbone throughout the plant and the adjacent substation. Ethernet communications will allow the use of commercially available, low cost, non-proprietary equipment and configuration tools. Existing radios and networked RTU's can be readily integrated to the Ethernet network using TCP/IP servers.

- **Protocols:** Communication between the different elements of the SCADA system would be by industry standard protocols, which are not proprietary to a single manufacturer. For devices that the manufacturer does not provide Ethernet as a native communication channel, AMC recommends TCP/IP encapsulation to allow different protocols to reside on the network simultaneously. Using device protocols such as Modbus and Devicenet, which provide a large selection of vendors, can provide easy device replacement in the future. Standardization on industry standard protocols will also reduce the number of configuration and programming tools necessary to purchase, learn to use, and maintain support contracts on.

- **Data Historian:** The implementation of an industry standard data base such as MS SQL will allow for reliable data storage and report generation, while providing an opportunity for the future third party analysis tools. The client has expressed a desire to continue using Wonderware. Wonderware recommends that when their software is configured for larger applications, such as this system, that SQL be used as the database. An implementation of SQL Server on a stand-alone PC platform with RAID array drives will provide a high reliability data storage system.

- **Control Room Philosophy:** Modern power plant control rooms differ greatly from the traditional power plant control room. The "big board" is gone and is no longer necessary. The SCADA controllers can monitor all equipment and operations, sounding an alert or alarm whenever anything is outside of the normal operating parameters. A second monitor is provided in the control room, primarily as a backup system, and also to provide easy access to multiple screens in the event of an operational abnormality. Another operator interface resides on the plant floor to provide easy access to all system

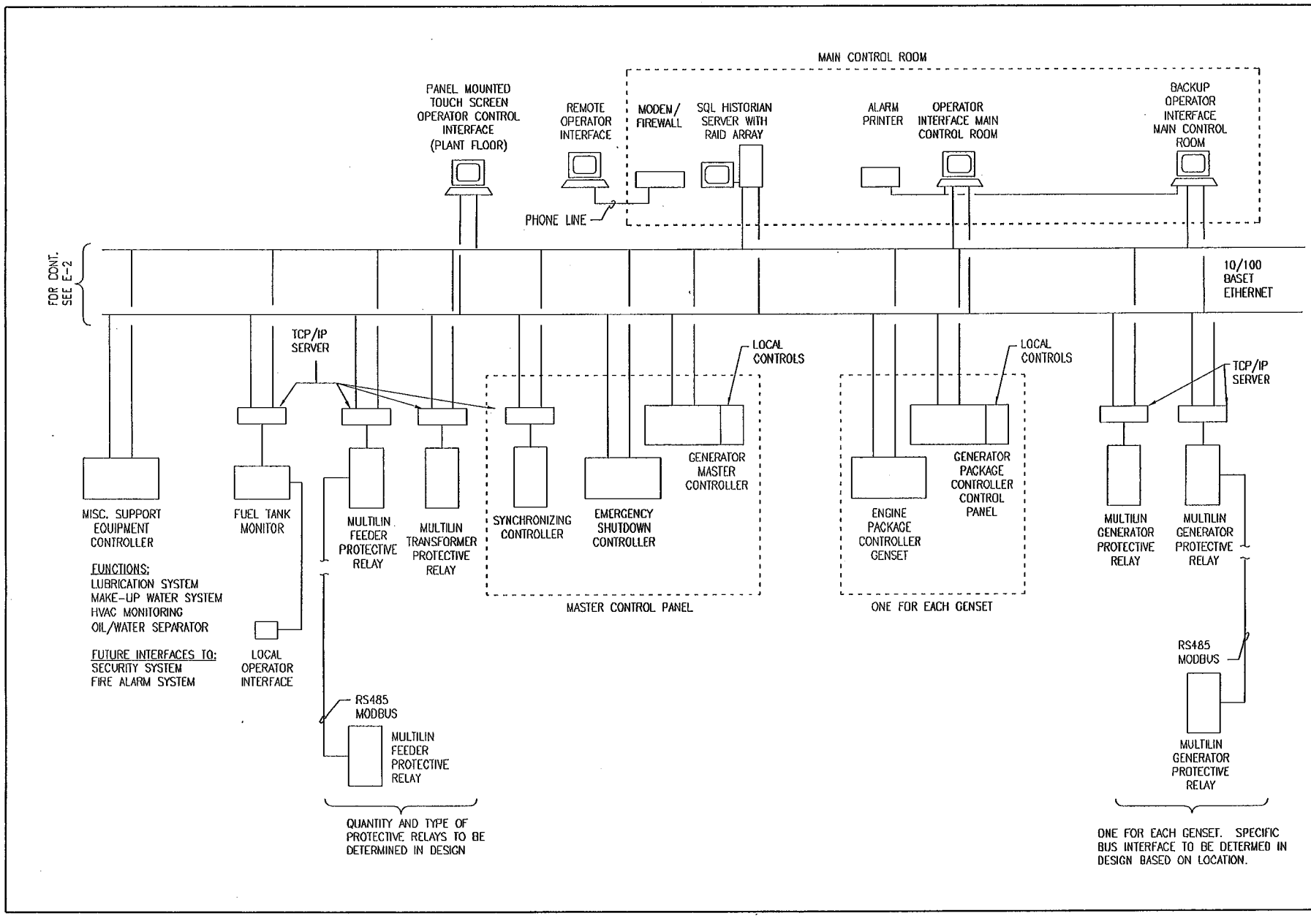
parameters during a startup.

- **Remote Access & Annunciation:** The SCADA system can be configured in a "client/server" configuration to allow ready access to all operational information from a remote location, the administration/crew center, and over a dial-up modem or other internet connection. An auto-dialer function may be implemented with a variety of notification methods, including:

  1. Pre-recorded phone messages
  2. E-mail notification
  3. Pager notification

- **Control Network Security:** For security, the Ethernet network within the plant remains isolated from the Internet. Security is provided by different levels of access which are assigned to the different staff members for both in-plant and remote access. Typical access prioritization includes:

  1. Engineering or system administrative access
  2. Lead Operator access to setpoint configuration
  3. Operator access for plant operation



Adams, Morgenthaler and Co., Inc.
701 East Tudor Road, Suite 250
Anchorage, Alaska 99503
fax 907-257-9191
phone 907-257-9100
www.amc-engineers.com

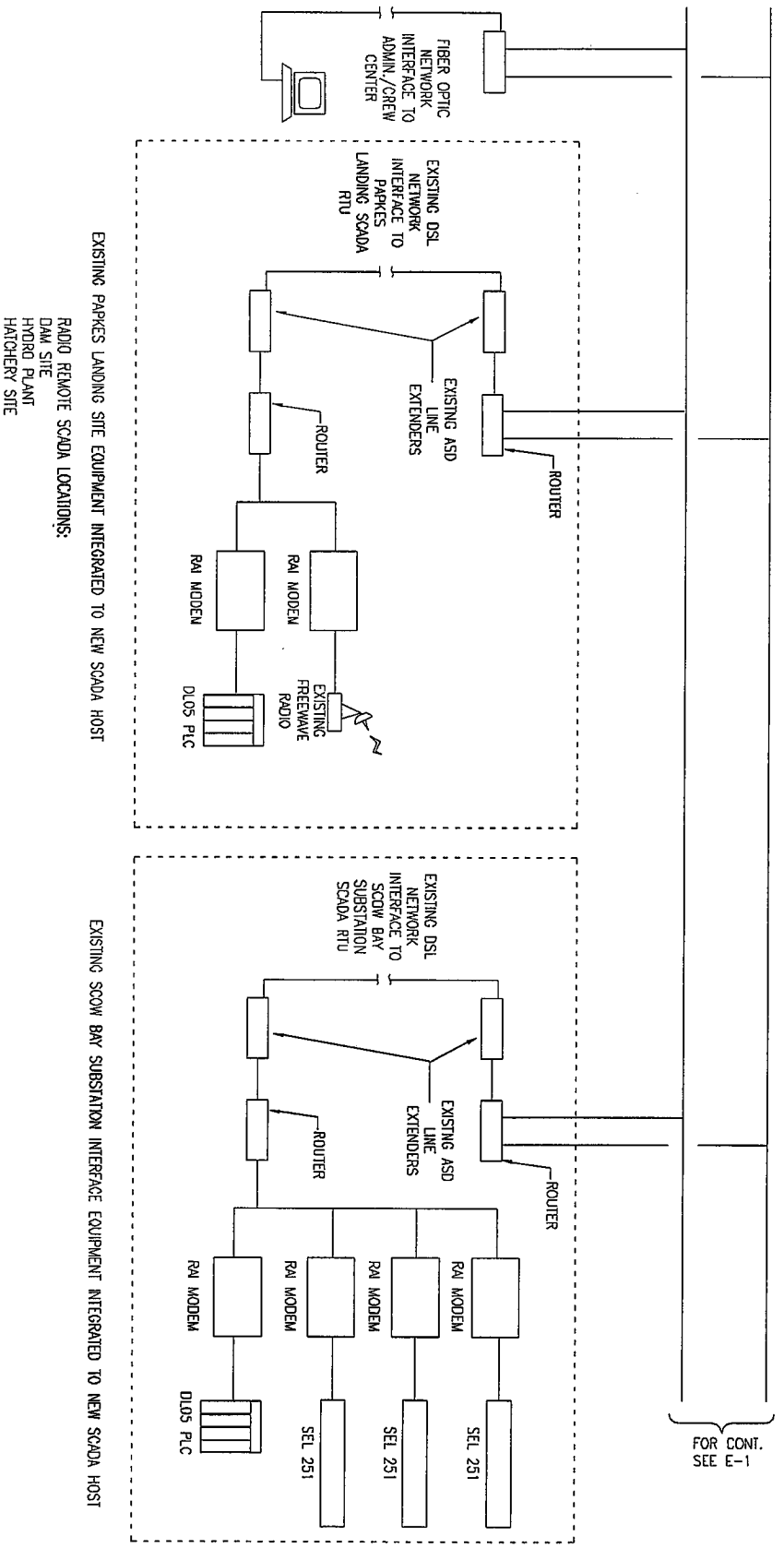
ENGINEERS

JOB TITLE: PETERSBURG POWER PLANT RELOCATION STUDY
CITY OF PETERSBURG
PETERSBURG, ALASKA

JOB NUMBER: 03403
CADFILE: 03403 E-1

DATE: February 17, 2004
DRAWN: BCS/TDD
CHECKED: DLB

SHEET E1

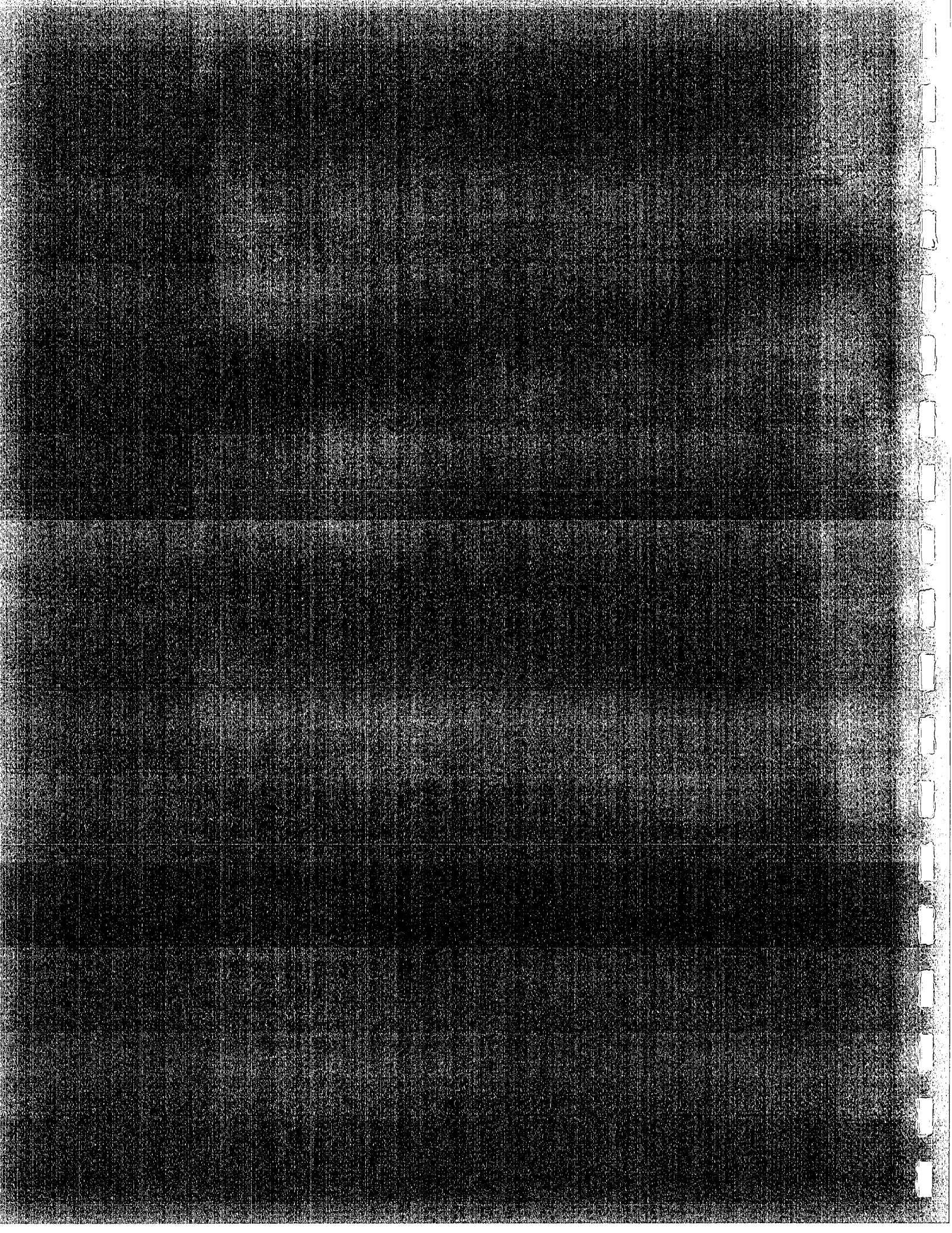


SHEET	JOB TITLE	PETERSBURG POWER PLANT RELOCATION STUDY CITY OF PETERSBURG PETERSBURG, ALASKA		
E2	JOB NUMBER	03403	DATE	February 17, 2004
	CADFILE	03403 E-2	DRAWN	BCS/TDD
			CHECKED	DLB

AMC ENGINEERS
Adams, Morgenthaler and Co., Inc.
701 East Tudor Road, Suite 250
Anchorage, Alaska 99503
fax 907-257-9191
phone 907-257-9100
www.amc-engineers.com

PETERSBURG POWER PLANT RELOCATION
MASTER PLAN AND PROGRAM

CHAPTER TWELVE
CONCLUSIONS AND RECOMMENDATIONS



PETERSBURG POWER PLANT RELOCATION
MASTER PLAN AND PROGRAM

MASTER PLAN

We recommend Master plan Scheme One as it offers somewhat more flexibility of the upper site while retaining the ability to maintain vehicle circulation completely around the power plant building. We further recommend that space be allowed for at the upper site for a station transformer to be located near the gen sets.

POWER PLANT

We recommend additional geotechnical study of this site to assure the competance of the pad. This study should be conducted before or during the early stages of the schematic design phase. Additional surveying may also be required.

ADMINISTRATION/CREW CENTER

The current property is somewhat small to accomodate the required building footprint as well as Crew vehicle access and parking on the Mitkof Highway side and sufficient parking for the Administration Center. To achieve adequate parking and vehicle circulation for the Administration/Crew Center we recommend that sufficient space for double loaded parking be provided on that side of the building. A depth of 74' feet would be sufficient. This would require that additional property be purchased on the uphill end of the site. An additional 30'-0" in depth by approxomately 105' in width should be sufficient. This would give a 5' sidewalk in front of the Aministration side of the building plus a 20' deep parking plus 26' for double lane access plus 20'deep parking plus a 3' sidewalk. We further recommend additional geotechnical study of this site to assure the competence of the pad. This study should be conducted before or during the early stages of the schematic design phase. Additional surveying may also be required.

SCADA SYSTEM

The existing SCADA system is a limited implementation of Wonderware. This existing system will need to be maintained and operational until the proposed power plant and it's new control and monitoring system and SCADA host are constructed, commissioned and operational. At the time the proposed power plant commissioning is completed, the existing and new SCADA components will be integrated with the power plant controls into one system.

AMC recommends that the proposed power plant monitoring and control system and the SCADA system be based on an open architecture structure. An open architecture design provides a modular system, which will allow for addition of new devices, or later replacement of equipment, without binding the system to a single manufacturer. The proposed, integrated power plant control system and SCADA system would use an upgraded version of Wonderware. Supplemental software modules provided by Wonderware would be used as the basis to provide the required functionality. The major areas the SCADA system would cover include: Power Plant monitoring and control, hydro plant operation monitoring and control, distribution monitoring and switching, protective relay monitoring, report generation and maintenance support.
Incorporation of new power plant system and tie-in components, as well as an action matrix is recommended before procurement of equipment and software. As-built of the existing SCADA system, equipment and instrumentation for development of a system wide Process and Instrument Diagram is recommend for interfacing the new SCADA elements. This information will be required for developing a fully integrated power plant control and SCADA system for PMP&L.

DISTRIBUTION SYSTEM

Relocation of the power plant from downtown adjacent to the Scow Bay substation will require changes to the existing power distribution system. PMP&L's existing distribution system is not adequate for the relocation of the City's power plant. The City's goal is to have all generation and support equipment and services removed from their present site.

The City has to complete modification of the existing distribution system from 2400V to 24.9 kV before the removal of PMP&L substation can be accomplished. Distribution of 24.9kV to PMP&L's customers from the Four Dam Pool Power Agency substation will require work at the Agency's substation and the distribution system.

It is recommended that power distribution from the Scow Bay substation be provided along the new Scow Bay single lane water line road to Sandy Beach Road and then tie into the existing 24.9 kV circuit to complete a power distribution loop serving the majority of PMP&L's customers. This loop will allow for increased capacity, reliability, and the potential for future power service area. This routing recommendation allows for phased construction and removal of the City's substation. The distribution line work is not a direct part of the power plant replacement, but is a critical element in the reuse of the existing power plant land area. Preparation of a detailed study with phasing plan and cost estimate for work on the City's power distribution is recommended.

POWER GENERATION

With peak power demand falling between 8 and 9 MW in the last two years, PMP&L should plan to install 9 MW of new power generation capacity, with another 3 MW of capacity of new or used generation equipment to allow loss of the largest gen set unit, for an ultimate capacity of at least 12 MW. New gen sets of 3 MW nominal capacity each were selected as a size that meets spatial restrictions, provides adequate flexibility to adapt to load swings, and, at medium speed, meet maintenance and life expectations. With the Crystal Lake hydro facility providing 1,100 – 1,800 kW of base load power, daily load curves of Petersburg's power demand need to be developed, so that low load data information can be included in the final gen set request for quotation. This information will be necessary for the potential suppliers to determine if their offered engines can meet the flexibility and transition requirements of load swings and operational characteristics of Petersburg, within their turndown recommendations, or if a smaller unit would be necessary. This information will be a factor in suppliers establishing warranty data and maintenance schedules.

The ability to automatically provide power to the station upon loss of service to the builidng will require a relatively small gen set with automatic transfer switch. There are two options to consider for providing building blackstart. If a pure station-service-only gen set is desired to automatically start upon power loss, to provide lighting and other essential services, such as air compressor power for the primary gen sets start system, UPS backup and turbo soak-back pump, and not to provide load transition capability, a 50 kW to 100 kW unit is likely sufficient. Alternately, a larger unit could be provided to supply station blackstart service, *and* to provide primary gen set load transition capability. A gen set serving this purpose might be 300 kW to 1000 kW, depending upon the choice of the primary units. It is not recommended that one of the primary gen sets be set up to automatically blackstart upon loss of station power. It is recommended that primary units are a manned start. The need for a combination blackstart *and* load transition unit will be driven by the choice of the primary gen sets, the low demand load data, and the manner in which the Crystal Lake hydro generation is utilized. These decisions are final design issues.

PMP&L must maintain generation capacity at the existing facility during construction of the new facility. This effectively eliminates the opportunity to use any of the existing plant equipment until the new facility is capable of providing peak demand. At that time, two of the three existing EMD units – at 2,500 kW capacity each – could be moved to the new plant. These units represent 5 MW of economical capacity, costing only the amount to move them over, install them, and to make some tuning and equipment modifications to meet expected more stringent emissions standards. New generation equipment capacity can be expected to cost approximately $500,000/MW, uninstalled. If the two EMD units were used, ultimate generation capacity would be 14 MW and would provide Petersburg growth capacity well into the future. Alternately, a fourth new 3 MW unit could be procured (at a cost of approx. $1.5 million), and all of the existing gen sets could be sold when the new plant is operational.

Three suitable potential suppliers were identified as capable of providing the desired new gen set equipment – Caterpillar, EMD, and Wartsila. Each have a solid history of installed capacity in engines of this size. Both CAT and Wartsila offer 4-stroke engines, while EMD offers a 2-stroke. In general, 4-stroke engines are more fuel efficient with better emissions characteristics, while 2-stroke engines provide a smaller footprint per kW delivered. The offered Warsila engine has the largest footprint, consistent with a lower speed of 720 rpm (CAT & EMD at 900 rpm), although it can be expected to wear more slowly.

Preliminary discussions indicate that enhanced pollution emissions, such as SCR, likely will not be required for Petersburg's standby power generation. Expected, however, are equipment modifications and tuning on the existing EMD units if they are to be used, to meet emissions criteria. Baseline emissions testing may be advised to determine if changes are even necessary.

Due to the lead time of gen set supply, estimated at 6-9 months, specification and procurement of the gen sets should take place as early in the design phase as possible. Petersburg, or their A/E representative, should undertake the RFQ issue, evaluation, recommendation, and procurement task, estimated to consume 2-3 months. Ultimately, from initiation to delivery, approximately one year may be required.

In preparation for the next phase of project activities, it is recommended that Petersburg undertake the following tasks:

1. Indicate desire, or not, to use the existing EMD units in the new power generation plant. This drives potential activities in emissions testing, specification and procurement, and spatial planning. Undertake baseline emissions testing if reuse of the EMD units is desired.

2. Affirm, or redirect planning around 3 MW nominal size units.

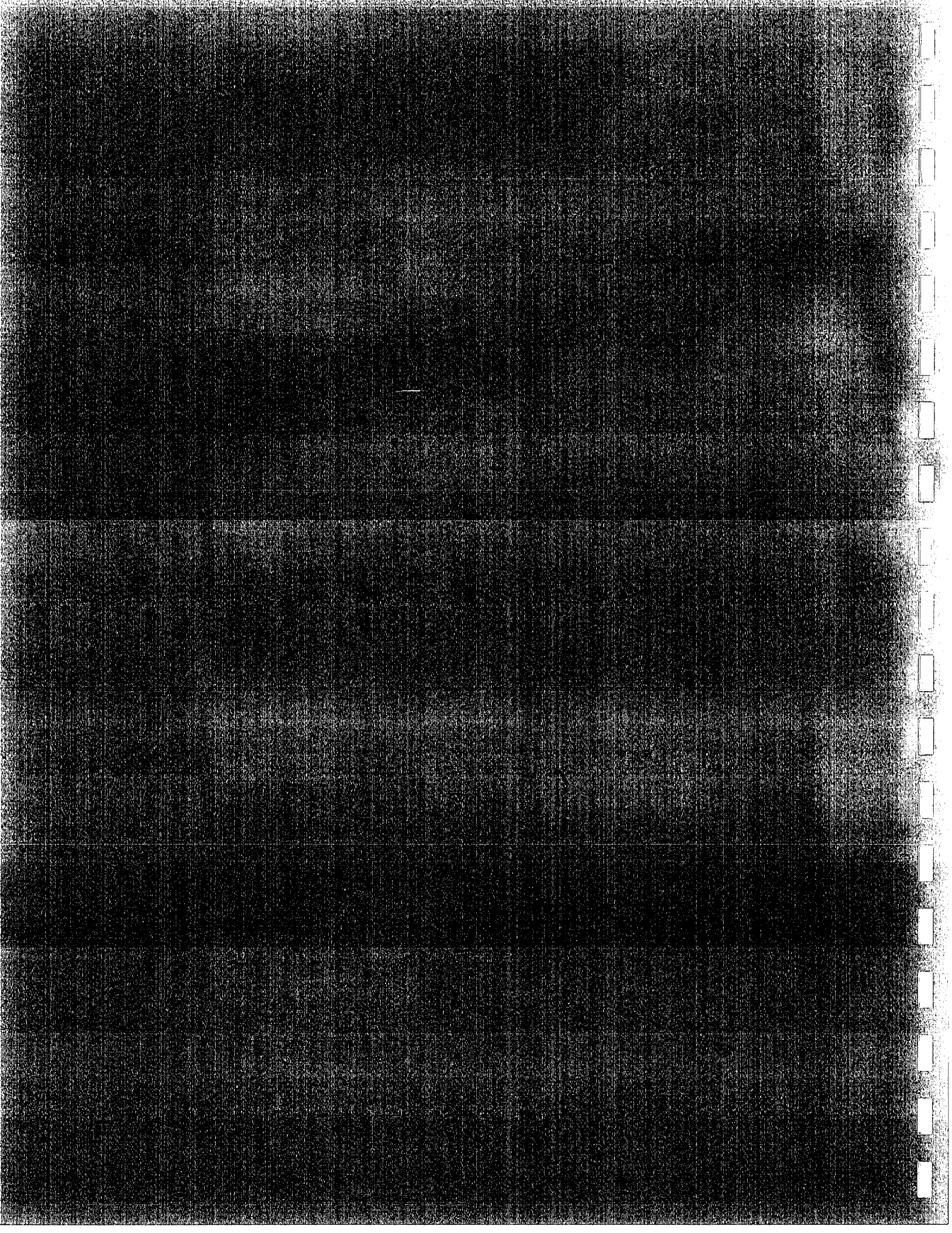
3. Record daily load swing data with the intent of establishing, in particular, low demand load data.

4. Provide historical data on contribution of power supply from Crystal Lake, the characteristics of that supply, and whether Petersburg wishes to continue that mode of operation or if change is a possibility based on a new power plant.

5. Initiate final planning and design activities as soon as possible, taking into account a potential one-year period to specify, procure, and deliver new gen sets.

PETERSBURG POWER PLANT RELOCATION
MASTER PLAN AND PROGRAM

APPENDIX



HMS #04002

CONSTRUCTION COST ESTIMATE
PRELIMINARY PROJECT BUDGET
POWER PLANT RELOCATION
PETERSBURG, ALASKA

COST CONSULTANT

HMS Inc.
4103 Minnesota Drive
Anchorage, Alaska 99503

(907) 561-1653
(907) 562-0420 FAX

ARCHITECTS

Minch Ritter Voelckers Architects
800 Glacier Avenue, Suite A
Juneau, Alaska 99801

February 12, 2004

NOTES REGARDING THE PREPARATION OF THIS ESTIMATE

This estimate was based on quantities taken, where possible, from early first draft design documents, dated December 15, 2003 and incorporates estimates for controls from AMC Engineers.

All costs are based on current market prices for materials, including transportation and the current labor rates for government contracts in Alaska, as issued by the Department of Labor, "Laborers and Mechanics Minimum Rates of Pay, Title 36, Public Contracts."

In addition to the basic building costs for work items, costs are applied for general requirements and profit. This element included all site operating costs, mobilization and demobilization, together with the general contractor's head office overhead expense, taxes, insurances and bonds, and a profit mark-up.

For estimating purposes, it is assumed that Part 1 (New Powerhouse) of this project will bid in Spring 2005, start July 2005, and be completed within (18) months commencement of work on site. This project will be phased and Part 2 (Demolition of the Existing) will commence January 2007 and be complete in (11) months. Also, the facility will be completely available to the contractor during construction.

When included in HMS Inc.'s scope of services, opinions or estimates of probable construction costs are prepared on the basis of HMS Inc.'s experience and qualifications and represent HMS Inc.'s judgment as a professional generally familiar with the industry. However, since HMS Inc. has no control over the cost of labor, materials, equipment or services furnished by others, over contractor's methods of determining prices, or over competitive bidding or market conditions, HMS Inc. cannot and does not guarantee that proposals, bids, or actual construction cost will not vary from HMS Inc.'s opinions or estimates of probable construction cost.

This estimate assumes normal escalation based on the current economic climate in Alaska. No consideration has been given to the probable impact on construction costs resulting from future increased activity brought about by a new TransAlaska gas line or additional major government spending. These events, together with opening ANWR, will have a major local inflationary effect, the cost of which is not possible for us to estimate at this early stage.

This estimate excludes architectural/engineering and bid preparation fees, administrative costs, costs for loose furniture and furnishings, etc., and power distribution system.

GENERAL SUMMARY

PART 1 - NEW CONSTRUCTION	$ 16,831,516
PART 2 - DEMOLITION WORK	1,711,939
TOTAL ESTIMATED CONSTRUCTION COST:	**$ 18,543,455**

PART 1
NEW CONSTRUCTION

PART 1 NEW CONSTRUCTION
SUMMARY

SITE WORK	$ 445,901
ADMINISTRATION/CREW CENTER	1,698,847
POWER PLANT	9,098,036
SUBTOTAL:	$ 11,242,784
GENERAL CONDITIONS	3,256,769
SUBTOTAL:	$ 14,499,553
CONTINGENCIES	2,331,963
TOTAL ESTIMATED CONSTRUCTION COST:	**$ 16,831,516**

SITE WORK SUMMARY

011 - SITE PREPARATION	$ 39,698
012 - SITE IMPROVEMENTS	49,326
013 - SITE BUILDING	61,431
014 - CIVIL AND MECHANICAL UTILITIES	185,329
015 - SITE ELECTRICAL	110,117
TOTAL SITE WORK:	**$ 445,901**

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION **SITE WORK** **011 - Site Preparation**	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			$	$	$	$	$	$
PREPARATION								
NOTE: Site cleared and filled by others.								
Grading site	9,500	SY	0.10	950	1.00	9,500	1.10	10,450
RETAINING WALL (110 LF)								
Excavate and backfilling	110	CY	3.90	429	6.50	715	10.40	1,144
Concrete footing	11	CY	185.00	2,035	55.00	605	240.00	2,640
Concrete wall	32	CY	185.00	5,920	75.00	2,400	260.00	8,320
Formwork to footing	244	LF	1.25	305	4.00	976	5.25	1,281
Formwork to wall	1,650	SF	1.35	2,228	4.90	8,085	6.25	10,313
Reinforcing steel	3,900	LBS	0.50	1,950	0.50	1,950	1.00	3,900
Foundation drain	120	LF	6.75	810	7.00	840	13.75	1,650
TOTAL ESTIMATED COST:				**$ 14,627**		**$ 25,071**		**$ 39,698**

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION **SITE WORK** **012 - Site Improvements**	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
PAVING								
Concrete ramp	400	SF	3.10	1,240	3.20	1,280	6.30	2,520
Rail	60	LF	15.50	930	12.10	726	27.60	1,656
Concrete stoop and pads	5	EA	75.00	375	100.00	500	175.00	875
FENCE								
Chainlink fence perimeter	990	LF	12.75	12,623	14.80	14,652	27.55	27,275
Truck gate	1	EA	666.00	666	1100.00	1,100	1766.00	1,766
Fence storage area	235	LF	12.75	2,996	14.80	3,478	27.55	6,474
Gate	1	EA	660.00	660	1100.00	1,100	1760.00	1,760
Bollards	20	EA	185.00	3,700	165.00	3,300	350.00	7,000
Pole storage (no structure, no racks, no fence)	--							
TOTAL ESTIMATED COST:				**$ 23,190**		**$ 26,136**		**$ 49,326**

PART 1 - NEW CONSTRUCTION **SITE WORK** **013 - Site Building**	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
FUEL STORAGE								
Substructure								
Concrete roof and foundation, slab on grade with thickened edge	8	CY	185.00	1,480	55.00	440	240.00	1,920
Formwork to edge	64	LF	1.25	80	4.00	256	5.25	336
Reinforcing steel	600	LBS	0.50	300	0.50	300	1.00	600
Finish to concrete	240	SF	0.15	36	1.10	264	1.25	300
Pole foundations	4	EA	180.00	720	125.00	500	305.00	1,220
Cover								
Steel pipe columns	4	EA	275.00	1,100	100.00	400	375.00	1,500
Wood framed structure	560	BF	0.55	308	1.40	784	1.95	1,092
Metal roof covering	260	SF	3.90	1,014	2.80	728	6.70	1,742
Bird screens	2	EA	650.00	1,300	195.00	390	845.00	1,690

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION **SITE WORK** **013 - Site Building**	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
COVERED STORAGE, BH, AND CHIPPER, 90'0"x20'0"								
Substructure								
Concrete roof and foundation, slab on grade with thickened edge	48	CY	185.00	8,880	55.00	2,640	240.00	11,520
Formwork to edges	220	LF	1.25	275	4.00	880	5.25	1,155
Reinforcing steel	4,700	LBS	0.50	2,350	0.50	2,350	1.00	4,700
Finish to concrete	1,800	SF	0.15	270	1.10	1,980	1.25	2,250
Pole footings	21	EA	180.00	3,780	125.00	2,625	305.00	6,405
Cover								
Steel pipe column	21	EA	275.00	5,775	100.00	2,100	375.00	7,875
Wood framed structure	2,720	BF	0.55	1,496	1.40	3,808	1.95	5,304
Metal roof covering	1,260	SF	3.90	4,914	2.80	3,528	6.70	8,442
Bird screens	4	EA	650.00	2,600	195.00	780	845.00	3,380
TOTAL ESTIMATED COST:				**$ 36,678**		**$ 24,753**		**$ 61,431**

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION **SITE WORK** **014 - Civil and Mechanical Utilities**	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			$	$	$	$	$	$
WATER MAIN								
Connections to existing main	1	EA	495.00	495	430.00	430	925.00	925
6" diameter DIP pipe	810	LF	12.35	10,004	13.00	10,530	25.35	20,534
Elbow	8	EA	175.00	1,400	130.00	1,040	305.00	2,440
Tee	3	EA	232.75	698	212.50	638	445.25	1,336
6" valve	3	EA	585.00	1,755	295.00	885	880.00	2,640
Hydrant	2	EA	990.00	1,980	550.00	1,100	1540.00	3,080
Trench and backfilling	2,595	CY	4.10	10,640	7.50	19,463	11.60	30,103
SANITARY SEWER								
Connection to existing main and manhole	1	EA	1990.00	1,990	1775.00	1,775	3765.00	3,765
6" diameter PVC	700	LF	3.90	2,730	3.65	2,555	7.55	5,285
6" yard cleanout	2	EA	240.00	480	95.00	190	335.00	670
Manhole	3	EA	1695.00	5,085	1330.00	3,990	3025.00	9,075
Trench and backfilling	2,285	CY	4.10	9,369	7.50	17,138	11.60	26,507

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION SITE WORK 014 - Civil and Mechanical Utilities	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
STORM DRAIN								
18" CMP pipe	400	LF	15.10	6,040	9.50	3,800	24.60	9,840
Modify existing catch basin and connections	2	EA	75.00	150	250.00	500	325.00	650
Outfall	1	EA	220.00	220	175.00	175	395.00	395
Trench and backfilling	300	CY	4.10	1,230	7.50	2,250	11.60	3,480
FUEL OIL								
Above ground fuel oil tank with integral dike, 15,000 gallons	1	EA	24650.00	24,650	3675.00	3,675	28325.00	28,325
Ditto, 1,100 gallons	1	EA	4475.00	4,475	510.00	510	4985.00	4,985
Treated wood base	6,915	BF	0.95	6,569	1.35	9,335	2.30	15,904
Piping	2	LOTS	750.00	1,500	650.00	1,300	1400.00	2,800
Leak detection system	2	EA	2995.00	5,990	1550.00	3,100	4545.00	9,090
Bollards	10	EA	185.00	1,850	165.00	1,650	350.00	3,500
TOTAL ESTIMATED COST:				**$ 99,300**		**$ 86,029**		**$ 185,329**

PART 1 - NEW CONSTRUCTION **SITE WORK** **015 - Site Electrical**	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			$	$	$	$	$	$
POWER TO ADMINISTRATION BUILDING								
4" conduit	420	LF	21.00	8,820	9.90	4,158	30.90	12,978
Conductors	2,000	LF	2.95	5,900	2.65	5,300	5.60	11,200
Trench	95	CY	2.50	238	5.20	494	7.70	732
Marker tape	420	LF	0.26	109	0.48	202	0.74	311
AREA LIGHTING								
Concrete base, 30'0" pole and fixture	10	EA	2135.00	21,350	1020.00	10,200	3155.00	31,550
Light fixtures attached to storage facilities and radiator area	25	EA	395.00	9,875	140.00	3,500	535.00	13,375
Conduit, wire and trench	1,500	LF	5.45	8,175	3.55	5,325	9.00	13,500
COMMUNICATION								
Conduit and trench	700	LF	5.05	3,535	7.60	5,320	12.65	8,855
MISCELLANEOUS								
Premium time	110	HRS			52.50	5,775	52.50	5,775
SUBTOTAL:				58,002		40,274		98,276

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION **SITE WORK** **015 - Site Electrical**	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
Subcontractor's Overhead and Profit on Materials	10.00%			5,800				5,800
Subcontractor's Overhead and Profit on Materials	15.00%					6,041		6,041
TOTAL ESTIMATED COST:				**$ 63,802**		**$ 46,315**		**$ 110,117**

ADMINISTRATION/CREW CENTER SUMMARY

01 - SITE WORK	$ 0
02 - SUBSTRUCTURE	120,875
03 - SUPER STRUCTURE	233,728
04 - EXTERIOR CLOSURE	239,845
05 - ROOF SYSTEMS	112,136
06 - INTERIOR CONSTRUCTION	257,335
07 - CONVEYING SYSTEMS	75,000
08 - MECHANICAL	458,319
09 - ELECTRICAL	177,921
10 - EQUIPMENT	23,688
11 - SPECIAL CONSTRUCTION	0
TOTAL ADMINISTRATION/CREW CENTER:	**$ 1,698,847**

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION ADMINISTRATION/CREW CENTER 02 - Substructure	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
Excavate/backfilling	170	CY	3.90	663	6.50	1,105	10.40	1,768
Concrete 4,000 PSI footings	36	CY	185.00	6,660	55.00	1,980	240.00	8,640
Concrete stem/retaining walls and columns	44	CY	185.00	8,140	75.00	3,300	260.00	11,440
Reinforcing steel	6,550	LBS	0.50	3,275	0.50	3,275	1.00	6,550
Formwork to footings	670	LF	1.25	838	4.00	2,680	5.25	3,518
Ditto walls	2,980	SF	1.35	4,023	4.90	14,602	6.25	18,625
Ditto columns	260	SF	2.00	520	8.00	2,080	10.00	2,600
Insulation and dampproofing	1,490	SF	1.80	2,682	1.25	1,863	3.05	4,545
6" filling	111	CY	8.50	944	4.90	544	13.40	1,488
Concrete slab on grade	117	CY	185.00	21,645	60.00	7,020	245.00	28,665
Reinforcing steel	15,760	LBS	0.50	7,880	0.50	7,880	1.00	15,760
Finish	6,000	SF	0.15	900	1.10	6,600	1.25	7,500
Expansion joint	320	LF	2.00	640	2.65	848	4.65	1,488
Elevator pit	1	EA	2000.00	2,000	1750.00	1,750	3750.00	3,750
Foundation drain	330	LF	6.75	2,228	7.00	2,310	13.75	4,538
TOTAL ESTIMATED COST:				**$ 63,038**		**$ 57,837**		**$ 120,875**

POWER PLANT RELOCATION
PETERSBURG, ALASKA
PRELIMINARY PROJECT BUDGET CONSTRUCTION COST ESTIMATE

DATE: 2/13/04

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION ADMINISTRATION/CREW CENTER 03 - Superstructure	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
Columns	13,000	LBS	1.17	15,210	1.05	13,650	2.22	28,860
Floor structure	48,000	LBS	0.70	33,600	0.65	31,200	1.35	64,800
Metal deck and topping	4,000	SF	4.25	17,000	4.10	16,400	8.35	33,400
Roof structure	50,000	LBS	0.70	35,000	0.65	32,500	1.35	67,500
Sheathing	6,834	SF	1.00	6,834	1.00	6,834	2.00	13,668
Stair	3	FLTS	5000.00	15,000	3500.00	10,500	8500.00	25,500
TOTAL ESTIMATED COST:				**$ 122,644**		**$ 111,084**		**$ 233,728**

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION ADMINISTRATION/CREW CENTER 04 - Exterior Closure	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
Metal siding with plywood sheathing and tyvek	7,440	SF	8.85	65,844	4.25	31,620	13.10	97,464
Studs and framing	17,000	BF	0.55	9,350	1.40	23,800	1.95	33,150
Insulation and vapor barrier	7,440	SF	1.00	7,440	0.50	3,720	1.50	11,160
Gypboard	6,000	SF	0.54	3,240	1.35	8,100	1.89	11,340
Roof soffit, framing and soffit board	440	SF	6.90	3,036	6.25	2,750	13.15	5,786
Exterior doors, frames and hardware	5	EA	1000.00	5,000	650.00	3,250	1650.00	8,250
Overhead doors and gear	4	EA	2950.00	11,800	1900.00	7,600	4850.00	19,400
Windows	1,120	SF	38.00	42,560	8.00	8,960	46.00	51,520
Louvers	1	LOT	1500.00	1,500	275.00	275	1775.00	1,775
TOTAL ESTIMATED COST:				**$ 149,770**		**$ 90,075**		**$ 239,845**

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION ADMINISTRATION/CREW CENTER 05 - Roof Systems	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
Metal roof and under felt	6,834	SF	5.90	40,321	4.50	30,753	10.40	71,074
Flashings and ridge	440	LF	3.10	1,364	2.95	1,298	6.05	2,662
Insulation and vapor barrier	6,000	SF	1.15	6,900	0.65	3,900	1.80	10,800
Framing and gypboard	6,000	SF	1.30	7,800	3.30	19,800	4.60	27,600
TOTAL ESTIMATED COST:				**$ 56,385**		**$ 55,751**		**$ 112,136**

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION ADMINISTRATION/CREW CENTER 06 - Interior Construction	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
Partition with studs, gypboard and sound insulation	11,000	SF	2.10	23,100	4.70	51,700	6.80	74,800
Doors, frames and hardware	32	EA	800.00	25,600	500.00	16,000	1300.00	41,600
Relights	100	SF	22.00	2,200	6.75	675	28.75	2,875
Floor finish	10,000	SF	3.00	30,000	1.00	10,000	4.00	40,000
Base	2,600	LF	1.00	2,600	1.10	2,860	2.10	5,460
Wall finish	26,000	SF	0.25	6,500	1.00	26,000	1.25	32,500
Wainscot	2,400	SF	3.75	9,000	1.50	3,600	5.25	12,600
Ceiling finish	10,000	SF	1.65	16,500	1.75	17,500	3.40	34,000
Miscellaneous painting	1	LOT	1000.00	1,000	5000.00	5,000	6000.00	6,000
Specialties	1	LOT	5000.00	5,000	2500.00	2,500	7500.00	7,500
TOTAL ESTIMATED COST:				**$ 121,500**		**$ 135,835**		**$ 257,335**

POWER PLANT RELOCATION
PETERSBURG, ALASKA
PRELIMINARY PROJECT BUDGET CONSTRUCTION COST ESTIMATE

DATE: 2/13/04

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION ADMINISTRATION/CREW CENTER 07 - Conveying Systems	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
Two-stop hydraulic elevator	1	EA	75000.00	75,000			75000.00	75,000
TOTAL ESTIMATED COST:				**$ 75,000**				**$ 75,000**

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION ADMINISTRATION/CREW CENTER 08 - Mechanical	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
PLUMBING								
Fixtures	20	EA	535.00	10,700	265.00	5,300	800.00	16,000
Waste and vent piping	700	LF	9.50	6,650	14.70	10,290	24.20	16,940
Trench	190	LF	1.90	361	2.90	551	4.80	912
Hot and cold piping including insulation	650	LF	12.15	7,898	14.30	9,295	26.45	17,193
Equipment (water heater, pumps, etc.)	1	LOT	12000.00	12,000	2000.00	2,000	14000.00	14,000
Oil/water separator	1	EA	21500.00	21,500	4000.00	4,000	25500.00	25,500
Drains including piping	6	EA	355.00	2,130	320.00	1,920	675.00	4,050
Hose bibs including piping	3	EA	400.00	1,200	465.00	1,395	865.00	2,595
Sump pump	1	EA	1650.00	1,650	420.00	420	2070.00	2,070
Trench drains (4 each)	60	LF	65.00	3,900	52.50	3,150	117.50	7,050
HEATING								
Boiler package and flue	2	EA	6150.00	12,300	660.00	1,320	6810.00	13,620
Expansion tank	1	EA	750.00	750	200.00	200	950.00	950
Make-up systems	1	LOT	1000.00	1,000	500.00	500	1500.00	1,500

PART 1 - NEW CONSTRUCTION ADMINISTRATION/CREW CENTER 08 - Mechanical	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
HEATING (Continued)								
Pumps	4	EA	900.00	3,600	270.00	1,080	1170.00	4,680
Hydronic piping	900	LF	12.15	10,935	14.30	12,870	26.45	23,805
Insulation	900	LF	4.50	4,050	6.60	5,940	11.10	9,990
Valves	1	LOT	2000.00	2,000	2000.00	2,000	4000.00	4,000
Baseboard	300	LF	62.50	18,750	37.00	11,100	99.50	29,850
Cabinet unit heaters	4	EA	670.00	2,680	265.00	1,060	935.00	3,740
Unit heaters	2	EA	440.00	880	290.00	580	730.00	1,460
VENTILATION								
Air handling unit	2	EA	10500.00	21,000	2500.00	5,000	13000.00	26,000
Exhaust fans	2	EA	700.00	1,400	210.00	420	910.00	1,820
Ducting	6,000	LBS	3.10	18,600	3.23	19,380	6.33	37,980
Outlet/dampers	80	EA	58.00	4,640	48.00	3,840	106.00	8,480
Insulation	450	SF	2.10	945	1.25	563	3.35	1,508
Terminal boxes	16	EA	585.00	9,360	185.00	2,960	770.00	12,320

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION ADMINISTRATION/CREW CENTER 08 - Mechanical	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
CONTROLS								
Electrical DDC controls	10,000	SF	2.75	27,500	2.40	24,000	5.15	51,500
Test and balance	40	HRS			125.00	5,000	125.00	5,000
SPECIAL SYSTEMS								
Fuel oil system	1	LOT	2000.00	2,000	1650.00	1,650	3650.00	3,650
FIRE PROTECTION								
Main connection including valves and control	1	EA	4750.00	4,750	1500.00	1,500	6250.00	6,250
Wet sprinkler system	10,000	SF	1.20	12,000	1.55	15,500	2.75	27,500
MISCELLANEOUS								
Premium time	500	HRS			53.00	26,500	53.00	26,500
SUBTOTAL:				227,129		181,284		408,413
Subcontractor's Overhead and Profit on Materials	10.00%			22,713				22,713
Subcontractor's Overhead and Profit on Labor	15.00%					27,193		27,193
TOTAL ESTIMATED COST:				**$ 249,842**		**$ 208,477**		**$ 458,319**

PART 1 - NEW CONSTRUCTION ADMINISTRATION/CREW CENTER 09 - Electrical	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
SERVICE AND DISTRIBUTION								
Main distribution panel, power and lighting panels, transformer, conduit and feeders	10,000	SF	1.25	12,500	0.75	7,500	2.00	20,000
LIGHTING AND POWER								
Lighting including connections	10,000	SF	2.60	26,000	2.00	20,000	4.60	46,000
Exterior lighting	6	EA	400.00	2,400	170.00	1,020	570.00	3,420
Emergency lights	8	EA	290.00	2,320	110.00	880	400.00	3,200
Exit signs	10	EA	190.00	1,900	110.00	1,100	300.00	3,000
Devices	10,000	SF	1.25	12,500	1.80	18,000	3.05	30,500
Connections and switching	26	EA	160.00	4,160	266.00	6,916	426.00	11,076
SPECIAL SYSTEMS								
Fire alarm/security	10,000	SF	0.55	5,500	0.70	7,000	1.25	12,500
Intercom/telephone/computer systems (complete)	10,000	SF	0.85	8,500	0.80	8,000	1.65	16,500
MISCELLANEOUS								
Premium time	225	HRS			52.50	11,813	52.50	11,813

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION ADMINISTRATION/CREW CENTER 09 - Electrical	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
SUBTOTAL:				75,780		82,229		158,009
Subcontractor's Overhead and Profit on Materials	10.00%			7,578				7,578
Subcontractor's Overhead and Profit on Labor	15.00%					12,334		12,334
TOTAL ESTIMATED COST:				**$ 83,358**		**$ 94,563**		**$ 177,921**

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION ADMINISTRATION/CREW CENTER 10 - Equipment	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
Casework (allowance)	1	LOT	10000.00	10,000	2000.00	2,000	12000.00	12,000
Window coverings	1,120	SF	6.90	7,728	2.25	2,520	9.15	10,248
Entry mats	100	SF	12.50	1,250	1.90	190	14.40	1,440
TOTAL ESTIMATED COST:				**$ 18,978**		**$ 4,710**		**$ 23,688**

POWER PLANT

POWER PLANT SUMMARY

01 - SITE WORK	$ 0
02 - SUBSTRUCTURE	218,071
03 - SUPER STRUCTURE	206,347
04 - EXTERIOR CLOSURE	289,588
05 - ROOF SYSTEMS	187,663
06 - INTERIOR CONSTRUCTION	120,848
07 - CONVEYING SYSTEMS	169,860
08 - MECHANICAL	341,876
09 - ELECTRICAL	7,425,909
10 - EQUIPMENT	4,685
11 - SPECIAL CONSTRUCTION	133,189
TOTAL POWER PLANT:	**$ 9,098,036**

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION POWER PLANT 02 - Substructure	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
Excavate/backfilling	270	CY	3.90	1,053	6.50	1,755	10.40	2,808
Concrete 4,000 PSI footings	63	CY	185.00	11,655	55.00	3,465	240.00	15,120
Concrete stem/retaining walls and columns	59	CY	185.00	10,915	75.00	4,425	260.00	15,340
Reinforcing steel	10,000	LBS	0.50	5,000	0.50	5,000	1.00	10,000
Formwork to footings	1,460	LF	1.25	1,825	4.00	5,840	5.25	7,665
Ditto walls	4,080	SF	1.35	5,508	4.90	19,992	6.25	25,500
Ditto columns	616	SF	2.00	1,232	8.00	4,928	10.00	6,160
Insulation and dampproofing	2,040	SF	1.80	3,672	1.25	2,550	3.05	6,222
Prepare area to receive concrete	1,036	SY	0.15	155	1.00	1,036	1.15	1,191
Concrete slab on grade	243	CY	185.00	44,955	60.00	14,580	245.00	59,535
Reinforcing steel	32,000	LBS	0.50	16,000	0.50	16,000	1.00	32,000
Finish	9,326	SF	0.15	1,399	1.10	10,259	1.25	11,658
Expansion joint	510	LF	2.00	1,020	2.65	1,352	4.65	2,372
Generator and transformer pads	6	EA	2000.00	12,000	1750.00	10,500	3750.00	22,500
TOTAL ESTIMATED COST:				**$ 116,389**		**$ 101,682**		**$ 218,071**

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION **POWER PLANT** **03 - Superstructure**	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE $	TOTAL $	RATE $	TOTAL $	UNIT RATE $	MATERIAL/LABOR $
Columns	20,000	LBS	1.17	23,400	1.05	21,000	2.22	44,400
Floor structure	12,000	LBS	0.70	8,400	0.65	7,800	1.35	16,200
Metal deck and topping	820	SF	4.25	3,485	4.10	3,362	8.35	6,847
Roof structure	84,000	LBS	0.70	58,800	0.65	54,600	1.35	113,400
Stair	3	FLTS	5000.00	15,000	3500.00	10,500	8500.00	25,500
TOTAL ESTIMATED COST:				**$ 109,085**		**$ 97,262**		**$ 206,347**

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION POWER PLANT 04 - Exterior Closure	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
Metal insulated panels	11,735	SF	12.00	140,820	5.50	64,543	17.50	205,363
Metal girts and clips	26,500	LBS	1.00	26,500	1.00	26,500	2.00	53,000
Exterior doors, frames and hardware	5	EA	1000.00	5,000	650.00	3,250	1650.00	8,250
Windows	200	SF	38.00	7,600	8.00	1,600	46.00	9,200
Louvers	1	LOT	1500.00	1,500	275.00	275	1775.00	1,775
Overhead doors and gear	2	EA	3300.00	6,600	2700.00	5,400	6000.00	12,000
TOTAL ESTIMATED COST:				**$ 188,020**		**$ 101,568**		**$ 289,588**

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION **POWER PLANT** **05 - Roof Systems**	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			$	$	$	$	$	$
Metal roof insulated panel	9,535	SF	12.65	120,618	6.60	62,931	19.25	183,549
Flashings and ridge	680	LF	3.10	2,108	2.95	2,006	6.05	4,114
TOTAL ESTIMATED COST:				**$ 122,726**		**$ 64,937**		**$ 187,663**

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION POWER PLANT 06 - Interior Construction	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
Partition with studs, gypboard and sound insulation	6,350	SF	2.10	13,335	4.70	29,845	6.80	43,180
Overhead door	1	EA	2950.00	2,950	2300.00	2,300	5250.00	5,250
Doors, frames and hardware	16	EA	800.00	12,800	500.00	8,000	1300.00	20,800
Relights	20	SF	22.00	440	6.75	135	28.75	575
Floor sealer	9,461	SF	0.15	1,419	0.65	6,150	0.80	7,569
Floor finish	685	SF	3.00	2,055	1.00	685	4.00	2,740
Base	1,180	LF	1.00	1,180	1.10	1,298	2.10	2,478
Wall paint	12,700	SF	0.11	1,397	0.70	8,890	0.81	10,287
Wainscot	240	SF	3.75	900	1.50	360	5.25	1,260
Ceiling finish	685	SF	1.65	1,130	1.75	1,199	3.40	2,329
Paint exposed ceiling	9,461	SF	0.15	1,419	1.00	9,461	1.15	10,880
Miscellaneous painting	1	LOT	1000.00	1,000	5000.00	5,000	6000.00	6,000
Specialties	1	LOT	5000.00	5,000	2500.00	2,500	7500.00	7,500
TOTAL ESTIMATED COST:				**$ 45,025**		**$ 75,823**		**$ 120,848**

POWER PLANT RELOCATION
PETERSBURG, ALASKA
PRELIMINARY PROJECT BUDGET CONSTRUCTION COST ESTIMATE

DATE: 2/13/04

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION POWER PLANT 07 - Conveying Systems	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
BRIDGE CRANE								
Support structure	50	TONS	1500.00	75,000	1300.00	65,000	2800.00	140,000
Crane, 3 ton	1	EA	11750.00	11,750	9715.00	9,715	21465.00	21,465
MONORAIL								
Support structure	110	LF	21.00	2,310	23.00	2,530	44.00	4,840
Crane, 1 ton	1	EA	2990.00	2,990	565.00	565	3555.00	3,555
TOTAL ESTIMATED COST:				**$ 92,050**		**$ 77,810**		**$ 169,860**

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION POWER PLANT 08 - Mechanical	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
PLUMBING								
Fixtures	6	EA	535.00	3,210	265.00	1,590	800.00	4,800
Waste and vent piping	300	LF	9.50	2,850	14.70	4,410	24.20	7,260
Trench	40	LF	1.90	76	2.90	116	4.80	192
Hot and cold piping including insulation	250	LF	12.15	3,038	14.30	3,575	26.45	6,613
Equipment (water heater, pumps, etc.)	1	LOT	8000.00	8,000	1750.00	1,750	9750.00	9,750
Oil/water separator	1	EA	26600.00	26,600	7000.00	7,000	33600.00	33,600
Drains including piping	6	EA	355.00	2,130	320.00	1,920	675.00	4,050
Hose bibs including piping	3	EA	400.00	1,200	465.00	1,395	865.00	2,595
HEATING								
Boiler package and flue	2	EA	6150.00	12,300	660.00	1,320	6810.00	13,620
Expansion tank	1	EA	750.00	750	200.00	200	950.00	950
Make-up systems	1	LOT	1000.00	1,000	500.00	500	1500.00	1,500
Pumps	4	EA	900.00	3,600	270.00	1,080	1170.00	4,680
Hydronic piping	800	LF	12.15	9,720	14.30	11,440	26.45	21,160

PART 1 - NEW CONSTRUCTION POWER PLANT 08 - Mechanical	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
HEATING (Continued)								
Insulation	800	LF	4.50	3,600	6.60	5,280	11.10	8,880
Valves	1	LOT	1750.00	1,750	1500.00	1,500	3250.00	3,250
Baseboard	30	LF	62.50	1,875	37.00	1,110	99.50	2,985
Cabinet unit heaters	4	EA	670.00	2,680	265.00	1,060	935.00	3,740
Unit heaters	12	EA	440.00	5,280	290.00	3,480	730.00	8,760
VENTILATION								
Air handling unit	1	EA	10500.00	10,500	2500.00	2,500	13000.00	13,000
Exhaust fan	2	EA	700.00	1,400	210.00	420	910.00	1,820
Ducting	2,500	LBS	3.10	7,750	3.23	8,075	6.33	15,825
Outlet/dampers	35	EA	58.00	2,030	48.00	1,680	106.00	3,710
Insulation	200	SF	2.10	420	1.25	250	3.35	670
CONTROLS								
Electrical DDC controls	10,150	SF	2.75	27,913	2.40	24,360	5.15	52,273
Test and balance	40	HRS			125.00	5,000	125.00	5,000

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION **POWER PLANT** **08 - Mechanical**	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
SPECIAL SYSTEMS								
Day tank	1	EA	4775.00	4,775	665.00	665	5440.00	5,440
Fuel oil piping	1	LOT	2000.00	2,000	1650.00	1,650	3650.00	3,650
Connection to equipment	8	EA	225.00	1,800	188.00	1,504	413.00	3,304
FIRE PROTECTION								
Main connection including valves and control	1	EA	4750.00	4,750	1500.00	1,500	6250.00	6,250
Sprinkler system (dry and preaction)	10,150	SF	1.45	14,718	1.80	18,270	3.25	32,988
MISCELLANEOUS								
Premium time	420	HRS			53.00	22,260	53.00	22,260
SUBTOTAL:				167,715		136,860		304,575
Subcontractor's Overhead and Profit on Materials	10.00%			16,772				16,772
Subcontractor's Overhead and Profit on Labor	15.00%					20,529		20,529
TOTAL ESTIMATED COST:				**$ 184,487**		**$ 157,389**		**$ 341,876**

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION POWER PLANT 09 - Electrical	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
SERVICE AND DISTRIBUTION								
Main distribution panel, power and lighting panels, transformer, conduit and feeders	10,150	SF	1.25	12,688	0.75	7,613	2.00	20,301
LIGHTING AND POWER								
Lighting including connections	10,150	SF	2.60	26,390	2.00	20,300	4.60	46,690
Exterior lighting	10	EA	400.00	4,000	170.00	1,700	570.00	5,700
Emergency lights	8	EA	290.00	2,320	110.00	880	400.00	3,200
Exit signs	10	EA	190.00	1,900	110.00	1,100	300.00	3,000
Devices	10,150	SF	1.25	12,688	1.80	18,270	3.05	30,958
Connections and switching	55	EA	160.00	8,800	266.00	14,630	426.00	23,430
SPECIAL SYSTEMS								
Fire alarm/security	10,150	SF	0.55	5,583	0.70	7,105	1.25	12,688
Intercom/telephone/computer systems	10,150	SF	0.85	8,628	0.80	8,120	1.65	16,748
Standby generator, 125 KW	1	EA	45000.00	45,000	7350.00	7,350	52350.00	52,350
Transfer switch	1	EA	6000.00	6,000	775.00	775	6775.00	6,775

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION **POWER PLANT** **09 - Electrical**	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE	TOTAL	RATE	TOTAL	UNIT RATE	MATERIAL/LABOR
			$	$	$	$	$	$
POWER GENERATORS								
New oil fired generator, 3 MW complete package with starter equipment, exhaust system and radiator	3	EA	1447791.00	4,343,373			1447791.00	4,343,373
(Caterpillar quote as requested) delivery charge	1	LOT	89225.00	89,225			89225.00	89,225
Relocate generators, 2.5 MW from existing power plant	2	EA						See Below
Start-up spare parts	1	LOT	42500.00	42,500			42500.00	42,500
Switchgear	1	LOT	472310.00	472,310			472310.00	472,310
Remote radiators	12	EA						Included
Relocate radiators	8	EA						See Below
Transformer, 4,160 volt to 25 KV	1	EA	155000.00	155,000	12900.00	12,900	167900.00	167,900
Labor Installing								
Generator equipment	1,380	HRS			55.00	75,900	55.00	75,900
Ditto switchgear	280	HRS			55.00	15,400	55.00	15,400
Ditto remote radiators	160	HRS			55.00	8,800	55.00	8,800

PART 1 - NEW CONSTRUCTION POWER PLANT 09 - Electrical	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
POWER GENERATORS (Continued)								
Labor Installing (Continued)								
Pick-up existing generators and install	1,200	HRS			55.00	66,000	55.00	66,000
Crane rental	1	EA	50000.00	50,000			50000.00	50,000
Truck rental	1	EA	3500.00	3,500			3500.00	3,500
Controls								
SCADA system complete (price by Engineer) (See Appendix)	1	LOT	173750.00	173,750	124000.00	124,000	297750.00	297,750
Integration to existing system (ditto)	1	LOT			40000.00	40,000	40000.00	40,000
Cable trays	240	LF	17.70	4,248	14.00	3,360	31.70	7,608
Conduit	1,200	LF	2.35	2,820	6.75	8,100	9.10	10,920
Cat 6 communication cable	6,000	LF	0.23	1,380	0.46	2,760	0.69	4,140
Control wire	7,000	LF	0.06	420	0.87	6,090	0.93	6,510
Training control systems	1	EA	2500.00	2,500	12500.00	12,500	15000.00	15,000
Commissioning and testing control systems	200	HRS			125.00	25,000	125.00	25,000

PART 1 - NEW CONSTRUCTION POWER PLANT 09 - Electrical	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
POWER GENERATORS (Continued)								
Distribution								
Grounding	300	LF	2.66	798	1.55	465	4.21	1,263
Connection to generator frame	5	EA	9.20	46	88.00	440	97.20	486
4" rigid steel conduit	3,600	LF	20.55	73,980	24.50	88,200	45.05	162,180
Elbows	160	EA	136.50	21,840	275.50	44,080	412.00	65,920
Heavy duty cable	14,500	LF	7.90	114,550	3.35	48,575	11.25	163,125
Ditto	4,000	LF	4.10	16,400	2.30	9,200	6.40	25,600
Connection to switchgear	5	EA	2985.50	14,928	497.50	2,488	3483.00	17,416
Exhaust								
Pipe flues	190	LF	38.95	7,401	33.00	6,270	71.95	13,671
Galvanized structural support	1,500	LBS	0.95	1,425	0.65	975	1.60	2,400
Intake								
Hood	5	EA	3950.00	19,750	1575.00	7,875	5525.00	27,625
Louvers and damper	5	EA	1750.00	8,750	1000.00	5,000	2750.00	13,750

PART 1 - NEW CONSTRUCTION POWER PLANT 09 - Electrical	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
POWER GENERATORS (Continued)								
Intake (Continued)								
Duct	3,000	LBS	3.10	9,300	3.23	9,690	6.33	18,990
Insulation	1,000	SF	2.10	2,100	1.25	1,250	3.35	3,350
Cooling Distribution								
Pumps	5	EA	975.00	4,875	225.00	1,125	1200.00	6,000
Ricwil pipe with flow and return piping	625	LF	100.00	62,500	35.00	21,875	135.00	84,375
Elbows	20	EA	75.50	1,510	85.00	1,700	160.50	3,210
Trench and backfilling	200	LF	1.95	390	3.25	650	5.20	1,040
Above ground pipe	750	LF	15.50	11,625	16.20	12,150	31.70	23,775
Insulation	750	LF	8.50	6,375	7.50	5,625	16.00	12,000
Fittings	100	EA	31.00	3,100	48.00	4,800	79.00	7,900
Valves	40	EA	375.00	15,000	245.00	9,800	620.00	24,800
TEST AND COMMISSION (GENERATORS)								
Testing/commissioning/training	240	HRS			95.00	22,800	95.00	22,800

PART 1 - NEW CONSTRUCTION POWER PLANT 09 - Electrical	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
MISCELLANEOUS								
Premium time	900	HRS			52.50	47,250	52.50	47,250
SUBTOTAL:				5,871,666		840,936		6,712,602
Subcontractor's Overhead and Profit on Materials	10.00%			587,167				587,167
Subcontractor's Overhead and Profit on Labor	15.00%					126,140		126,140
TOTAL ESTIMATED COST:				**$ 6,458,833**		**$ 967,076**		**$ 7,425,909**

POWER PLANT RELOCATION
PETERSBURG, ALASKA
PRELIMINARY PROJECT BUDGET CONSTRUCTION COST ESTIMATE

DATE: 2/13/04

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION **POWER PLANT** **10 - Equipment**	QUANTITY	UNIT	MATERIAL		LABOR		TOTAL	TOTAL
			RATE $	TOTAL $	RATE $	TOTAL $	UNIT RATE $	MATERIAL/LABOR $
Casework (allowance)	1	LOT	2300.00	2,300	750.00	750	3050.00	3,050
Window coverings	100	SF	6.90	690	2.25	225	9.15	915
Entry mats	50	SF	12.50	625	1.90	95	14.40	720
TOTAL ESTIMATED COST:				**$ 3,615**		**$ 1,070**		**$ 4,685**

PART 1 - NEW CONSTRUCTION POWER PLANT 11 - Special Construction	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
EXHAUST PAD								
Concrete pad	15	CY	185.00	2,775	55.00	825	240.00	3,600
Formwork to edge	70	LF	1.25	88	4.00	280	5.25	368
Reinforcing steel	1,300	LBS	0.50	650	0.50	650	1.00	1,300
Finish to concrete	250	SF	0.15	38	1.10	275	1.25	313
Structural supports	10,000	LBS	1.00	10,000	1.00	10,000	2.00	20,000
Concrete footings	11	EA	375.00	4,125	500.00	5,500	875.00	9,625
COOLING SHED, 120'0"x24'0"								
Substructure								
Concrete roof and foundation, slab on grade with thickened edge	77	CY	185.00	14,245	55.00	4,235	240.00	18,480
Formwork to edge	288	LF	1.25	360	4.00	1,152	5.25	1,512
Reinforcing steel	6,900	LBS	0.50	3,450	0.50	3,450	1.00	6,900
Finish to concrete	2,880	SF	0.15	432	1.10	3,168	1.25	3,600
Pole footings	22	EA	180.00	3,960	125.00	2,750	305.00	6,710

PART 1 - NEW CONSTRUCTION POWER PLANT 11 - Special Construction	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
COOLING SHED, 120'0"x24'0" (Continued)								
Cover								
Steel pipe column	22	EA	275.00	6,050	100.00	2,200	375.00	8,250
Wood framed structure	6,500	BF	0.55	3,575	1.40	9,100	1.95	12,675
Metal roof covering	3,000	SF	3.90	11,700	2.80	8,400	6.70	20,100
Bird screens	4	EA	650.00	2,600	195.00	780	845.00	3,380
VEHICLE CANOPY								
Gravel paving								Elsewhere
Concrete footing	8	EA	180.00	1,440	125.00	1,000	305.00	2,440
Steel pipe columns	8	EA	275.00	2,200	110.00	880	385.00	3,080
Wood framed structure	2,200	BF	0.55	1,210	1.40	3,080	1.95	4,290
Metal roof covering	980	SF	3.90	3,822	2.80	2,744	6.70	6,566
TOTAL ESTIMATED COST:				**$ 72,720**		**$ 60,469**		**$ 133,189**

GENERAL REQUIREMENTS
AND
CONTINGENCIES
(PART 1 - NEW CONSTRUCTION)
JULY 2005 - JANUARY 2007

PART 1 - NEW CONSTRUCTION General Conditions	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
Mobilization/demobilization	1	LS	2000.00	2,000	4000.00	4,000	6000.00	6,000
Certified payroll filing fee	1	LS	5000.00					
Freight and handling	1,000	TONS	45.00	45,000	30.00	30,000	75.00	75,000
Travel costs	210	RT	250.00	52,500			250.00	52,500
Project sign	1	EA	500.00	500	500.00	500	1000.00	1,000
Supervision/quality control	18	MOS			11500.00	207,000	11500.00	207,000
Field engineering	6	MOS			10000.00	60,000	10000.00	60,000
Expediting	18	MOS			5250.00	94,500	5250.00	94,500
Clerical	18	MOS			3500.00	63,000	3500.00	63,000
Temporary facilities	18	MOS	1200.00	21,600	300.00	5,400	1500.00	27,000
Scaffolding	13	MOS	1800.00	23,400			1800.00	23,400
Temporary utilities	18	MOS	750.00	13,500	100.00	1,800	850.00	15,300
Communications	18	MOS	350.00	6,300			350.00	6,300
Equipment, trucks, pick-ups, etc.	18	MOS	2000.00	36,000			2000.00	36,000
Crane	3	MOS	23000.00	69,000			23000.00	69,000

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION **General Conditions**	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
Tools	18	MOS	700.00	12,600			700.00	12,600
Consumables, fuel, etc.	18	MOS	600.00	10,800			600.00	10,800
Mechanic labor	500	HRS			48.00	24,000	48.00	24,000
Submittals/as-builts	1	LS	1500.00	1,500	7500.00	7,500	9000.00	9,000
Testing, special inspections	1	LS	25000.00	25,000			25000.00	25,000
Cleaning	18	MOS	150.00	2,700	750.00	13,500	900.00	16,200
Security	18	MOS	1000.00	18,000			1000.00	18,000
Permits	1	LS						By Owner
Final clean	1	LS	2000.00	2,000			2000.00	2,000
Per-diem (for rented house and meals)	3,850	MD	95.00	365,750			95.00	365,750
Premium time (general)	2,350	HRS			47.00	110,450	47.00	110,450
SUBTOTAL:				$ 708,150		$ 621,650		$ 1,329,800
Home office	4.00%							502,903
Profit	8.00%							1,046,039
Bond	1.06%							149,688

PART 1 - NEW CONSTRUCTION General Conditions	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
Insurance	1.60%							228,339

TOTAL ESTIMATED COST: **$ 3,256,769**

HMS Project No.: 04002

PART 1 - NEW CONSTRUCTION Contingencies	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
ESTIMATOR'S CONTINGENCY								
The estimator's allowance for architectural and engineering requirements that are not apparent at this early level of design documentation	10.00%							$ 1,449,955
ESCALATION CONTINGENCY								
The allowance for escalation from the date of estimate to July 2005 at the rate of 3.50% per annum	5.53%							$ 882,008

TOTAL ESTIMATED COST: **$ 2,331,963**

APPENDIX
SCADA ESTIMATE
BY AMC ENGINEERS

AMC Engineers

Value-Added Engineering Services

Adams, Morgenthaler and Company, Inc.

Input date: 11-Feb-04
Topic: SCADA Estimate
Project / Code: 3118/ARROCAM
Engineer: BCS

Estimated Budget for SCADA and Power Plant Control System Integration

PROPOSED POWER PLANT EQUIPMENT

ITEM #	DESCRIPTION	MANUFACTURER	MODEL #	QTY.	COST EA.	MAT. COST	INTEGRATION LABOR (HR)	TOTAL LABOR ($)	TOTAL COST ($)
1	PC, SCADA HOST	DELL	WORKSTATION 360	1	$2,800	$2,900	10	$1,000	$3,900
2	PC, SCADA SQL HISTORIAN	DELL	POWEREDGE 2600	1	$6,700	$6,700	10	$1,000	$7,700
3	PC, SCADA BACKUP INTERFACE	DELL	WORKSTATION 360	1	$2,900	$2,900	10	$1,000	$3,900
4	PC, SCADA REMOTE INTERFACE	DELL	LATITUDE D600	1	$2,600	$2,600	10	$1,000	$3,600
5	ALARM PRINTER	DELL	S2500	1	$900	$900	1	$100	$1,000
6	PC, SCADA CREW CENTER INTERFACE	DELL	WORKSTATION 360	1	$2,900	$2,900	10	$1,000	$3,900
7	PC, POWER PLANT INTERFACE	ALLEN BRADLEY	VERSAMAX 15"	1	$5,000	$5,000	30	$3,000	$8,000
8	SUPPORT EQUIPMENT CONTROLLER	ALLEN BRADLEY	CONTROL LOGIX	1	$35,000	$35,000	100	$10,000	$45,000
9	SUPPORT EQUIPMENT CONTROLLER PROGRAMMING	N/A	N/A	1	$0	$0	100	$10,000	$10,000
10	TCP/IP CONVERTER - MODBUS	GE	MULTINET FE	5	$700	$3,500	2	$1,000	$4,500
11	GENERATOR PROTECTIVE RELAY	GE	MULTILIN 489	5	$6,800	$34,000	40	$20,000	$54,000
12	TRANSFORMER PROTECTIVE RELAY	GE	MULTILIN 745	2	$7,100	$14,200	20	$4,000	$18,200
13	FEEDER PROTECTIVE RELAY	GE	MULTILIN 760	2	$4,600	$9,200	20	$4,000	$13,200
14	PROTECTIVE RELAY CONFIGURATION SOFTWARE	GE		1	$1,300	$1,300	5	$500	$1,800
15	TCP/IP CONVERTER - MISC	LANTRONIX	MSS485T	2	$700	$1,400	20	$4,000	$5,400
16	RECLOSER - OVERCURRENT RELAY	SCHWEITZER	SEL-351	1	$2,650	$2,650	20	$2,000	$4,650
17	ETHERNET MODEN (TCP/IP SERVER)	RAI	N/A	1	$400	$400	2	$200	$600
18	ETHERNET ROUTERS/SWITCH	BB	TBD	20	$1,200	$24,000	3	$6,000	$30,000
19	FIBER TO COPPER ADAPTER	BB	TBD	1	$500	$500	10	$1,000	$1,500
20	WONDERWARE SOFTWARE FACTORY SUITE	WW	N/A	1	$11,100	$11,100	10	$1,000	$12,100
21	SQL SOFTWARE	WW	N/A	1	$0	$0	100	$10,000	$10,000
22	INTOUCH	WW	N/A	1	$0	$0	100	$10,000	$10,000
23	ACTIVE FACTORY SOFTWARE	WW	N/A	1	$0	$0	40	$4,000	$4,000
24	WONDERWARE RUN TIME	WW	N/A	4	$1,800	$7,200	10	$4,000	$11,200
25	OPC SOFTWARE	TBD	TBD	2	$1,800	$3,600	20	$4,000	$7,600
26	PLC SOFTWARE	ALLEN BRADLEY	CONTROLLOGIX	1	$1,800	$1,800	2	$200	$2,000
27	GENERATOR SYSTEM INTEGRATION	N/A	N/A	2	$0	$0	100	$20,000	$20,000
						$173,750	605	$124,000	

AVERAGE LABOR RATE $100

BASIS OF GENERAL EQUIPMENT COST IS VENDOR BUDGETARY NUMBERS
BASIS OF LABOR ESTIMATE IS ROUGH ORDER OF MAGNITUDE
BASIS OF ESTIMATE IS DWG. 03403 E1, E2, DATED 2/11/04

PROPOSED POWER PLANT SUBTOTAL	$297,750
EXISTING SCADA INTEGRATION SUBTOTAL	$40,000
TOTAL (ROUNDED)	$338,000

AMC Engineers

Value-Added Engineering Services

Adams, Morgenthaler and Company, Inc.

Input date:	**11-Feb-04**
Topic:	**SCADA Estimate**
Project / Code:	**3118/ARROCAM**
Engineer:	**BCS**

Estimated Budget for SCADA and Power Plant Control System Integration

SCADA INTEGRATION

ITEM #	DESCRIPTION	QUANTITY	INT. LABOR (Hr.)	TOTAL LABOR
1	Papkes Landing RTU	1	50	$5,000
2	Scow Bay	1	50	$5,000
3	RADIO MODEM INTEGRATION	1	40	$4,000
4	dam site	1	20	$2,000
5	hydro plant	1	30	$3,000
6	hatchery site	1	10	$1,000
7	FUEL TANK MONITOR	1	50	$5,000
8	OPC SOFTWARE INTEGRATION	2	60	$12,000
9	EXISTING ASD LINE EXTENDER INTEGRATION	1	30	$3,000
			340	
	SUBTOTAL			**$40,000**

PART 2
DEMOLITION WORK

PART 2 DEMOLITION WORK
SUMMARY

NON-HAZARDOUS DEMOLITION	$ 790,636
HAZARDOUS MATERIAL DEMOLITION	79,980
EARTHWORK	47,080
SUBTOTAL:	$ 917,696
GENERAL CONDITIONS	490,728
SUBTOTAL:	$ 1,408,424
CONTINGENCIES	303,515
TOTAL ESTIMATED CONSTRUCTION COST:	**$ 1,711,939**

HMS Project No.: 04002

PART 2 - DEMOLITION WORK	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
NON-HAZARDOUS DEMOLITION								
Demolish two-story wood framed office shop building	45,925	SF			3.10	142,368	3.10	142,368
Demolish generator area (lean to, steel framed)	9,200	SF			7.50	69,000	7.50	69,000
Break-up and remove concrete footings and slab on grade	32,163	SF			2.25	72,367	2.25	72,367
Demolish generator building, steel framed	10,875	SF			7.50	81,563	7.50	81,563
Break-up and remove concrete footings and slab on grade	10,875	SF			2.25	24,469	2.25	24,469
Demolish generator steel framed building	5,525	SF			7.50	41,438	7.50	41,438
Break-up and remove concrete footings and slab on grade	5,525	SF			2.25	12,431	2.25	12,431
Remove generators and other equipment, 2,100 KW - 600 KW	4	EA			1500.00	6,000	1500.00	6,000
Remove Connex box, chassis mounted with generator	1	EA			1000.00	1,000	1000.00	1,000
Remove fuel tank concrete pad and cover structure	2,450	SF			3.00	7,350	3.00	7,350

PART 2 - DEMOLITION WORK	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
NON-HAZARDOUS DEMOLITION (Continued)								
Remove sheds and miscellaneous structures	5	EA			550.00	2,750	550.00	2,750
Remove concrete paving and pads	3,000	SF			1.50	4,500	1.50	4,500
Remove fence	200	LF			2.00	400	2.00	400
Landfill costs	5,000	TONS	50.00	250,000	15.00	75,000	65.00	325,000
TOTAL NON-HAZARDOUS DEMOLITION:				**250,000**		**540,636**		**790,636**
HAZARDOUS MATERIAL DEMOLITION								
Mobilization, equipment set-up, health checks, suits and other needs	1	LOT	3600.00	3,600	2880.00	2,880	6480.00	6,480
Testing	1	LOT	10800.00	10,800			10800.00	10,800
Remove hazardous material from structure	1	LOT			45000.00	45,000	45000.00	45,000
Remove fuel tank and piping, 15,000 gallons	1	EA			1200.00	1,200	1200.00	1,200
Remove skimmer and waste storage tank	1	LOT			1500.00	1,500	1500.00	1,500
Clear site	1	LOT	2500.00	2,500	5000.00	5,000	7500.00	7,500

PART 2 - DEMOLITION WORK	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
HAZARDOUS MATERIAL DEMOLITION (Continued)								
Dump fees	1	LOT	5000.00	5,000	2500.00	2,500	7500.00	7,500
TOTAL HAZARDOUS MATERIAL DEMOLITION:				**21,900**		**58,080**		**79,980**
EARTHWORK								
Filling	2,000	CY	11.50	23,000	5.00	10,000	16.50	33,000
Grading	12,800	SY	0.10	1,280	1.00	12,800	1.10	14,080
TOTAL EARTHWORK:				**24,280**		**22,800**		**47,080**
TOTAL ESTIMATED COST:				**$ 296,180**		**$ 621,516**		**$ 917,696**

GENERAL REQUIREMENTS
AND
CONTINGENCIES
(PART 2 - DEMOLITION)
FEBRUARY 2007 - SEPTEMBER 2007

HMS Project No.: 04002

PART 2 - DEMOLITION WORK **General Conditions**	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
Mobilization/demobilization	1	LS	1000.00	1,000	1500.00	1,500	2500.00	2,500
Certified payroll filing fee	1	LS	5000.00	5,000			5000.00	5,000
Travel costs	36	RT	250.00	9,000			250.00	9,000
Project sign	1	EA	500.00	500	500.00	500	1000.00	1,000
Supervision/quality control	8	MOS			11500.00	92,000	11500.00	92,000
Clerical	8	MOS			3500.00	28,000	3500.00	28,000
Temporary facilities	8	MOS	1200.00	9,600	300.00	2,400	1500.00	12,000
Temporary utilities and communication	8	MOS	750.00	6,000	100.00	800	850.00	6,800
Equipment, trucks, pick-ups, etc.	8	MOS	1150.00	9,200			1150.00	9,200
Crane	2	MOS	23000.00	46,000			23000.00	46,000
Consumables, fuel, etc.	8	MOS	300.00	2,400			300.00	2,400
Mechanic labor	150	HRS			48.00	7,200	48.00	7,200
Submittals/as-builts	1	LS	1500.00	1,500			1500.00	1,500
Cleaning	8	MOS	50.00	400	250.00	2,000	300.00	2,400
Security	8	MOS	500.00	4,000			500.00	4,000

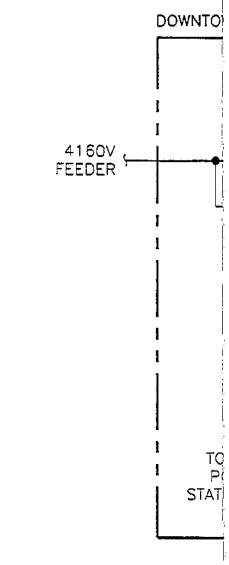
PART 2 - DEMOLITION WORK General Conditions	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
Permits	1	LS						By Owner
Final clean	1	LS	750.00	750			750.00	750
Per-diem (for rented house and meals)	480	MD	95.00	45,600			95.00	45,600
Premium time (general)	600	HRS			47.00	28,200	47.00	28,200
SUBTOTAL:				$ 140,950		$ 162,600		$ 303,550
Home office	4.00%							48,850
Profit	8.00%							101,608
Bond	1.06%							14,540
Insurance	1.60%							22,180

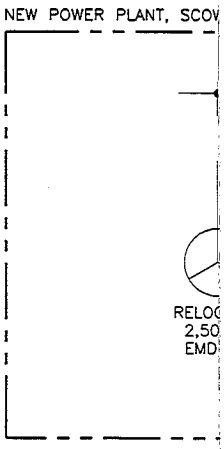
TOTAL ESTIMATED COST: **$ 490,728**

HMS Project No.: 04002

PART 2 - DEMOLITION WORK **Contingencies**	QUANTITY	UNIT	MATERIAL RATE $	MATERIAL TOTAL $	LABOR RATE $	LABOR TOTAL $	TOTAL UNIT RATE $	TOTAL MATERIAL/LABOR $
ESTIMATOR'S CONTINGENCY								
The estimator's allowance for architectural and engineering requirements that are not apparent at this early level of design documentation	10.00%							$ 140,842
ESCALATION CONTINGENCY								
The allowance for escalation from the date of estimate to February 2007 at the rate of 3.50% per annum	10.50%							$ 162,673

TOTAL ESTIMATED COST: **$ 303,515**





35pb1n1.dwg	THIS DRAWING WAS PREPARED BY POWER ENGINEERS, INC. FOR A SPECIFIC PROJECT, TAKING INTO CONSIDERATION THE SPECIFIC AND UNIQUE REQUIREMENTS OF THE PROJECT. REUSE OF THIS DRAWING OR ANY INFORMATION CONTAINED IN THIS DRAWING FOR ANY PURPOSE IS PROHIBITED UNLESS WRITTEN PERMISSION FROM BOTH POWER AND POWER'S CLIENT IS GRANTED.	POWER ENGINEERS	AMC ENGINEERS PETERSBURG MPL POWERPLANT RELOCATION STUDY SIMPLIFIED ELECTRICAL ONE-LINE	JOB NUMBER 103593 REV B DRAWING NUMBER E1-1

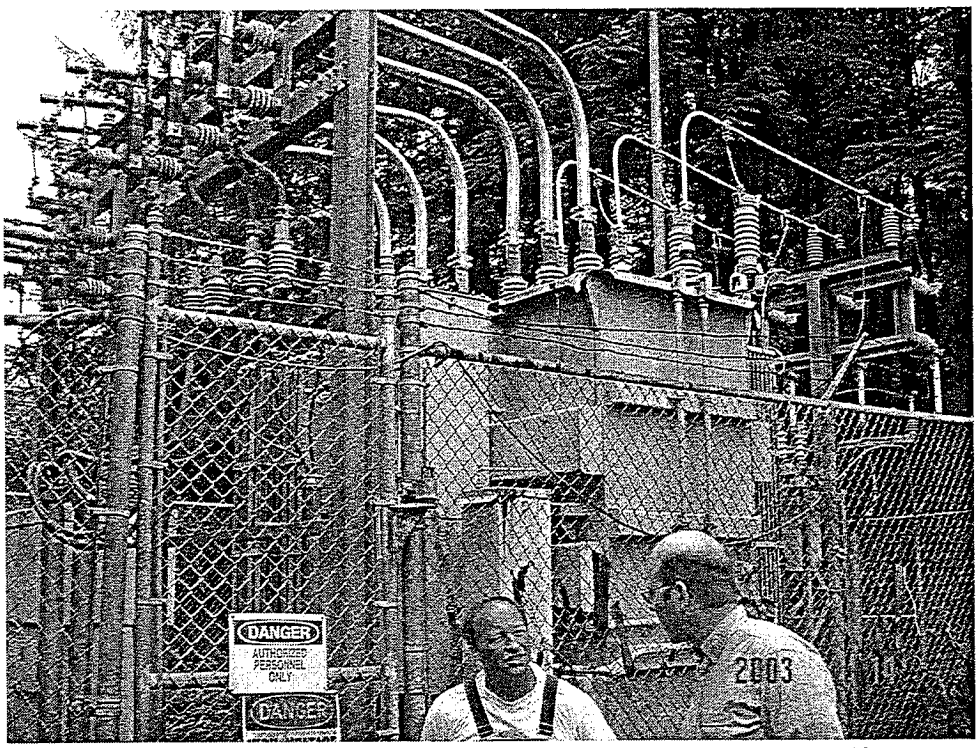


PHOTO 1 PMP&L EXISTING SUBSTATION AT POWER PLANT AREA

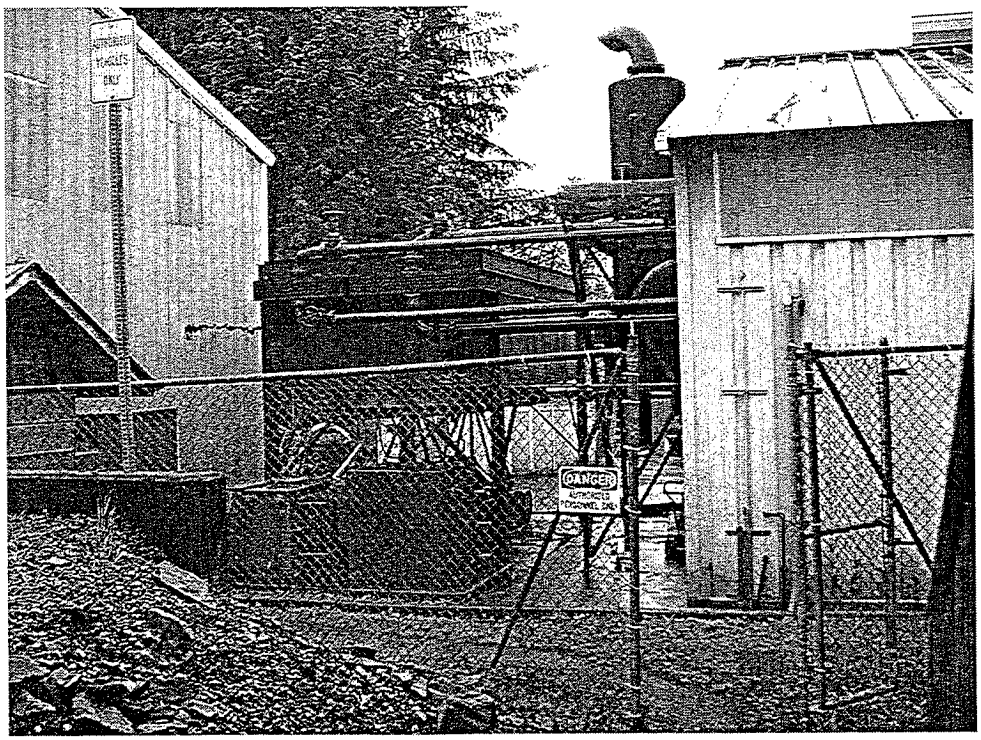


PHOTO 2 EXISTING POWER PLANT SITE; RADIATORS AND EXHAUST

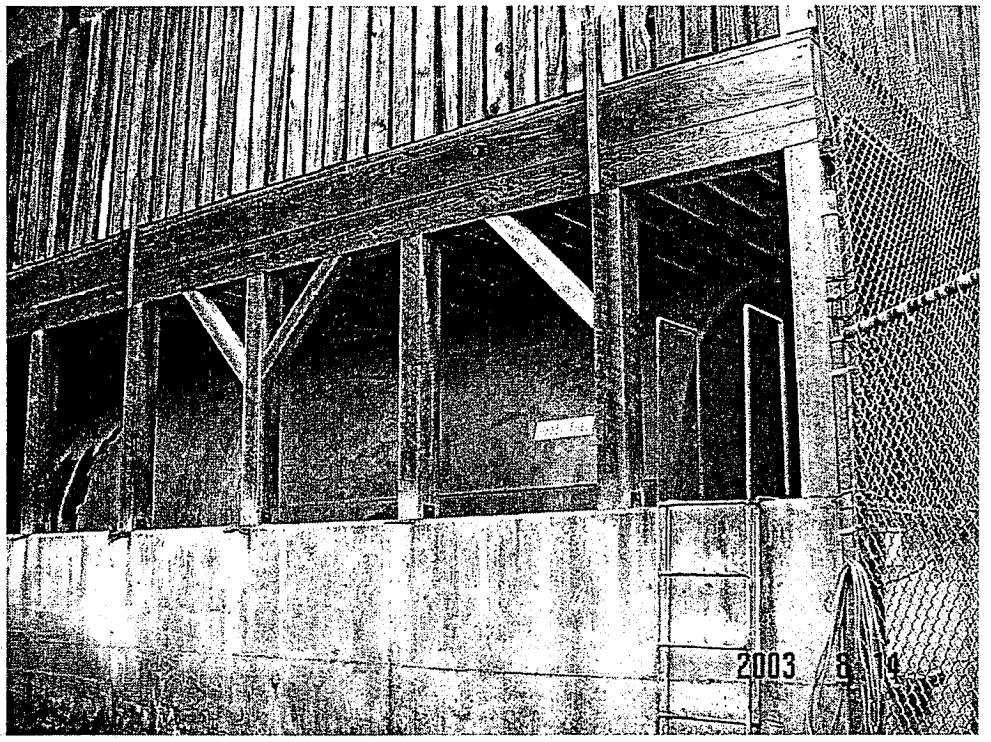


PHOTO 3 EXISTING 15,000 GALLON FUEL STORAE TANK AND CONTAINMENT

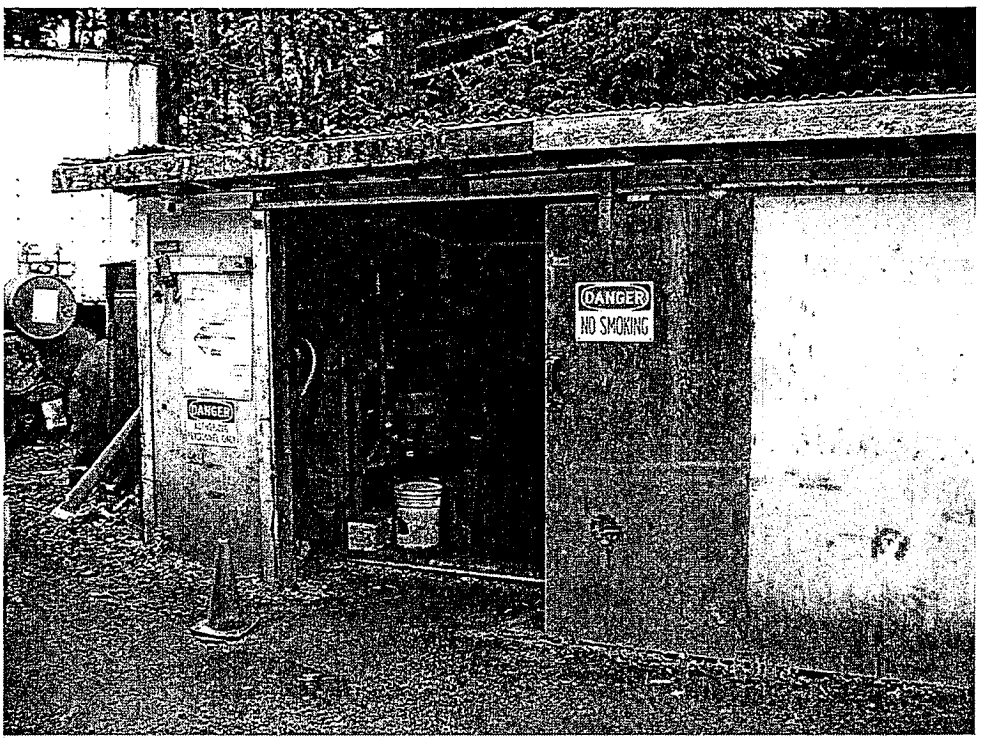


PHOTO 4 EXISTING POWER PLANT SITE OIL SKIMMER BUILDING

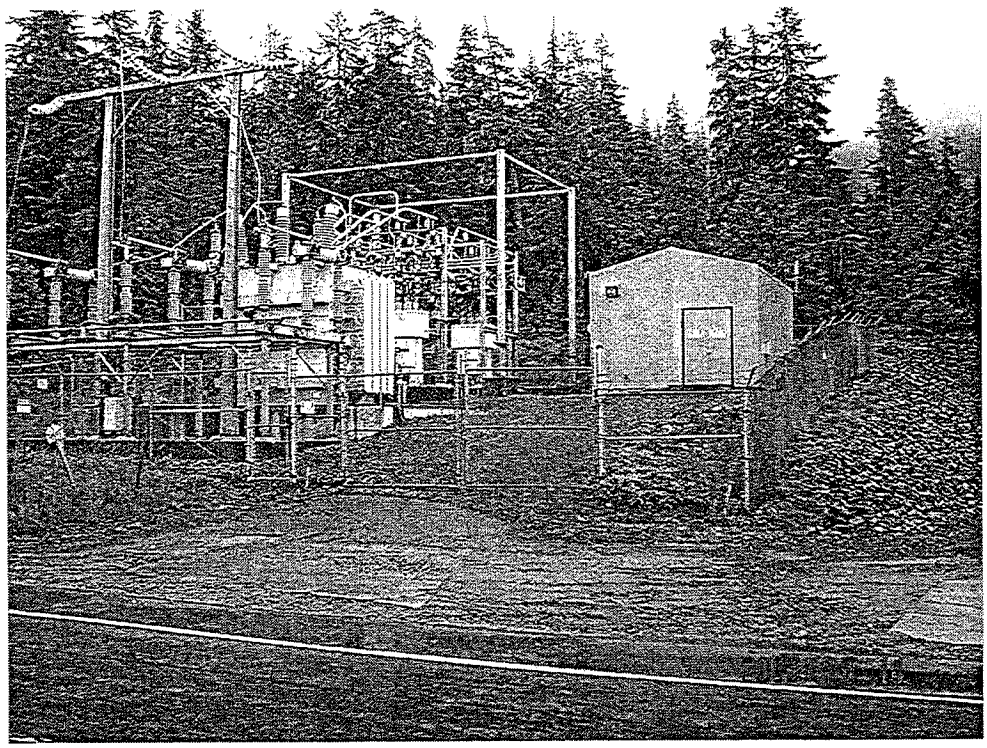


PHOTO 5 FOUR DAM POOL POWER AGENCY SUBSTATION
ADMINISTRATION/CREW CENTER TO BE LOCATED TO RIGHT

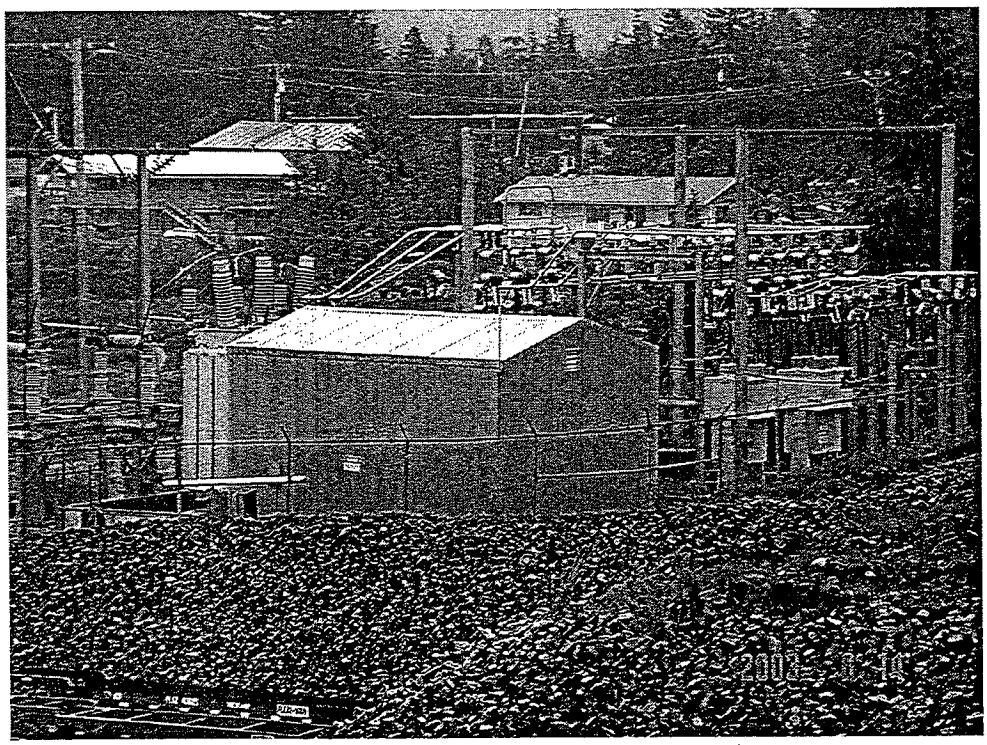


PHOTO 6 FOUR DAM POOL POWER AGENCY SUBSTATION
LOOKING FROM ENTRANCE TO YARD STORAGE & POWER PLANT

PHOTO 7 LOOKING FROM ENTRANCE TO YARD STORAGE AREA

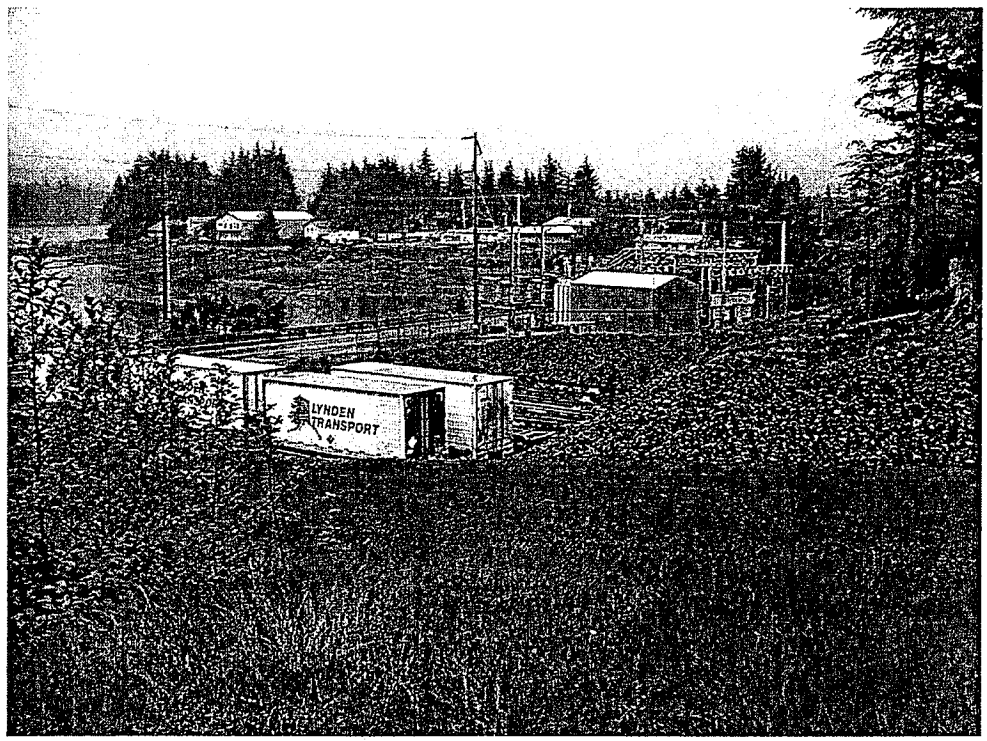


PHOTO 8 ADMINISTRATION/CREW CENTER TO BE LOCATED WHERE VANS ARE STORED

PHOTO 9 ROADWAY FROM MITKOF HWY.
TO POWER PLANT AND YARD STORAGE

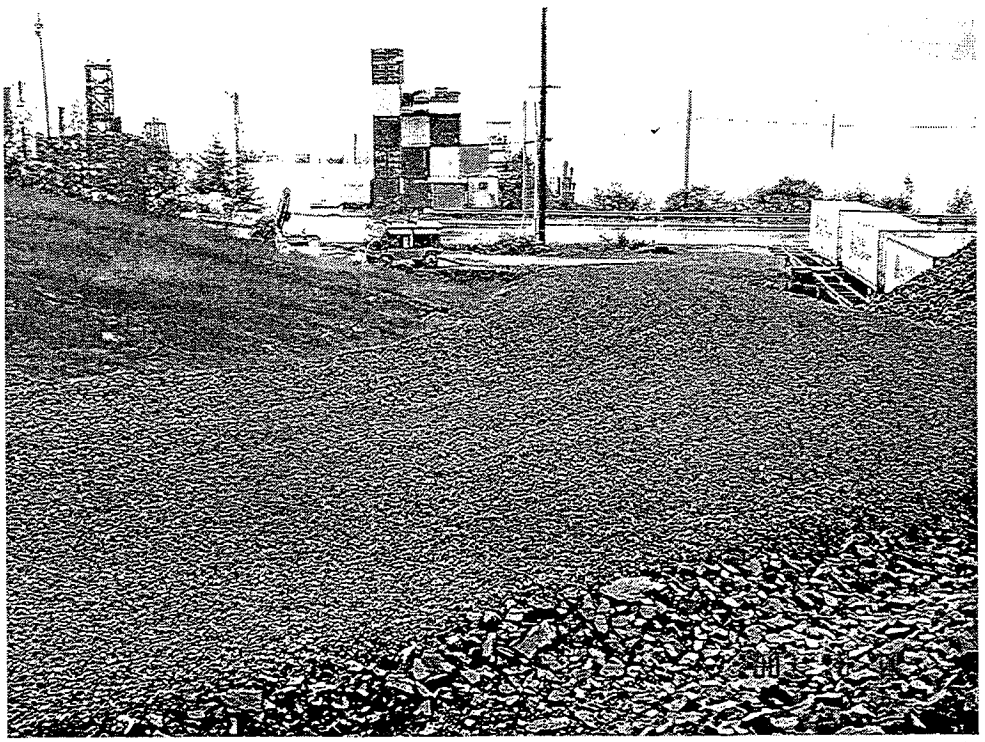


PHOTO 10 LOOKING FROM YARD STORAGE ENTRANCE TOWARDS MITKOF HWY.

PHOTO 11 DRAINAGE COLLECTION AND CONDUIT UNDER ROADWAY

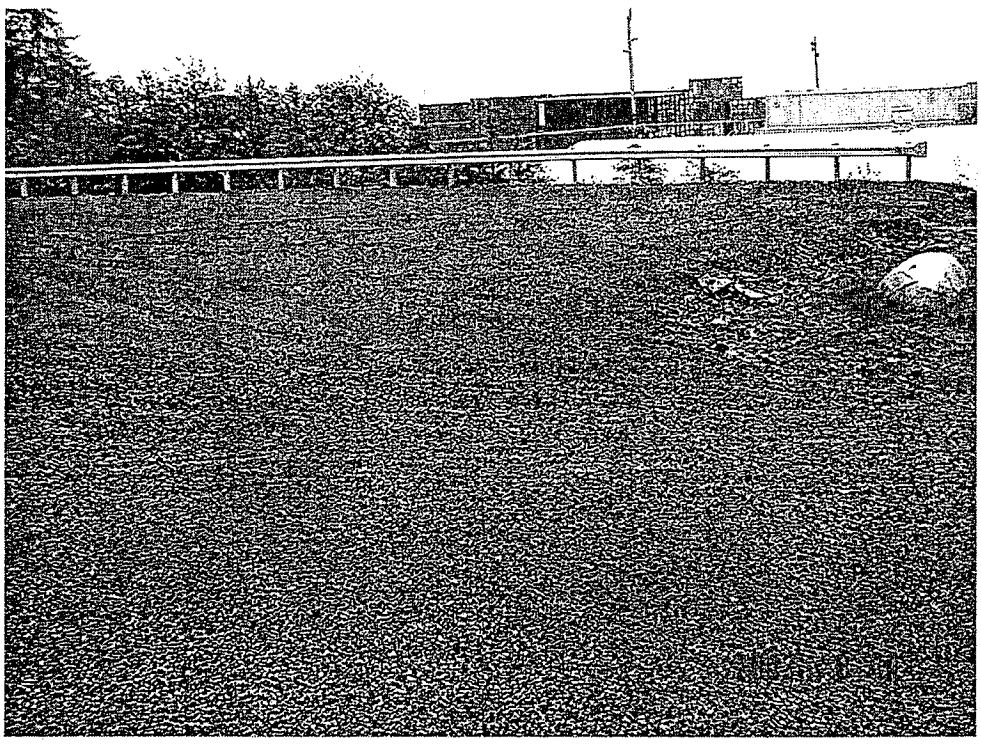


PHOTO 12 YARD STORAGE AREA AND GUARD RAIL

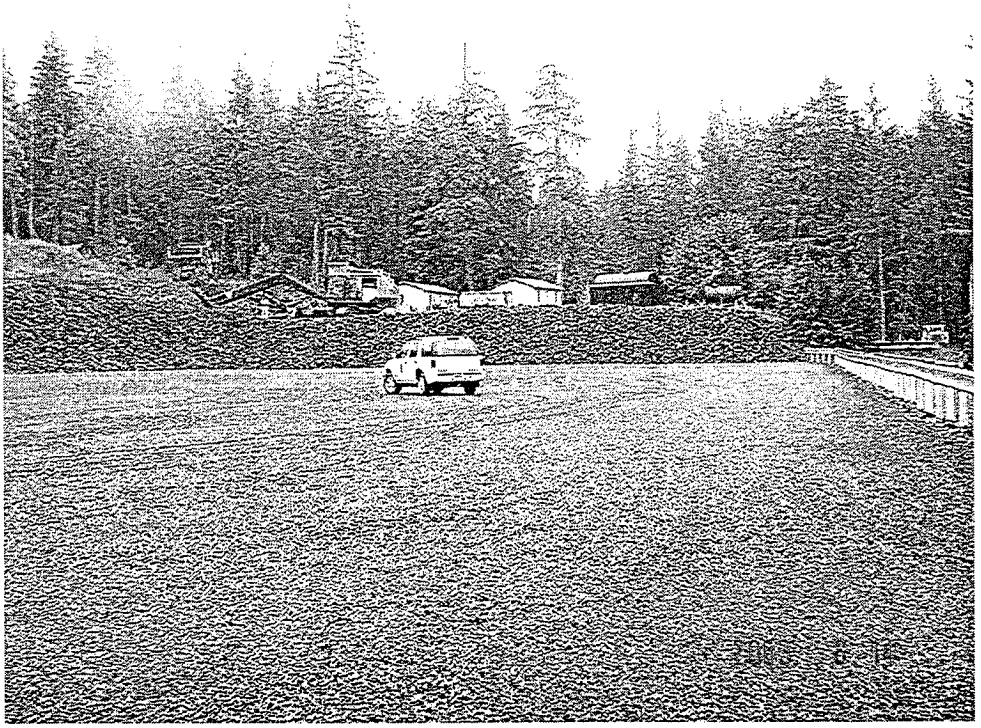


PHOTO 13 LOOKING FROM ENTRANCE TO POWER PLANT AND YARD STORAGE

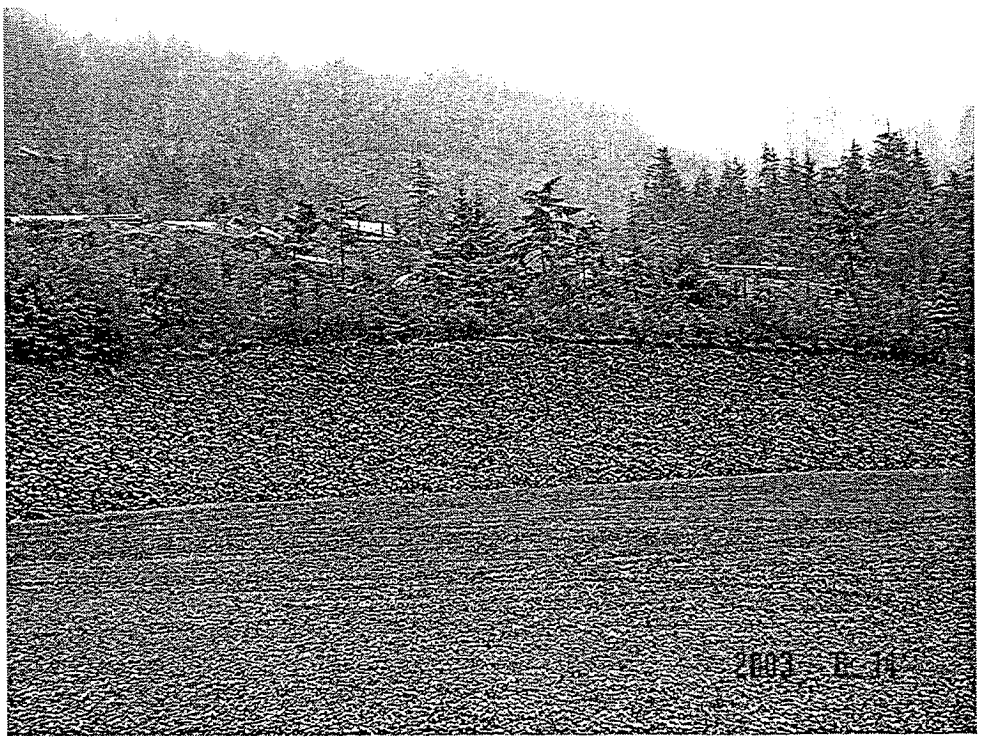


PHOTO 12 LOOKING YARD STORAGE AREA