

NORTHWEST HOSPITAL
FINAL ENVIRONMENTAL IMPACT STATEMENT

City of Seattle
Department of Construction and Land Use

Prepared in compliance with:

The State Environmental Policy Act of 1971,
Chapter 43.21C, Revised Code of Washington.

SEPA Guidelines effective April 4, 1984, as
revised, Chapter 197-11 Washington
Administrative Code.

City of Seattle SEPA Ordinance 111866
Municipal Code Chapter 25.05 effective
October 1, 1984, as amended.

February 4, 1991

FACT SHEET

Action Sponsor Northwest Hospital
1550 N. 115th St.
Seattle, WA 98133

Proposed Action The proposal is a Council Land Use action to approve a Major Institutional Master Plan for Northwest Hospital.

Project Location The site is the existing Northwest Hospital Campus located between North 115th Street and North 120th Street bounded by Ashworth Ave. (as extended) on the west and extends to within approximately 100 feet of Meridian Ave. N. on the east.

Approximate Date of Implementation Construction could begin as early as 1991 and continue through 2000.

Lead Agency City of Seattle, Department of Construction and Land Use

Responsible Official and Contact Person Faith Lumsden, Senior Land Use Specialist
Dept. of Construction and Land Use
408 Municipal Building
600 - 4th Ave.
Seattle, WA 98104
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Decision Maker Seattle City Council

Authors and Principal Contributors This Environmental Impact Statement has been prepared under the direction of the City of Seattle Dept. of Construction and Land Use. Research and analysis was provided by:

Northwest Hospital: Project Manager for Major Institution Master Plan and EIS.
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Transportation Solutions Inc:
Transportation Analysis

N.G. Jacobson and Associates:
Parking and Drainage Analysis

Waldron, Pomeroy, Smith, Foote & Akira:
Land Use Architectural Analysis

Wieland and Lindgren:
Energy Analysis

Worthy and Associates:
Landscape Analysis

TRC Environmental Consultants:
Air Quality Analysis

N.G. Jacobson and Associates:
Water Supply Analysis

Licenses, Permits
and Other Required
Approvals

City of Seattle:
Institutional Master Plan
Master Use Permits
Demolition Permits
Building Permits
Drainage Permits
Electrical Permits
Mechanical Permits
Sewer Permits
Fire Code Inspections
Street Use Permits (during construction)

State of Washington:
Certificate of Need, Dept.
of Social and Health Services

Date of Issue of
Draft EIS

April 26, 1990

Draft EIS Review
Period

In accordance with SEPA guidelines
the DEIS was circulated for a 30-day
comment period.

Public Hearing

A public hearing on the DEIS was held
on Wednesday, May 16, 1990 at Northwest
Hospital. A public forum to gather addi-
tional public comments was held on
Tuesday, June 12, 1990 at Ingraham High
School Lunch Room.

Issue Date of
Final EIS

February 4, 1991

Location of
background Data

Land Use Review Section
Department of Construction and
Land Use
408 Municipal Building
600 Fourth Ave.
Seattle, WA 98104

Northwest Hospital
1550 N. 115th St.
Seattle, WA 98133

Cost to Public
for Copy of EIS

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FINAL ENVIRONMENTAL IMPACT STATEMENT

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I. SUMMARY

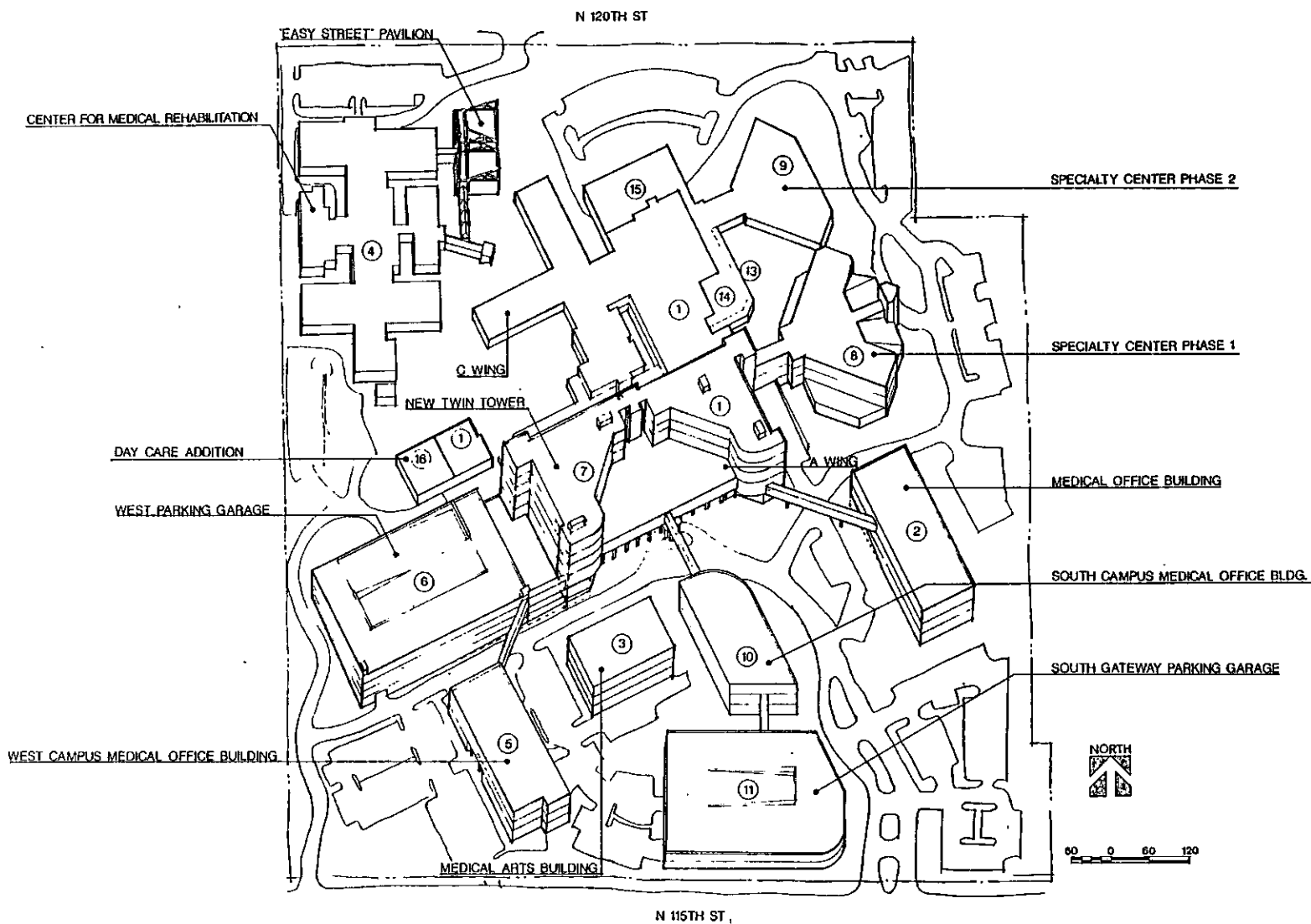
INTRODUCTION

This Final Environmental Impact Statement provides updates and expands the Traffic, Air Quality and Solid Waste Disposal segments of the Draft Environmental Impact Statement as well as providing new information on the existing and future water supply. It also discusses the impacts of Plan Option C, presents comments by agencies and the public and responds to those comments.

DESCRIPTION OF PLAN OPTION C

Northwest Hospital has outlined four alternatives, a "no action" alternative and three development alternatives (Option A, Option B and Option C) as proposed campus Master Plans. (Please refer to Exhibit 1 for site plan of Option C.) Option C represents a lower level of campus development with 284,700 fewer total square feet of facility development than Option A. Of the total 1,258,776 total square feet, 418,000 square feet are designated for parking garages. The following are the major differences between Option A and Option C:

- Under Option C, Specialty Center I is reduced from a 71,300 square foot, four-story building to a 65,000 square foot, three-story building. Under Option C, Specialty Center I is 6,300 gross square feet smaller and 14 feet shorter than under Option A.



NORTHWEST HOSPITAL FUTURE
PLAN C

EXHIBIT 1

PLAN C
SITE PLAN



Waldron,
Ramsey, Smith,
Fox & Akira
Architects

Project No.	0014	Sheet No.	
Scale		Drawn by	
Check by			
Date	12-80		

- Under Option C, the West Campus Parking Garage is reduced from a 1,100-stall, 290,000 square foot building to a 900-stall, 250,000 square foot, three-story building. Under Option C this garage is 40,000 gross square feet smaller with 200 fewer parking stalls than under Option A.
- Under Option C, Specialty Center II is reduced from a 125,700 square foot, four-story building to a 40,000 square foot, one-story building. Under Option C, Specialty Center II is 85,700 gross square feet smaller and is 44 feet shorter in height than under Option A.
- Under Option C, the South Campus Medical Office Building is reduced from a 156,700 square foot, four-story building to a 60,000 square foot, three-story building. Under Option C, this building is 96,700 gross square feet smaller and is 14 feet shorter in height than under Option A.
- Under Option C, the South Gateway Parking Garage is reduced from an 850-stall, 224,000 square foot, three-story building to a 650-stall, 168,000 square foot, two-story building. Under Option C, this garage is 56,000 gross square feet smaller with 200 fewer parking stalls than under Option A.

II. AFFECTED ENVIRONMENT, REVISIONS AND ADDITIONS TO, IMPACTS, MITIGATING MEASURES

NATURAL ENVIRONMENT

AIR QUALITY (Incinerator)

The site presently contributes airborne particulates and chlorides from its incineration system. Such systems are generally used by hospitals for the safe disposal of any solid waste materials which may have been exposed to possible bacterial contamination, generally including any disposable materials used in patient rooms, examination rooms or laboratories if not carefully segregated in use. The alternative to incineration is transport to remote incinerators or to specially approved landfills for hazardous wastes, or sterilization of the infectious portions of the waste stream.

Northwest Hospital is under a regulatory order from PSAPCA to reduce chloride emissions from the incineration system. As a first step, the hospital has eliminated most uses of polyvinyl chloride plastics, the major source. To reach full compliance, the hospital has selected a compliance method that includes a replacement incinerator of improved design and "state-of-the-art" incinerator flue-gas cleanup equipment. The plan also includes selective segregation and sterilization in a steam autoclave as backup to the incineration system. See Appendix C for description of incinerator project.

Impacts (Option C)

The proposal would be expected to increase the volume of burnable infectious wastes as the hospital's patient load increases. Without improvement of the incinerator or change to

an alternate disposal method, emissions would increase accordingly. However, in complying with the regulatory order to decrease chloride emissions, all emissions will be reduced to levels significantly lower than present conditions. The selected gas cleanup technology, dry lime scrubber and fabric filter (baghouse) works best on acid gases such as chlorine and sulfur compounds because they react chemically with the lime to form solid particles of sizes that can be caught effectively by a baghouse. Along with the particles of calcium chloride and calcium sulfate, the baghouse also catches droplets of hydrocarbons that form as the gas cools and other particulates then form in the incinerator. Reductions of heavy metal particulates, for example, are reduced by more than 90 percent.

Alternatively, the incinerator could be taken out of service and all of the waste sent to landfill and/or remote processing locations. Chloride emissions would cease. Reductions in other emissions would be offset to some extent by exhaust emissions and fugitive dust from increased diesel truck traffic. It should also be noted that transporting and handling of infectious waste is cause for serious concern. Accidents in packaging, handling and transit, along with a diminishing number of off-site disposal facilities, make off-site disposal an uncertain proposition.

Mitigating Measures

Air emissions from the incinerator will decrease by installation of additional pollution control technology.

AIR QUALITY (Traffic)

Affected Environment

Air quality consultants, TRC, selected three intersections to

evaluate air quality impacts from traffic to and from an expanded hospital facility. Intersections were selected based on discussions with Transportation Solutions, Inc. (TSI) regarding those intersections having the highest future project-related traffic volumes and the poorest intersection levels of service. These intersections are: Aurora Ave. North and North 115th, Meridian Ave. North and Northgate Way; and N. 130th and 5th Ave. N.E. Although the hospital adds a greater percentage to traffic at intersections closer to the hospital, the closer intersections do not have sufficient total traffic volumes to exceed ambient air quality standards.

TRC used two measures to assess traffic-related air quality effects of the proposed project. First, TRC computed total peak-hour emissions of hydrocarbons, carbon monoxide, and nitrogen oxides due to traffic along streets near the intersections being examined. Second, TRC used the Caline3 dispersion model (FHWA 1979) to compute carbon monoxide (CO) concentrations that would occur near the intersections examined based on peak-hour traffic projections for the year 2000.

As shown in Exhibit 2, modeling of existing conditions revealed possible and likely current violations of the 9 ppm 8-hour CO standard near all three intersections examined. These violations are caused by the high traffic volumes and long delays on one or more legs of each intersection.

At the intersection of Aurora Avenue North with North 115th Street, high CO concentrations occur at sidewalk locations along Aurora south of the intersections primarily due to the high traffic volumes along Aurora Avenue North. Predicted concentrations at these receptors are equal to the 9 ppm 8-hour standard, a level not to be exceeded more than once per year.

Modeling indicated existing probable violations of the 8-hour standard at sidewalk locations along all four legs of the intersection of N. Northgate Way with Meridian Avenue N.

Modeled 8-Hour CO Concentrations (ppm)

Receptor	1990 Existing	2000 No Action	2000 Project	2000 Proj w/ Mit	Project Impact
Aurora North of 115th	8	7	8	6	-1.3
Aurora South of 115th	9	8	9	7	-1.3
115th East of Aurora	5	5	5	4	-0.6
Meridian North of Northgate	11	6	6	6	0.7
Meridian South of Northgate	12	6	6	6	0.6
Northgate East of Meridian	15	8	8	8	0.1
Northgate West of Meridian	17	8	8	8	0.0
5th North of 130th	16	11	11	11	0.1
5th South of 130th	17	11	12	12	0.3
Roosevelt East of 5th	10	7	7	5	-1.5
130th West of 5th	24	16	16	16	0.1

8-Hour Ambient Standard: 9

Project impact represents the net effect in the year 2000 of the proposed hospital based on comparing 8-hour CO levels with the project with mitigation to CO levels resulting from No Action. As noted in the text, no mitigation measures were applied for the analysis of the N Northgate Way/Meridian Avenue N intersection.

Note: Neither ambient standard is to be exceeded more than once per year.

Predicted values at several receptors are significantly above the 9 ppm health standard primarily due to high traffic volumes along Northgate Way and long delays. Note that these high values are for locations within five feet of the side of the road. Concentrations decrease markedly with increasing distance from the road.

Modeling also identified probable existing violations of the 8-hour CO standard at sidewalk locations along all four legs of the intersection of N. 130th Street with 5th Avenue NE. The high concentrations on three of the four legs (excepting Roosevelt east of 5th) are caused primarily by freeway traffic. The receptors with the highest concentrations are those between 5th Avenue NE and the freeway. Along Roosevelt Way NE east of 5th, the high concentrations are those between 5th Avenue NE and the freeway. Along Roosevelt Way NE east of 5th, the high concentrations are due to the intersection delay. If these concentrations occur more than once per year, they would violate the 8-hour health standard for CO. It is important to note that these levels would occur in places where people are not likely to spend much time. Consequently, even though such concentrations would constitute violations, they are not likely to represent significant health threats.

Impacts (Plan C)

Modeling of concentrations for the year 2000 show improvements in air quality at all three intersections. This improvement is due to reduced emissions from new cars. The project would slightly increase these CO levels at several locations. Levels at two intersections would remain about the same as under the No Action alternative, and the 8-hour CO standard would continue to be exceeded at one of these intersections. Levels at Aurora Avenue south of 115th can reach the standard without mitigation. Implementing traffic mitigation in conjunction with the project would result in lower pollutant concentrations at most affected locations, but violations of the 8-hour CO standard

would continue at North 130th and 5th Ave. N.E.

The greatest impact of the proposed project from traffic-generated pollutants would be about a 0.7 part per million (ppm) 8-hour CO level near the intersection of N. Northgate Way with Meridian Avenue N. Impacts at all other receptors would be less, and with mitigation measures, the project would reduce 8-hour CO levels as much as 1.5 ppm lower than No Action. See Exhibit 2.

One-hour concentrations are well below the one-hour CO standard of 35 PPM.

Mitigating Measures

Two columns in Exhibit 2 pertain to projected 8-hour CO levels from traffic-related to the proposed hospital expansion project with implementation of traffic mitigation measures including road and signal improvements as discussed in the Revised Traffic Analysis included as FEIS Appendix A. The column labeled 2000 Project with Mitigation displays the predicted 8-hour CO levels and indicates mitigation would reduce pollutant concentrations 1-2 ppm at the intersections of Aurora Avenue N. with N. 115th Street and N. 130th Street with 5th Avenue N. The column labeled Project Impact displays the change in 8-hour CO levels under this alternative compared with No Action.

Traffic mitigation as proposed in the Revised Traffic Analysis at the intersection of Aurora Avenue N. with N. 115th Street would reduce CO concentrations at all receptors and result in levels lower than with No Action. Along Aurora, mitigation would reduce levels about 1.3 ppm below No Action levels. Along N. 115th Street east of Aurora, mitigation would reduce levels about 0.6 ppm below No Action. Eight-hour CO levels at all receptors would be below the 9 ppm limit.

There were no mitigation measures applied to the intersection of N. Northgate Way with Meridian Avenue N., so the predicted levels for this alternative are the same as for the project without mitigation. Project-related traffic would increase 8-hour CO levels up to 0.7 ppm above No Action, but concentrations would remain below the standard. While no specific traffic mitigation measures have been identified for this intersection, any future improvements developed by the Northgate Comprehensive Plan that increase travel speeds or reduce idling would further reduce CO concentrations.

Traffic mitigation at the intersection of N. 130th Street with 5th Avenue N.E. would reduce CO concentrations at all receptors and result in lower 8-hour levels than No Action at half the receptors. Mitigation for Roosevelt Way N.E. east of 5th Avenue N.E. would reduce 8-hour concentrations about 0.8 to 1.5 ppm below No Action levels. CO levels at other receptors would be slightly above or slightly below No Action levels, with the effects of the mitigation somewhat obscured by the impacts of the freeway traffic. CO levels at those receptors closest to the freeway would still exceed the 8-hour standard, but the maximum concentration attributable to the proposed project is only 0.3 ppm.

Unavoidable Adverse Impacts

Modeling indicated about a 1 ppm increase over No Action 8-hour CO levels at one receptor at the intersection of N. Northgate Way with Meridian Avenue N. in the year 2000 with the proposed project. Concentrations at all other receptors at this intersection would be about the same as with No Action. Concentrations at this intersection would not exceed the 9 ppm limit.

Modeling indicated about a 1 ppm increase over No Action 8-hour CO levels at one receptor at the intersection of N. 130th Street with 5th Avenue N.E. in the year 2000 with the proposed project. Concentrations at all other receptors at this intersection would be about the same as with No Action. Levels at three receptors, including the one that would experience the 1 ppm project-related increase, would probably exceed the 8-hour standard under worst-case meteorological conditions. The concentration from this project to these conditions is very small at 0.3 ppm.

No Action Alternative

No Action would result in lower concentrations near all intersections due to reductions in future emission rates, but some 8-hour CO violations would persist at one intersection.

For a full discussion of the impacts of acute emissions on air quality, please refer to the Traffic-Related Air Quality Analysis, Summary Report included as Appendix B.

ENERGY

Impacts (Option C)

While the impacts of Plan C on energy consumption are similar to impacts of Plans A and B, they will be lessened by the reduced size of the proposed development. Projections for Plan C are given in the Energy Summary Table (Exhibit 3.)

Mitigating Measures

Mitigating measures for Plan C will remain the same as previously described in the Draft Environmental Impact Statement.

ENERGY SUMMARY PLAN C

BUILDING	GAS ENERGY MBtu	EXISTING ELECTRIC ENERGY, MWh	PEAK ELECTRIC DEMAND, KW S/W	GAS ENERGY MBtu	PLAN C ELECTRIC ENERGY, MWh	PEAK ELECTRIC DEMAND, KW S/W
1. MAIN HOSPITAL	40,000	12,600	1320/1250	31,000	10,800	1200/1100
2. MEDICAL OFFICE BUILDING	-0-	2,150	410/410	-0-	2,150	410/410
3. MEDICAL ARTS BUILDING	-0-	942	183/183	-0-	942	183/183
4. CENTER FOR MEDICAL REHABILITATION	3,704	1,087	130/430	3,704	1,250	145/430
5. WEST CAMPUS MOB	-0-	-0-	0/0	-0-	932	338/505
6. WEST GARAGE	-0-	-0-	0/0	-0-	350	125/125
7. TWIN TOWER	-0-	-0-	0/0	13,500	4,725	780/600
8. SPECIALTY CENTER, PHASE 1	-0-	-0-	0/0	5,850	2,048	360/338
9. SPECIALTY CENTER, PHASE 2	-0-	-0-	0/0	3,600	1,260	208/160
10. SOUTH CAMPUS MOB	-0-	-0-	0/0	3,000	360	180/90
11. SOUTH GATEWAY GARAGE	-0-	-0-	0/0	-0-	235	84/84
12-14. SMALL HOSPITAL ADDITIONS	-0-	-0-	0/0	986	715	90/68
15. ADMINISTRATION ADDITION	-0-	-0-	0/0	650	585	78/52
16. DAY CARE ADDITION	-0-	-0-	0/0	115	90	10/08
17. PROFESSIONAL BUILDING (A)	<u>1,400</u>	<u>180</u>	<u>82/45</u>	<u>-0-</u>	<u>-0-</u>	<u>0/0</u>
	45,104	16,959	2125/2318	52,405	26,442	4191/4153

(A) To be demolished with construction of South Campus MOB

LEGEND:

MBtu - MILLIONS OF BRITISH THERMAL UNITS
MWh - MEGAWATT HOURS (MILLIONS OF WATT-HOURS)
KW - KILOWATTS (THOUSANDS OF WATTS)
S/W - SUMMER DEMAND/WINTER DEMAND

NOTE: Energy and demand for existing buildings are based upon analysis of utility bills for recent years. Calculations for new additions and buildings were made in accordance with DCLU Director's Rule 3-87, "ENERGY CONSUMPTION AND PEAK DEMAND INFORMATION FOR ENVIRONMENTAL REVIEW."

Unavoidable Adverse Impacts

The proposed plan will result in additional demand for and consumption of limited electrical and natural gas resources. Cumulative non-quantifiable impact associated with new generation and transmission facilities and uses related to generally increased demand includes further destruction of wilderness and wildlife habitat. Estimates of impact on Seattle City Light are summarized in the Electric Energy Cost/Revenue Summary Table (see Exhibit 4).

BUILT ENVIRONMENT

CONSTRUCTION IMPACTS

NOISE

Affected Environment (Additional Information)

Noise from heating/ventilating and mechanical equipment, as measured from Stendall Place near the hospital property line by a sound engineer, contributes less noise than the background noise from I-5. Noise impacts from Plan C are similar to impacts from Plans A and B.

LAND USE

The Land Use Section includes discussions related to the site and planning area as well as a discussion of how the plans relate to Seattle's Major Institution Land Use Policy.

ELECTRIC ENERGY COST/REVENUE SUMMARY

PLAN "C"

BUILDINGS (ITEMS)	YEAR	Net MWh	LIFETIME COST to City Light	LIFETIME REVENUE to City Light	DIFFERENCE Revenue minus Cost
WEST CAMPUS MOB, #5	1990	932	\$ 842,957	\$ 583,096	- \$ 259,861
SMALL ADDITIONS, #12 through #16	1992	1,450	\$ 1,096,548	\$ 768,515	- \$ 328,033
WEST GARAGE #6	1992	350	\$ 264,684	\$ 185,504	- \$ 79,180
TWIN TOWER #7	1995	4,725	\$ 4,865,805	\$ 2,913,104	- \$ 1,952,701
SPECIALTY CENTER Phase 1, #8	1997	2,048	\$ 2,230,637	\$ 1,255,104	- \$ 975,533
SOUTH CAMPUS MOB & S. GATEWAY GARAGE, #10, #11, & #17	1999	415	\$ 471,668	\$ 253,706	- \$ 217,962
SPECIALTY CENTER Phase 2, #9	2000	1,260	\$ 1,460,216	\$ 769,167	- \$ 691,049

NOTES:

1. Cost and Revenue factors are from "LIFETIME COSTS AND REVENUE CALCULATIONS FOR EIS ANALYSIS OF ELECTRICAL ENERGY USE" (Prepared by Seattle City Light) November 1988. In accordance with the provisions of this document, the cost/revenue calculations are based on a startup date of 1 January of the year following the projected completion date given in the table.

2. Assumed lifetimes are 30 years for additions and alterations, 40 years for new buildings. In practice, hospital buildings are subject to major renovations in cycles of about 20 years and, in general, these renovations significantly affect energy use. With a hospital policy of incorporating energy system improvements when renovating, overall energy efficiency will improve over time.

SITE AND PLANNING AREA

Affected Environment (Additional Information)

A proposal unrelated to Northwest Hospital's Master Plan was submitted to the City of Seattle affecting neighboring property. (Project address: 1918 N. 115th Street, MUP #9002717) There is no affiliation or agreement between Northwest Hospital and the individuals making this proposal. This unrelated proposal is to relocate three single-family structures for the construction of two, 2-story buildings to be used for a day care center and school (a total of 240 students and staff). The proposal includes application for an administrative conditional use permit to allow a day care and a private school in a single-family zoned area (SF 7200).

Impacts (Option C)

The proposed expansion of facilities on the site under Option C would intensify building density of the existing site by 284,700 fewer square feet of facility development than under Option A or by 91,300 fewer square feet than under Option B.

Mitigating Measures

Downsized Option C maintains existing campus institutional zoning and substantially reduces impact to residential area northeast of the hospital campus by reducing height and bulk of proposed buildings.

RELATIONSHIP TO PLANS AND POLICIES

The relationship of the Master Plan to the land use policies is fully discussed in Section II-11 of the Draft and Final Master Plan, incorporated herein by reference.

GLARE AND SHADOW

Impacts (Option C)

A. Glare

Parameters assumed for the glare analysis of Option C will remain the same as those assumed for Options A and B.

Glare diagrams are shown on Exhibits 5 through 7 (summer, spring/fall, winter) for Specialty Center I and II under Option C.

Exhibit 5, Summer (June 21) show morning glare impacts for Option C on the residents to the north and northeast from 5:40 a.m. and 6:40 a.m. Morning glare reflections are within campus boundaries beginning at approximately 6:00 a.m.

Exhibit 6, Spring/Fall (Mar. 21/Sept. 21) show morning glare impacts for Option C on the residents to the north and east at 6:30 a.m. and 7:30 a.m. Morning glare reflections are within campus boundaries beginning at approximately 7:30 a.m.

Exhibit 7, Winter (Dec. 21) show morning glare impacts for Option C on the residents to the north and east from 8:35 a.m. to 10:05 a.m. Morning glare reflections are within campus boundaries beginning at approximately 10:00 a.m.

GLARE IMPACTS SUMMER - PLAN C

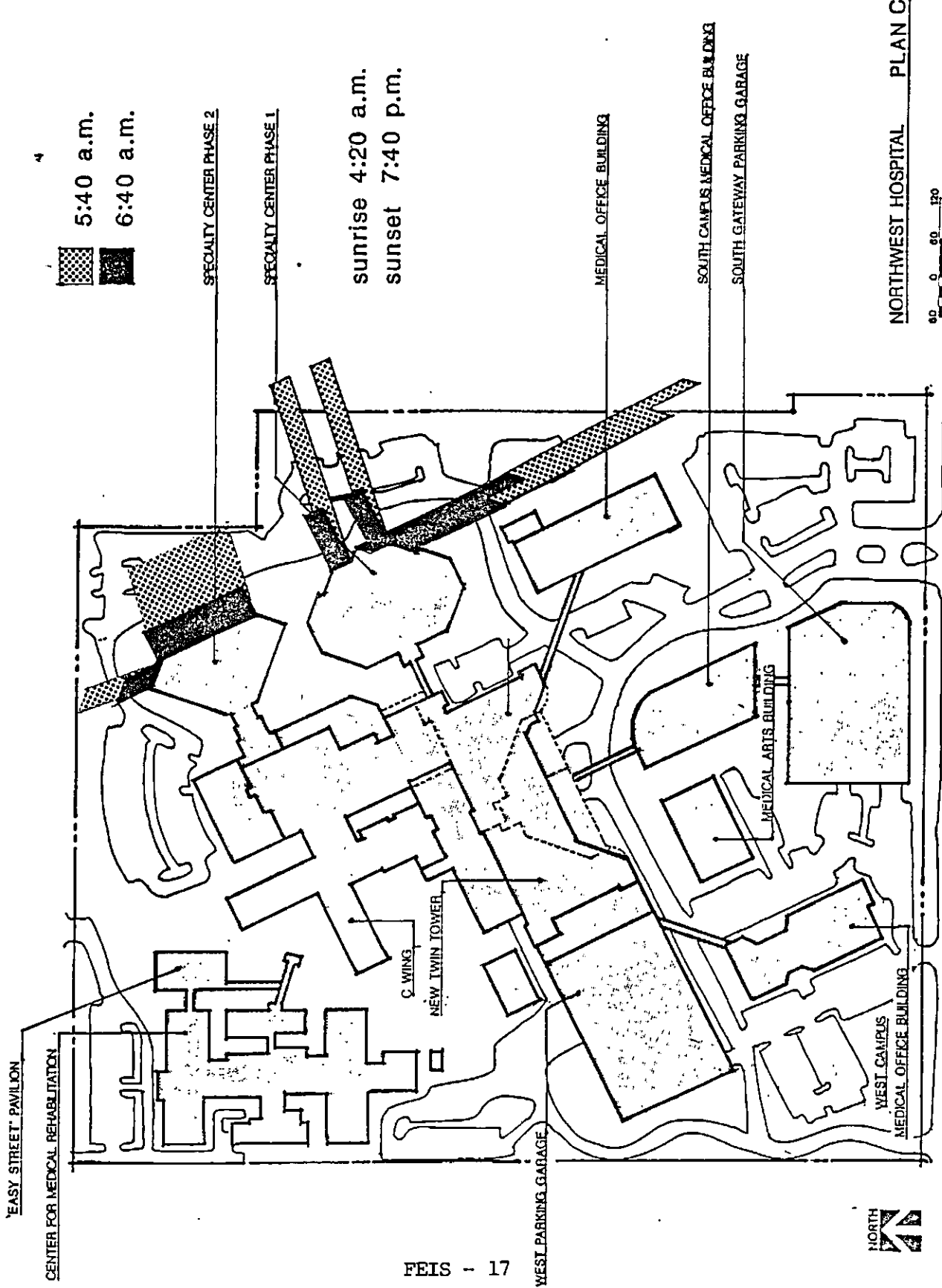


Waldron,
Hickory Smith
Hickory & Smith
Architects

EXHIBIT 5

NORTHWEST HOSPITAL PLAN C

0 60 120



GLARE IMPACTS WINTER - PLAN C

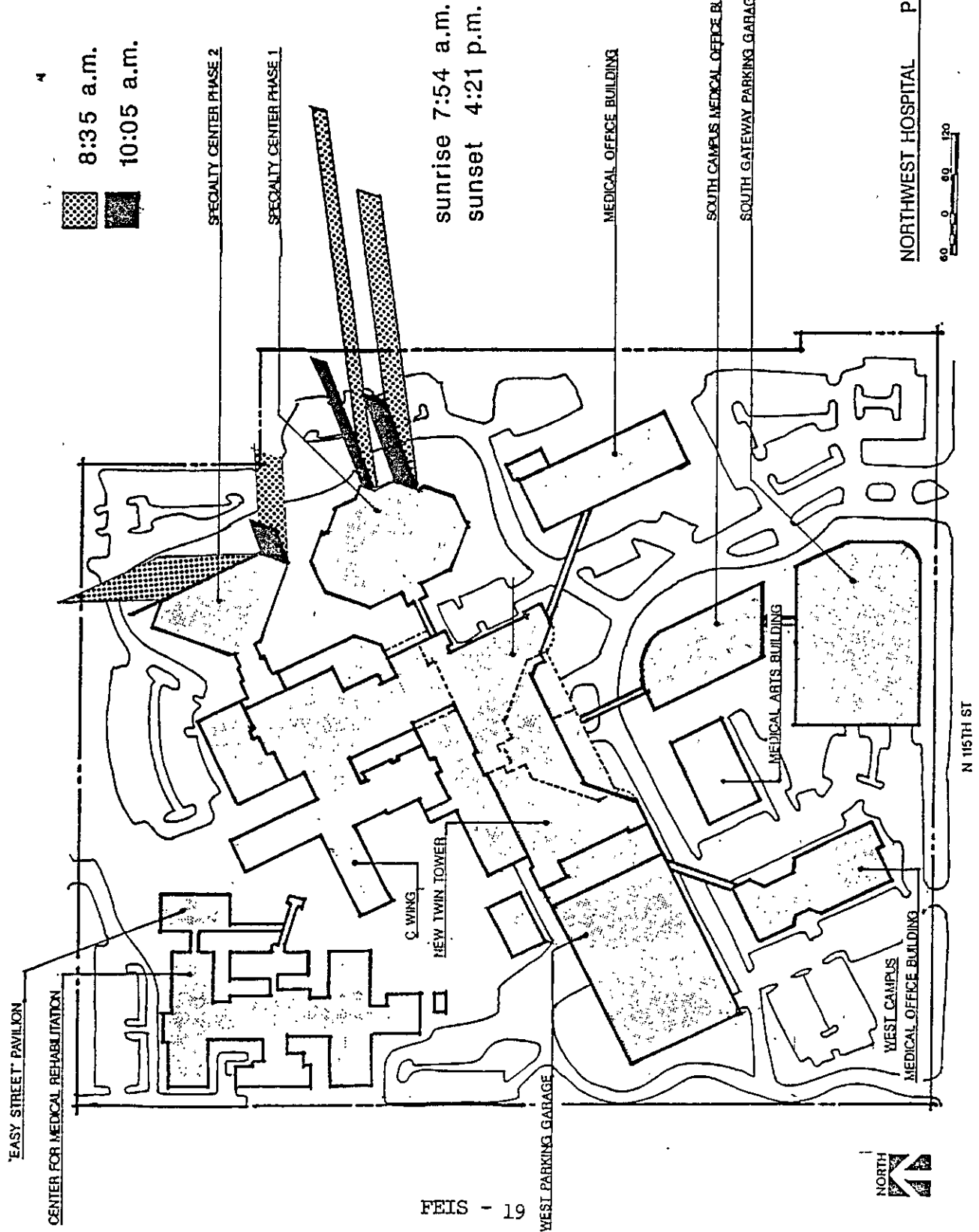


William
H. Hines
Hines & Hines
Architects

Project No.	100-100000
Sheet No.	100-100000
Date	10/1/80
Scale	1" = 100'

EXHIBIT 7

NORTHWEST HOSPITAL PLAN C



B. Shadows

Calculations were made to determine the degree of shadow impact during winter (December 21) as a worst-case condition for Option C (refer to Exhibit 8). In this exhibit, only shadows of proposed buildings which extend beyond campus boundary are shown. Shadows cast by existing trees and buildings are not shown for clarity. Lines of extent of proposed structure shadow from 8:00 a.m. to 4:00 p.m. have been shown. Proposed structures do not cast significant shadows beyond the campus boundaries from February 25 through October 15. In some instances, shadows from existing trees are greater than shadows from existing or proposed buildings. Extent of shadow impact for proposed structures which would affect areas outside the campus between 9:00 a.m. and 3:00 p.m. in December are also illustrated in Exhibit 8.

Specialty Center I: Under Option C, at 8:00 a.m. (6 minutes after sunrise), the shadow of Specialty Center I extends approximately 400 feet beyond the northwest corner of the campus boundary. At 4:00 p.m. (21 minutes before sunset), the shadow extends approximately 1080 feet beyond the east campus boundary.

Specialty Center II: Under Option C at 8:00 a.m. shadows of Specialty Center II extend approximately 450 feet beyond the campus boundary. At 4:00 p.m. the shadow of Specialty Center II extends approximately 400 feet beyond the campus boundary.

South Gateway Garage: Under Option C at 8:00 a.m. the shadow is contained within the campus boundary. Under Option C at 4:00 p.m. the shadow extends 280 feet beyond the east campus boundary.

SHADOW IMPACTS WINTER - PLAN C



William
H. Smith
Architects
P.O. Box 100
Seattle, WA 98101

EXHIBIT 8

Dec. 21 Shadows

- 9 a.m./3 p.m.
- noon
- maximum extent of shadows
- 8 a.m./4 p.m.

sunrise 7:54 a.m.
sunset 4:21 p.m.

NORTHWEST HOSPITAL PLAN C

0 0 0 0 0 120

4 p.m. shadow, typ

8 a.m. shadow, typ.

EAST STREET PAVILION

CENTER FOR MEDICAL RESEARCH

SECURITY CENTER PHASE 2

SECURITY CENTER PHASE 1

C-WING

NEW TWIN TOWER

A-WING

WEST PARKING GARAGE

MEDICAL OFFICE BUILDING

SOUTH CAMPUS MEDICAL OFFICE BUILDING

SOUTH GATEWAY PARKING GARAGE

MEDICAL ARTS BUILDING

WEST CAMPUS MEDICAL OFFICE BUILDING

N 115TH ST



West Parking Garage: Under Option C at 8:00 a.m. the shadow of the West Parking Garage extends approximately 1,450 feet beyond the west campus boundary. At 4:00 p.m. the shadow will be contained within the campus boundaries.

South Campus Medical Office Building: Under Option C at 8:00 a.m. the shadow of the South Campus Medical Office Building will be contained within the campus boundaries. At 4:00 p.m. the shadow extends approximately 730 feet beyond the east campus boundary.

Mitigating Measures

The reduced heights of Specialty Centers I and II in Option C act as mitigation to reduce glare and shadow impacts on the surrounding neighborhood. Glare is also reduced by tall trees planted on the peripheral of the hospital campus.

AESTHETICS

Impacts (Option C)

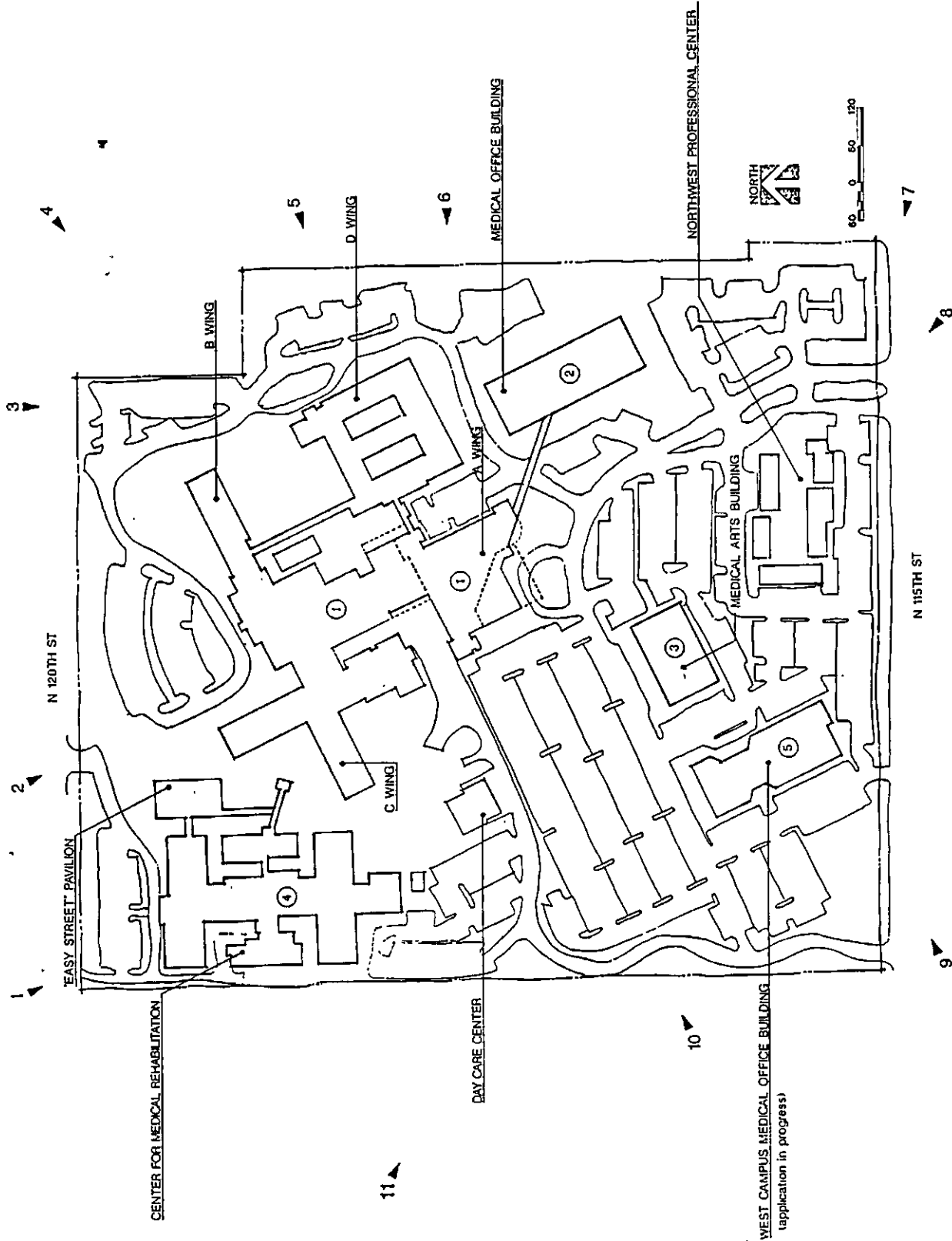
Further analysis was conducted of the impact of the structures proposed by Plan Option C. Refer to Exhibit 9 to locate view-points 2, 3, 4, 5, 8 and 10. These photographs are superimposed with profiles of the proposed buildings under Option C where impacts have been diminished due to downscaling of the proposed facilities. Specialty Center I and II, most visible from the north along North 120th Street, are particularly reduced in scale. (Refer to Exhibits 10 through 13.) View Diagrams from Stendall Place (Exhibits 16 and 17) have also been added to the final EIS.

VIEW DIAGRAMS

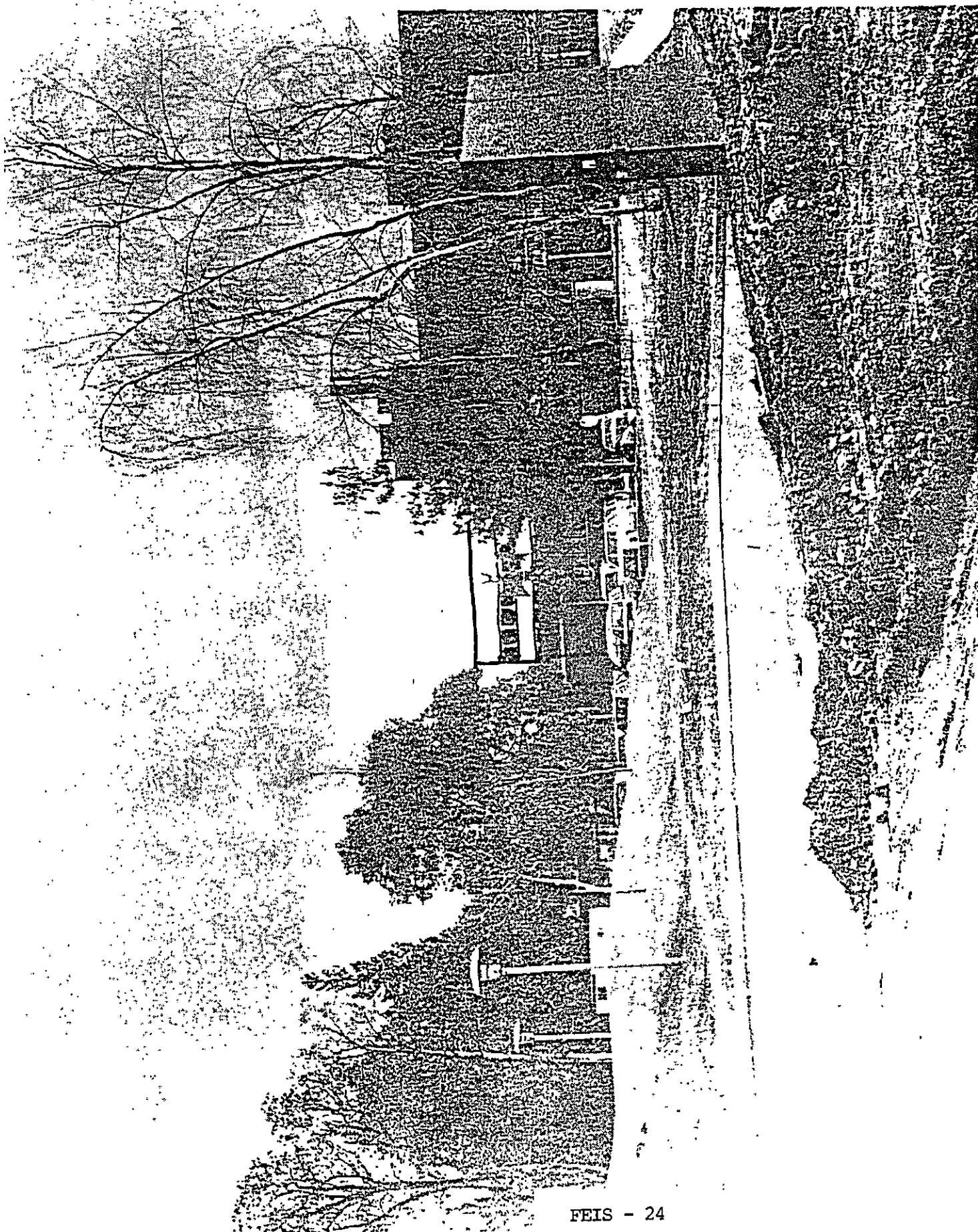


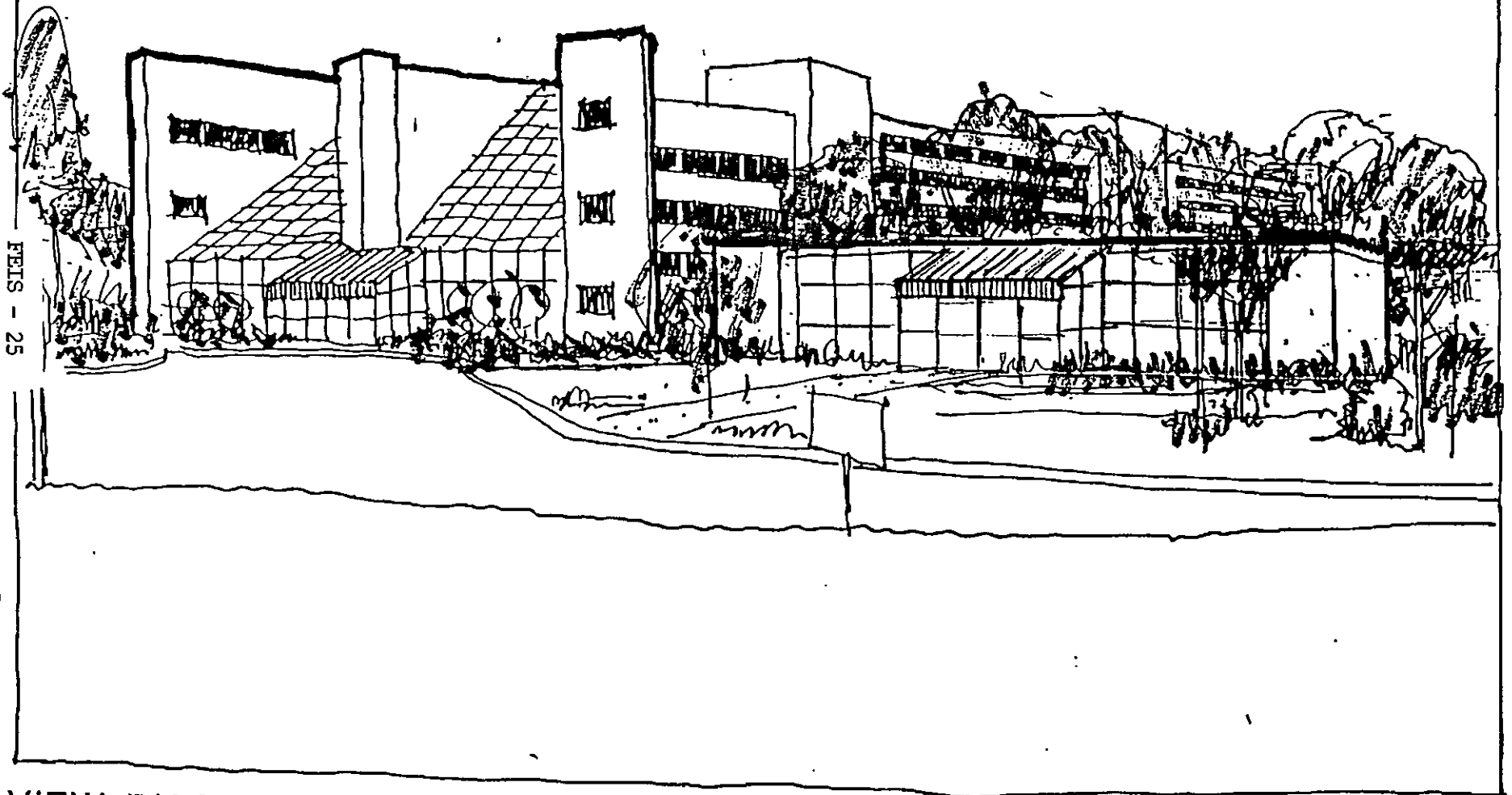
Waldron
Parker Smith
Hawkes & Alden
Architects

EXHIBIT 9



NORTHWEST HOSPITAL VIEW DIAGRAMS





VIEW DIAGRAM 3 (Plan C)

From northeast corner of campus



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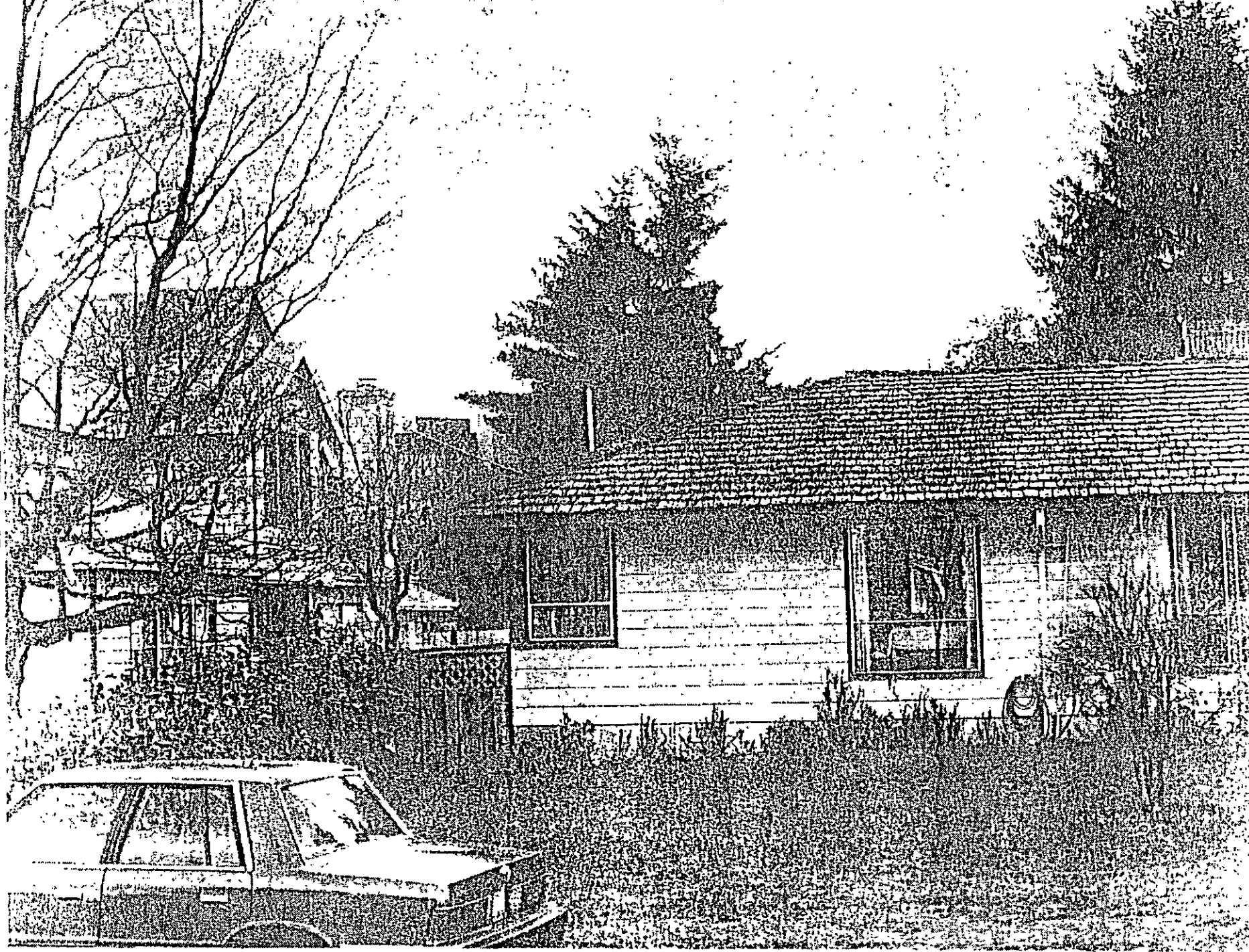
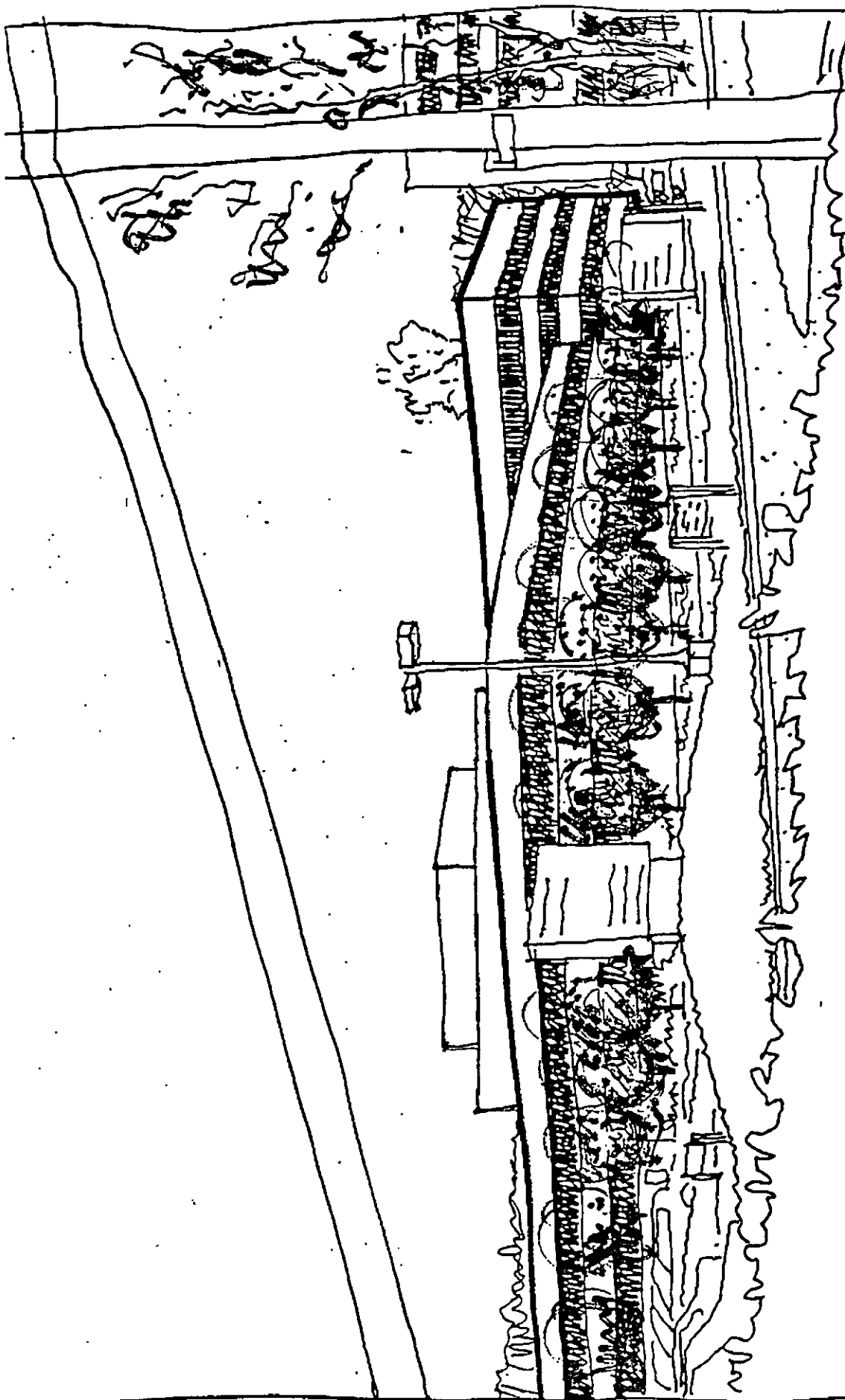


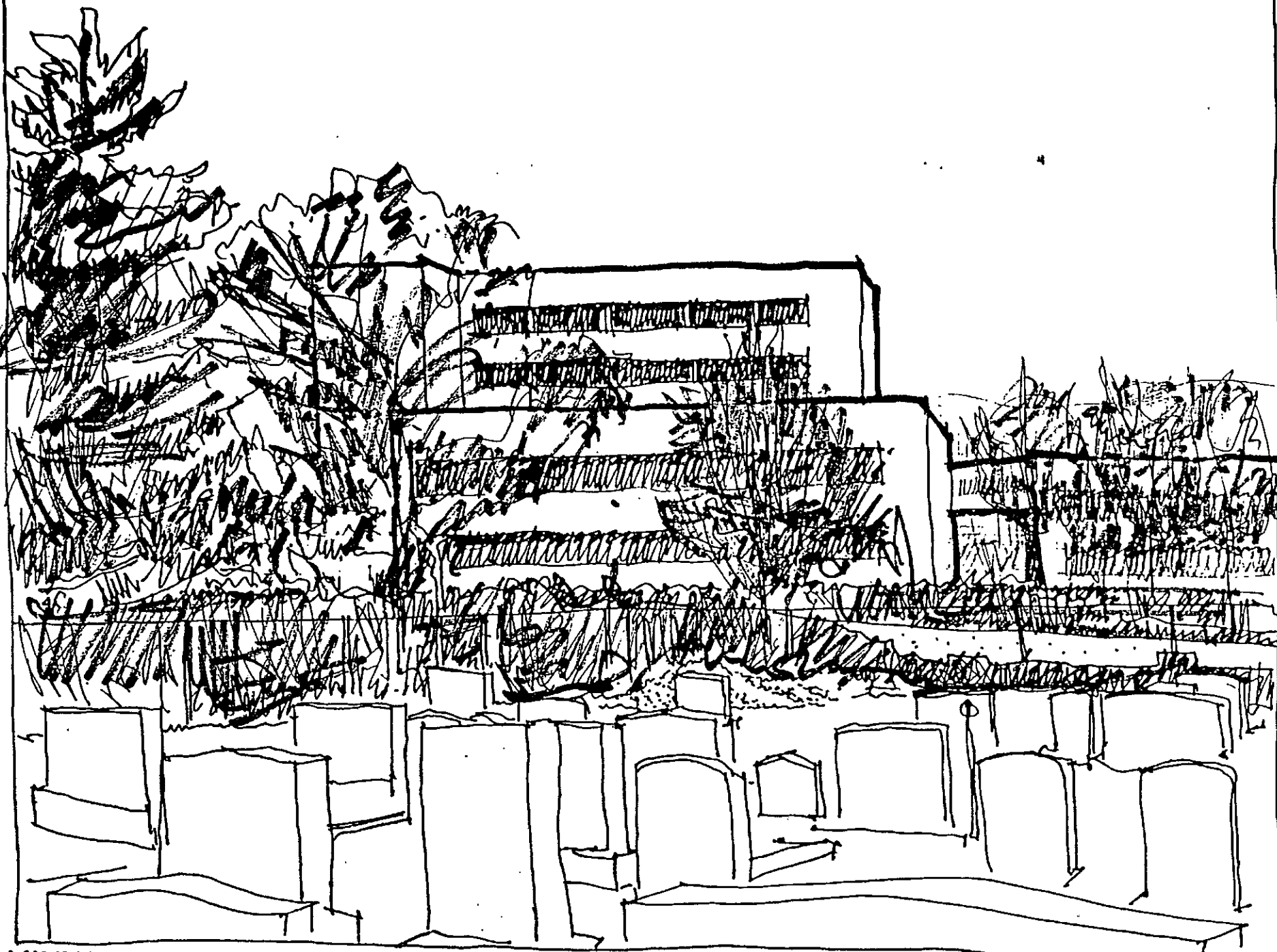
EXHIBIT 13

VIEW DIAGRAM 5 (Plan C)

From Meridian N.



VIEW DIAGRAM 8 (Plan C) From main hospital entrance along N 115th



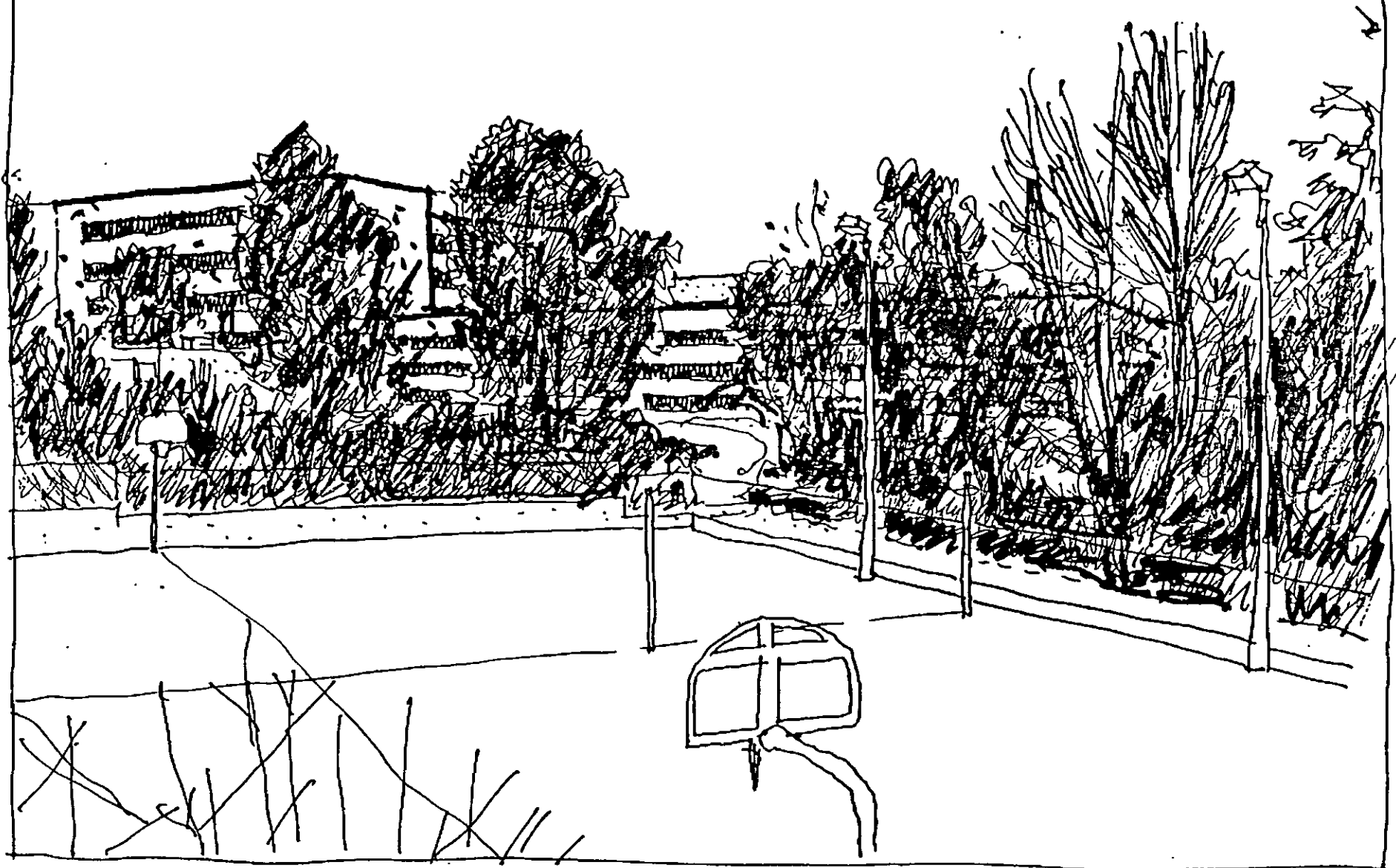
VIEW DIAGRAM 10 (Plan C)

From cemetery at west side of campus



VIEW DIAGRAM 11 (existing)

From Stendall Place



VIEW DIAGRAM 11 (Plan C)

From Stendall Place

TRANSPORTATION

This section contains discussions related to vehicular traffic, parking, the Transportation Management Program (TMP) and traffic hazards. The complete traffic analysis report and the proposed transportation management program are included as appendices to the Final Environmental Impact Statement.

VEHICULAR TRAFFIC

Affected Environment (Updated Traffic Analysis)

Street Network

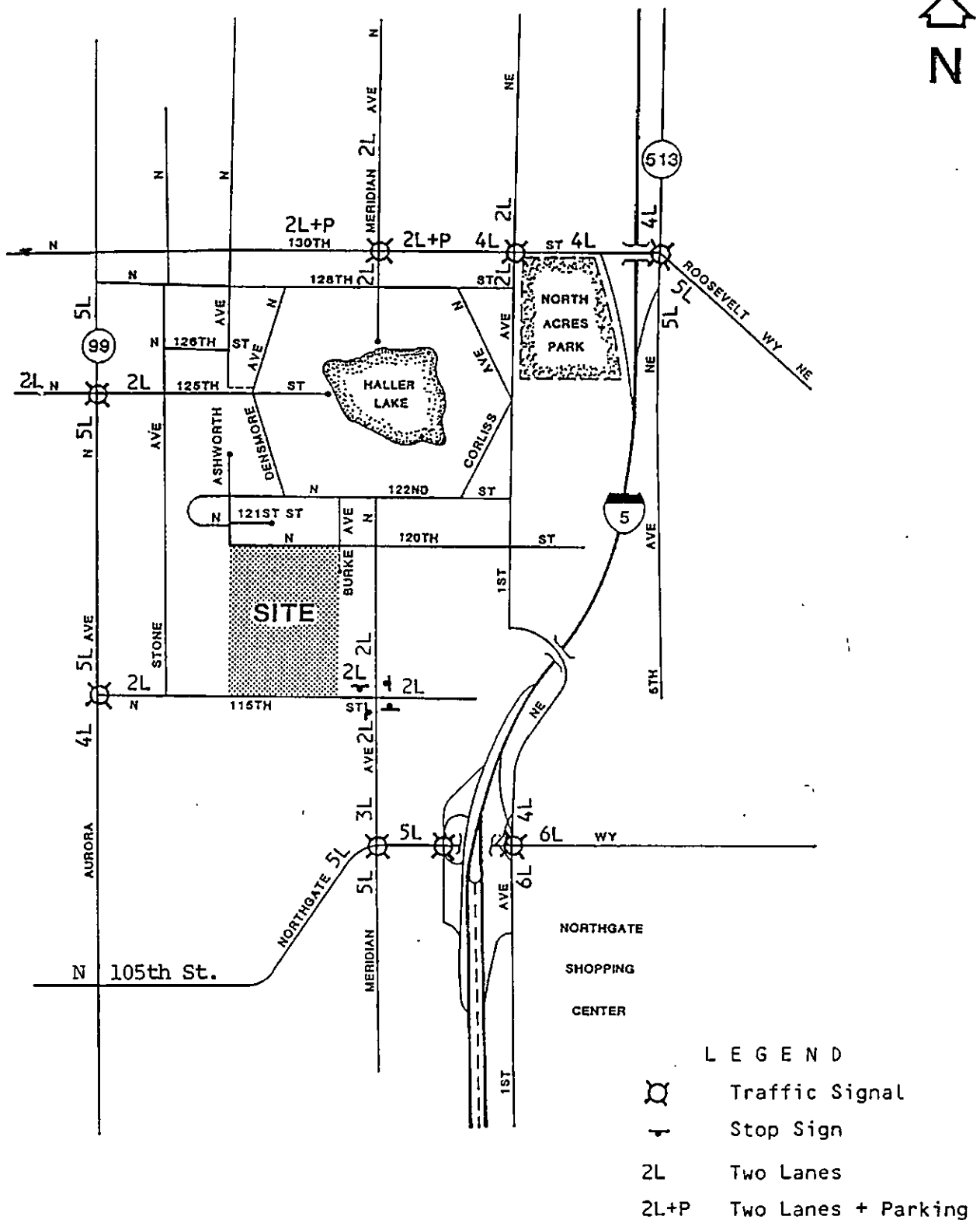
The street system in the vicinity of the Northwest Hospital site generally falls in a grid pattern with the "avenues" running north and south and the "streets" oriented east and west. Exhibit 18 shows the street system in the vicinity of the project site.

Major arterials surrounding the site include:

-- Aurora Avenue N.: a five- to seven-lane principal arterial that runs from Denny Way in downtown Seattle to Edmonds Way S.W. where it becomes Pacific Highway.

-- Meridian Avenue N.: a north-south, two-lane collector arterial that passes through the residential area surrounding Northwest Hospital.

-- Northgate Way: a four- to five-lane arterial which runs from Lake City Way to Ashworth Ave. N. where it becomes N. 105th St. and continues to Greenwood Ave. where it becomes Holman Road.



-- Interstate 5 (I-5): a six to eight-lane divided freeway which runs north and south through Washington, Oregon and California.

-- N. 115th Street: a two-lane main access street for the Northwest Hospital campus that intersects with Aurora Avenue North to the west and Meridian Avenue N. to the east. This street is proposed to be widened to 40 feet with development of the West Campus MOB.

-- N. 130th Street: a two-lane minor arterial that widens into four lanes at the Aurora Ave. N. and 1st Ave. N.E. intersections.

-- 1st Avenue N.E.: a two-lane road included in the analysis because vehicles leaving the Northwest Hospital Campus may access N. 130th St. by turning right off Meridian Ave. N. onto N. 122nd St. and following Corliss Avenue N. to 1st Avenue N.E.

Traffic Control

Traffic control is generally provided with stop signs where local streets intersect the arterial street system. Signals control traffic at the intersections of Meridian Avenue N. and Northgate Way; Meridian Avenue N. and N. 130th Street; N. 115th Street and Aurora Avenue North; 1st Avenue N.E. and N.130th Street; Aurora Avenue North and North 125th Street; Corliss Avenue and Northgate Way; 1st Avenue Northeast and Northgate Way; and 5th Avenue Northeast and North 130th Street. A four-way stop sign presently controls the intersection of N. 115th Street and Meridian Avenue North.

Vehicular Traffic

Traffic volume information was assembled from the City of Seattle Engineering Department files and supplemented by traffic counts made by the traffic consultants in June 1990. This information

represents the most comprehensive set of recent traffic counts in the area.

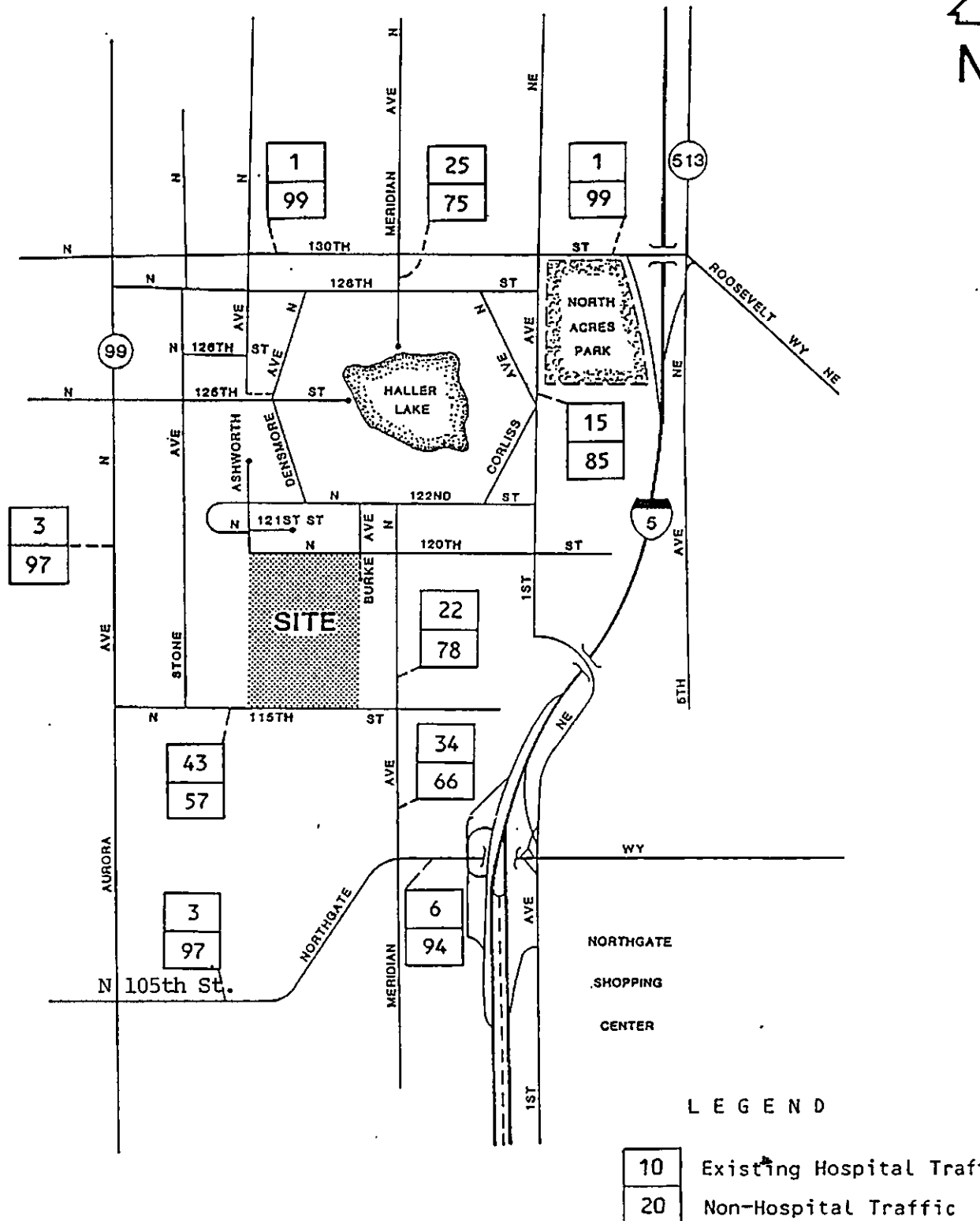
Aurora Avenue North carries 36,350 vehicles per day (vpd) and 3,160 vehicles per hour (vph) in the PM peak hour between North 115th and North 125th Streets. The next most heavily traveled arterial in the area is Northgate Way which serves 35,110 vpd and 2,760 vph in the PM peak hour. In front of the campus, N. 115th Street carries volumes of 6,500 vpd and 560 vph in the afternoon peak hour. Meridian Avenue N. carries 13,820 vpd and 1,190 vph in the PM peak hour at its intersection with Northgate Way. First Avenue N.E. carries 6,100 vpd and 890 vph in the PM peak hour south of its intersection with N. 130th Street. North 130th Street has volumes of 21,000 vehicles daily and 1,650 vph in the PM peak hour at its intersection with Meridian Avenue.

Trips Generated

Currently, an average of 739 one-way vehicle trips on and off the Northwest Hospital campus are generated during peak afternoon hours using major arterials that serve the site. Existing and future trip generation figures were derived from information available in the Institute of Transportation Engineers' (ITE) Trip Generation Manual, (4th Edition). To check the validity of this approach, actual traffic counts at the site driveways were compared against the estimated trip generation associated with the current development. The traffic counts and estimated trips were found to correspond very closely.

Trip Distribution

Exhibit 19 illustrates the existing traffic split between hospital and non-hospital traffic during peak hour.



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Level of Service

Level of Service (LOS) is used as a measure to describe the ability of an intersection to accommodate the peak hour traffic. LOS is expressed on a scale from LOS "A" (free flow) to LOS "E" (substantial delay) to LOS "F" (beyond reliable delay estimates). LOS at a four-way stop is expressed as "saturation level."

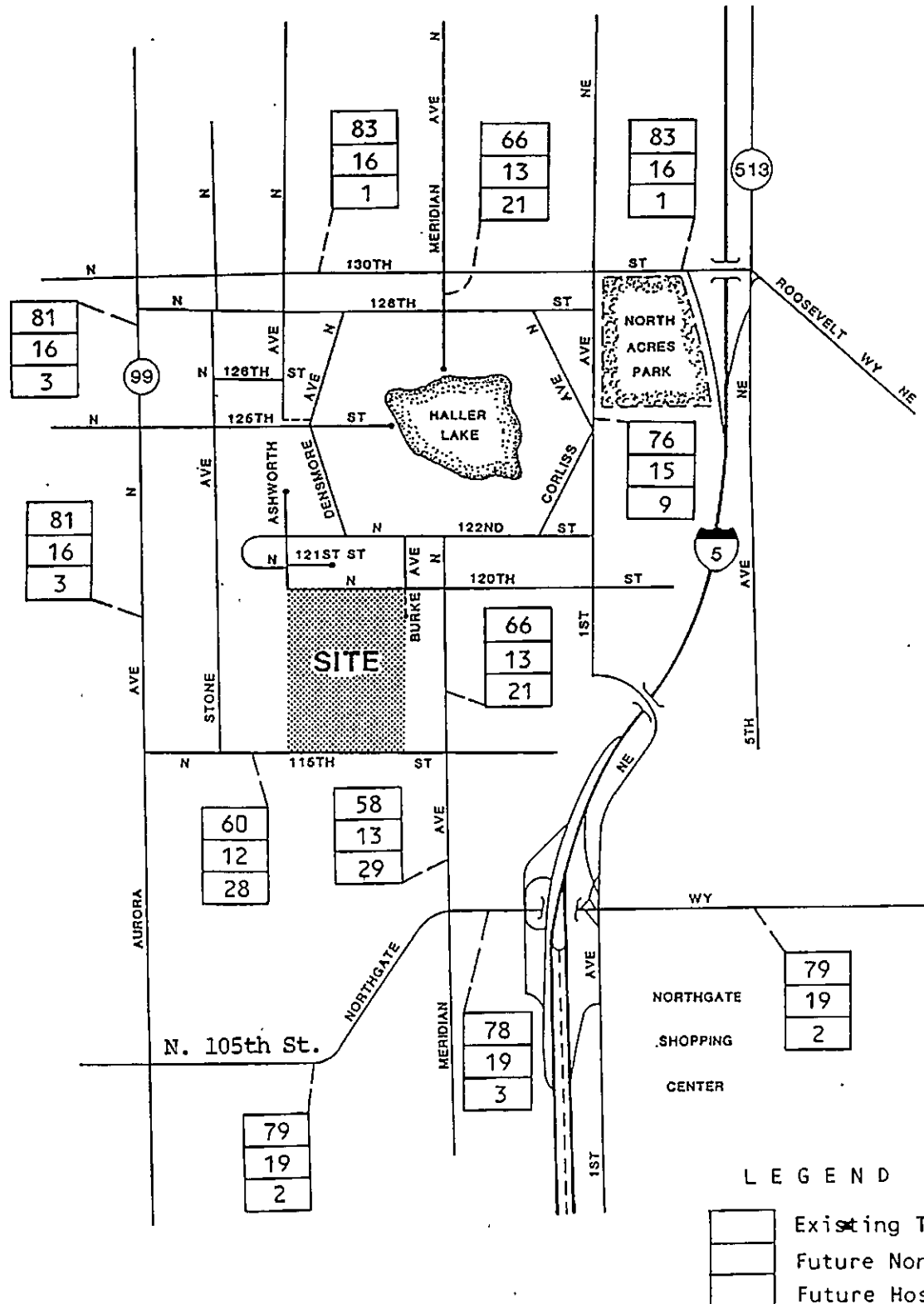
The following table illustrates existing LOS information for the nine main intersections surrounding Northwest Hospital:

<u>Intersection</u>	<u>Existing LOS (1990 Data)</u>
Northgate Way/Meridian Ave.	F (Delay beyond reliable est.)
N. 130th St./Meridian Ave.	B (12.3 second delay)
N. 130th St./1st Ave.	F (Delay beyond reliable est.)
N. 115th St./Aurora Ave.	D (34.5 second delay)
N. 115th St./Meridian Ave.	C (68% saturation level)
Aurora Ave./N. 125th St.	C (19.0 second delay)
Corliss Ave./Northgate Way	B (11.0 second delay)
1st Ave. N.E./Northgate Way	F (Delay beyond reliable est.)
5th Ave. N.E./N. 130th St.	F (Delay beyond reliable est.)

Impacts of Option C

Vehicular Traffic

To clarify the proportions of future non-project and future hospital-related traffic in the year 2000, Exhibit 20 reflects the percentages that plan option C would contribute to 2000 traffic volumes. The highest percentage of future hospital traffic for Plan C on a major street is along Meridian Avenue N. between Northgate Way and N. 115th. For Plan C hospital traffic will contribute 29% of future volume. This represents 59% of the total traffic increase on this portion of Meridian Ave. N. by the year 2000. The added hospital volume along N. 115th between Aurora Avenue and Meridian Avenue N. will contribute 28%



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YEAR 2000 TRAFFIC VOLUME
PERCENTAGES

TSI

Transportation Solutions Inc.

NORTHWEST
HOSPITAL
CAMPUS

of future volume. Along major streets including Aurora Avenue N., Northgate Way and N. 130th Street, future hospital traffic contributes 3% or less of the future 2000 traffic volumes under plan option C.

Trips Generated

Due to the variety of structures and building uses included in the Master Plan, trip generation estimates were developed for each increment of the Master Plan. The factors of building floor area and probable use (i.e., inpatient, outpatient) were determined for each new structure. Exhibit 21 reflects the incremental peak hour trips generated by each of the facility additions proposed under plan option C.

Level of Service

Transportation Solutions, Inc., the traffic engineering firm retained to undertake the analysis, indicates that in 2000, with or without the addition of the project traffic volumes, all intersections analyzed deteriorate to LOS-F with the exception of Corliss Avenue/Northgate Way which declines to LOS-C. This deterioration is mainly due to non-project traffic volumes created by other new developments in the area and the shifting of travel patterns by driver. (See Exhibit 22.)

Mitigation Measures

Mitigation measures include both street improvement as well as policy and programmatic strategies. Policy and programmatic mitigation strategies were previously discussed in the Draft EIS.

PEAK HOUR
TRIP GENERATION SUMMARY

OPTION C

	TRIPS	TOTAL	
CURRENT:	739	739	
WITH WEST CAMPUS MOB:	210	949	
WITH WEST CAMPUS MOB AND:			
TWIN TOWERS	237	1186	
SPECIALTY CENTER I	110	1296	
SPECIALTY CENTER II	101	1397	
SOUTH CAMPUS MOB	213	1610	
SWEDISH TUMOR INSTITUTE	5	1615	
A/B WING CORRIDOR	3	1618	
HEART/CATH LAB	21	1639	
ADMINISTRATIVE ADDITION	42	1681	
DAYCARE ADDITION	6	1687	
DEMOLISH B/D WINGS	-81	1606	
DEMOLISH NW PROF CENTER	-44	1562	
TOTAL TRIPS		1562	(480 TRIPS ENTER/1082 EXIT)
TOTAL NEW TRIPS		823	(258 TRIPS ENTER/565 EXIT)
TOTAL NEW TRIPS WITH MODE SPLIT REDUCTIONS		773	(243 TRIPS ENTER/530 EXIT)

TABLE 3
LEVEL OF SERVICE SUMMARY
LOS (DELAY) [V/C RATIO]*

SIGNALIZED INTERSECTION LOS (DELAY)	1990 EXISTING	2000 W/O PROJECT	2000 W/ PROJECT
AURORA AVE/N 115TH ST	D (34.5)	F [1.26]	F [1.41]
AURORA AVE/N 125TH ST	C (19.0)	F [1.18]	F [1.24]
MERIDIAN AVE/NORTHGATE WAY	F [1.34]	F [1.72]	F [2.01]
MERIDIAN AVE/N 130TH ST	B (12.3)	F [1.16]	F [1.22]
CORLISS AVE/NORTHGATE WAY	B (11.0)	C (17.6)	C (23.4)
1ST AVE NE/NORTHGATE WAY	F (78.9)	F [1.36]	F [1.40]
1ST AVE NE/N 130TH ST	F [1.66]	F [2.48]	F (**)
5TH AVE NE/N 130TH ST	F [0.74]	F [0.95]	F [0.97]

* The Volume to Capacity (V/C) ratio has been listed in "[]"
as a measure of comparison where the average vehicle delay
cannot be calculated due to restrictions in LOS software.

** Neither V/C ratio nor delay can be calculated.

FOUR-WAY STOP INTERSECTION LOS (SATURATION LEVEL)***	1990 EXISTING	2000 W/O PROJECT	2000 W/ PROJECT
MERIDIAN AVE/N 115TH ST	C (68%)	D (82%)	F (109%)

*** For four-way stop intersections, the LOS is based on
Saturation level, which is a measure of the percent
of available capacity used up at the intersection.

Suggested Street Improvements

Potential street improvements that could serve as mitigation strategies are identified on an intersection-by-intersection basis for Option C. (See figures 12 through 17 in the Revised Traffic Analysis included as Appendix A in the FEIS.) These represent the improvements that alone would mitigate impacts if the TMP is not successful. These improvements are options only, to be considered by the Seattle Engineering Department. Final decision-making about which street improvement options to implement has not occurred. See Appendix A (page A32) for discussion of Level of Service (LOS) improvements associated with proposed street improvements. The actual improvements necessary are dependent on the success of the TMP. For a full discussion of the street improvements and schematic designs of improvements to all major intersections in the vicinity of Northwest Hospital, please refer to the complete Revised Traffic Analysis included as Appendix A of the FEIS.

Unavoidable Adverse Impacts

An unavoidable increase in hospital-related traffic occurs with the implementation of plan Option C.

Construction of the various facilities will also cause some unavoidable delays and inconveniences in the vicinity of the project site.

No Action Alternative

With or without the addition of the project traffic volumes, all intersections analyzed deteriorate to LOS-F with the exception of Corliss Avenue and Northgate Way which declines to LOS-C with or without project additions. Much of the deterioration in LOS

is due to the growth in traffic volumes generated by other new developments or redevelopments (i.e., Northgate apartments, Northgate Mall, etc.). (See Exhibit 20 for percentage estimates of future non-project growth.)

PARKING

Impacts (Option C)

The long-term parking space demand associated with Master Plan Option C is set forth in Exhibit 23. This exhibit shows additional parking will be provided by construction of two parking garages. The exhibits also reflect further reduction of on-street parking spaces on N. 115th to account for further street improvements.

Phase I will include construction of the West Campus Parking Garage and is expected to satisfy actual parking demand generated by the Twin Tower in Phase II of the Master Plan.

Mitigation

Due to scaled down development under Plan C, there will be a reduced demand for parking facilities compared to Option A and B.

SOLID WASTE DISPOSAL

Affected Environment (Additional Information)

During 1989 Northwest Hospital established a Recycling Committee to identify areas where recycling is possible, to develop recycling procedures and to identify methods to eliminate unnecessary use of disposable items. In addition to recycling of

EXHIBIT , PLAN C

NORTHWEST HOSPITAL CAMPUS				PARKING SPACE DEMAND				PARKING SPACE SUPPLY					PARKING SURPLUS OR (DEFICIENCY)
DEV. PHASES (EST. YR OF COMPL.)	I.D. #'s	BUILDING DESCRIPTION	AREA (GSF)	PER PROP. BLDG.	CUMUL. DEMAND	TMP ADJ. (a)	REDUCED CUMUL. DEMAND	CAMPUS SURFACE PARKING	REM. LOT SURFACE PARKING	PARKING GARAGES	N. 115TH STREET PARKING	TOTAL PARKING PROVIDED	
1990	1-4	EXISTING BUILDINGS	265,440	1,500	1,500	1.00	1,500	874	190	0	140	1,204	(296)
1990	5	WEST CAMPUS M.O.B.	59,353	267	1,767	1.00	1,767	874	190	0	105	1,169	(598) (b)
1990		PARKING LOT MOD'S(c)	0	0	1,767	1.00	1,767	1,333	190	0	105	1,628	(139)
1990	12	SWEDISH TUMOR INSTITUTE	1,700	0	1,767	1.00	1,767	1,333	190	0	105	1,628	(139)
PHASE I 1992 FEIS - 44	13	A-WING/B-WING CORR.	2,205	0	1,767	0.98	1,732	1,333	190	0	105	1,628	(104)
	14	CATH. LABORATORY/ SUPPORT SERV. ADD.	13,305	11	1,778	0.98	1,742	1,333	190	0	105	1,628	(114)
	15	ADMINISTRATION ADDITION	13,000	30	1,808	0.98	1,772	1,333	190	0	105	1,628	(144)
	16	DAY CARE ADDITION	2,000	0	1,808	0.98	1,772	1,333	190	0	105	1,628	(144)
	6	WEST GARAGE	250,000	0	1,808	0.98	1,772	(339) 994	190	900	105	2,189	417
PHASE II (1995)	7	TWIN TOWER	149,946	242	2,050	0.95	1,948	(68) 926	190	900	60	2,076	128
PHASE III (1997)	8	SPECIALTY CENTER I	65,000	212	2,262	0.93	2,104	(70) 856	190	900	60	2,006	(98)
PHASE IV (1999)	10	SOUTH CAMPUS M.O.B.	60,000	(269-62 NWPC) 207	2,469	0.91	2,247	(100) 756	190	900	60	1,906	(341) (d)
	11	SOUTH GATEWAY GAR. (+650 CARS)	168,000	0	2,469	0.91	2,247	(105) 651	190	1,550	60	2,451	204
PHASE V (2000)	9	SPECIALTY CENTER II	40,000	(189-120 B-wing) 69	2,538	0.90	2,284	721	190	1,550	60	2,521	237

(a) 1% Annual reduction in demand based on HOV goals in TMP.

(b) Because surface lot modifications would be built in conjunction with West Campus M.O.B., the parking deficiency would be (139).

(c) If the West Garage is built in lieu of all surface parking modifications, Campus surface parking would increase to 994, garage stalls would increase to 900 and the parking surplus would be 422.

(d) Because the South Garage would be built in conjunction with the South Campus M.O.B., the parking surplus would be 204.

cardboard since the beginning of 1990, Northwest Hospital has established institution-wide mechanisms for recycling computer paper, white paper and aluminum cans. A separate compactor for cardboard is also being acquired to accomplish total recycling of all cardboard.

During 1991 the capital budget will include funding to eliminate all disposables from the cafeteria, coffee shop and patient trays through acquisition of reusable glassware, tableware, etc.

Additionally, newspaper has been continuously recycled by the Northwest Hospital volunteers since 1986.

Incinerated waste from the hospital may still be accommodated by an improved facility that meets or exceeds air emissions standards (see Air Quality). Alternatively, the incinerator could be replaced with alternative means of disposal, including shipping to landfill and/or remote processing locations.

The present incinerator consumes about two tons of waste per day. At this rate, it is operating well below its maximum capacity. It has operated at four tons per day in the past, very near to its maximum capacity. Increased recycling, moving more noninfectious waste to landfill, and ceasing to accept material from medical tenants other than Northwest's are the reasons for the decrease.

At the time it was installed, the existing incinerator met the air quality requirements for emission of particulates. There were no specific limits on other emissions. After the regulations limiting emission of chlorides was adopted, the machine was tested. It did not meet the requirements of the new regulation.

At the same time period, waste that is potentially infectious -- now called "biohazardous" -- began to be regulated at the federal, state and local levels. The thrust of this increased regulation is to broaden the definition of what is "biohazardous" and require special treatment. At Northwest, the result of the tightening regulations is to increase the amount of waste from the existing facility that must be treated as biohazardous. Increases because of facility growth are in addition to the increases because of regulatory changes.

The replacement incinerator will have a nominal capacity of nine tons per day, with a practical maximum of seven to eight tons per day. The size was chosen to accept the waste production of Scheme A with biohazardous waste defined as it is now, under federal law, on the east coast of the U.S. With Scheme C or smaller, use is unlikely to exceed six tons per day.

The new incinerator system will meet the regulations for chloride emissions, in this instance 80% removal with an upper limit of 100 parts per million. The chosen removal method, dry lime scrubber with baghouse, will also remove other potential emissions. For example, the incinerator is designed to meet particulate limits without the control gear. By adding the baghouse to reduce chlorides, particulates are expected to decrease by more than 90%. The result will be far less particulate emission than the existing incinerator. Other potential pollutants will be greatly reduced as well.

Of the methods of dealing with biohazardous waste, incineration on site was selected as a proven technology that allows Northwest Hospital to deal with the waste on site and with full control. Alternative on-site treatments, including sterilization with steam or with chemicals, raise issues of chemical discharges to the air and/or the sewers. Off-site methods reduce

the control of the process by the hospital, making it more difficult to make sure the process is being done correctly. Off-site methods also require that the untreated biohazardous waste be transported to the treatment site over public streets. The incineration option was selected as having the best overall control over biohazards, air emissions, and sewer discharge.

Impacts in the waste stream for Option C are not expected to be more than 5% to 10% less than the impact generated by Option A, particularly in view of the fact that both options forecast the same number of inpatient beds, the largest source of waste.

WATER/STORM WATER

Impacts (Option C)

The existing detention pond on the hospital campus is 50,400 cubic feet in size with a restricted orifice that limits outflow to a maximum release rate of 4.0 cubic feet per second. The pond was designed in 1980 to handle storm water during a 10-year storm from ultimate development of 30.39 acres of the hospital campus (the maximum runoff coefficient was assumed to be $C = 0.75$). It was also designed to accept storm water from Stendall Place (7.65 acres) and an 8.26-acre residential area to the north. One portion of the hospital campus, a 1.82-acre area near the Northwest Professional Center, drains directly to North 115th.

The City of Seattle now requires the detention pond to be sized for a 25-year storm. The Seattle Engineering Department has also requested that the pond be sized to handle runoff from the 1.82-acre area near the Northwest Professional Center.

Considering these factors and the calculated increase in impervious surface area under the master plan (the maximum runoff coefficient for Plan A was calculated to be $C = 0.64$), the detention pond must be increased in size to 57,011 cubic feet while maintaining the current release rate of 4.0 cubic feet per second.

WATER SUPPLY

Affected Environment

Northwest Hospital's water service is supplied by a Seattle Water Department distribution system (580' pressure zone) in the north end of Seattle. The water reservoir serving this particular distribution system network is located north-northwest of the campus between North 138th and North 143rd Streets and Evanston Avenue North and Linden Avenue North.

Northwest Hospital's connections to this network occur at the intersection of North 115th Street and Meridian Avenue North and on North 120th Street. The City's water supply at both locations is provided by an 8" diameter main pipe.

Inside the Northwest Hospital's Campus, water is distributed through a private 10" diameter supply line pipe and loop system. All of Northwest Hospital Campus Facility's domestic, irrigation, fire protection and fire hydrant water are tapped from this looped supply line system. Internally, several of the buildings' on-Campus water use is metered by private water meters to apportion their share of the overall water consumption costs.

Irrigation systems for the majority of the landscaping on Campus are tapped directly to the main water supply line. The

remainder of the irrigation systems are supplied on the building side of the privately metered Medical Office Building.

In addition to the water being supplied to the individual buildings' sprinkler systems, the Campus is protected by nine fire hydrants connected to the private supply loop.

WATER DISTRICT SERVICE CAPACITY

The entire Northwest Hospital Campus is located within the water service pressure zone of 580'. At the present time, no problems have been identified in the local water distribution system supplying Northwest Hospital. On Campus, there have been occasional reports of lower water pressures at peak demand hours of the day in the upper floors of the A-Wing Hospital Tower. It is likely, however, that this condition could be alleviated by use of a booster pump to service these floors.

Static water pressures from the Seattle water distribution system's 8" mains were taken on August 4, 1990 at City fire hydrants at Meridian Avenue North and North 115th Street (Elev. 374'), and at Densmore Avenue North and North 120th Street (Elev. 392'). These pressures were 86 psi and 78 psi, respectively. The pressure differential between these two hydrants corresponds to the elevation difference between them. On August 28, 1990, the static pressure at the City hydrant on North 120th Street measured 79 psi. At this same time the static water pressures were taken on Campus at a hydrant on the south side of D-Wing and at the hospital's check valve vault on the north side of B-Wing. These pressures were 70 psi and 65 psi, respectively.

Fire flow capacity, which is generally the governing factor in the design of a water distribution system of this size, is less

than the ideal standard of 1500 gpm or more in this water distribution system and on Campus. The Washington Surveying and Rating Bureau, which establishes the risk ratings and protection grading schedules for fire protection in the State, records fire hydrant flow on Campus as having a static pressure of 70 psi and a flow of 980 gpm with 45 psi residual pressure. Similar testing by an outside consultant on August 28, 1990 corroborated this data within a range of approximately one or two percent static pressures. Based on this data to achieve approximately 1500 gpm of flow out of this system through a pumper would draw the static pressure down to the range of 10 to 20 psi.

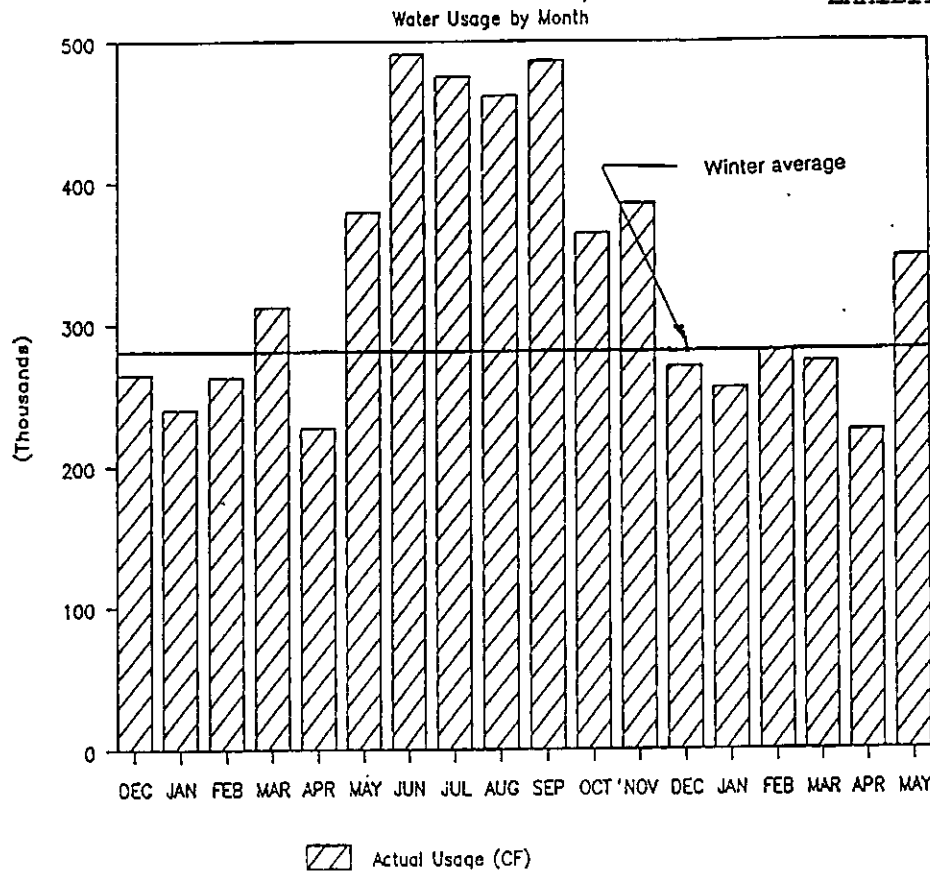
Good water pressure in the Seattle area is generally considered to be above 60 psi; acceptable water pressure to be above 40 psi. In developing fire water flow capacity, it is considered acceptable to draw the static pressure with the use of fire truck pumpers down to a range between 10 and 20 psi. A static pressure below this range has the potential of imposing negative water pressures on the water distribution system.

Water Use

The current overall annual water consumption by Northwest Hospital Campus is approximately 32.5 million gallons. From the City of Seattle's water bills, a histogram shows the Campus's monthly water consumption from December 1989 through May 1990 (Exhibit 24). This data indicates a significant irrigation water use component in the Spring and Summer months of the year. Based upon the City of Seattle Water Department's billing computer, the average Winter water use by the Campus is 260,300 cubic feet/month (or 1,947,300 gallons/month). In the drier months of June, July, August, and September, the Campus's water use is increased to approximately 480,000 cubic feet/month (or 3,591,000 gallons/month), an approximate 85 percent jump over the Winter average water demand.

Northwest Hospital

EXHIBIT 24



Total Consumption 1989	4349500 cf (32.5 MG/year)
Winter Average x 12 months	3383900 cf (25.3 MG/year)
Yearly Irrigation Component	965600 cf (7.2 MG/year)

Data is based on 1989 calendar year actual usage, and were obtained from City of Seattle Water Department billing to Northwest Hospital.

From Exhibit 24 data, it is estimated that approximately 7.2 million gallons/year of water is presently utilized by the Campus for irrigation, and approximately 25.3 million gallons/year of water is used for domestic purposes.

Northwest Hospital Campus's landscaping currently consists of a mixture of high- and low-water demand areas. Currently irrigation water use on Campus accounts for approximately 22 percent of the total annual volume of water used by the Campus.

Impacts (Plan C)

Expected water consumption on the Campus will change as buildings and landscaped areas are removed, added, and modified. The most extensive changes will result from increased water uses due to major additions to the hospital and the development of additional buildings on Campus. With full development, irrigation water demands are expected to be reduced a minimum of 16 percent from current demand levels. By including all of the proposals of the Master Plan over the phased implementation of development shown in the Master Plan will eliminate approximately 16 percent of current turf and other irrigated planing areas in relationship to the whole Campus.

Projections for irrigation and domestic water consumption are given in the Water Use Summary Table (Exhibit 25). The projections include expected consumption for existing buildings which will remain, based upon current usage, along with reduced irrigation water demands to reflect expected landscaping area reduction. Estimates of annual water use consumption for Plan C are derived from the existing water consumption for the Campus. These values derived from existing use characteristics show the increase in water consumption as directly proportional to the increase in square foot area of development.

NORTHWEST HOSPITAL CAMPUS
MASTER PLAN 'C'
Projected Water Usage

BUILDING	DESCRIPTION	EXISTING		PLAN 'C'	
		YEARLY FLOW (MG/YEAR)	PEAK DEMAND* GPM	YEARLY FLOW (MG/YEAR)	PEAK DEMAND* GPM
1	** MAIN HOSPITAL	22.1	126.1	18.5	105.6
2	** MEDICAL OFFICE BLDG	1.8	10.3	1.8	10.3
3	** MEDICAL ARTS BUILDING	1.0	5.7	1.0	5.7
4	** MED. REHABILITATION CTR.	0.3	1.7	0.3	1.7
5	WEST CAMPUS M.O.B.	0	0.0	1.6	9.1
6	WEST PARKING GARAGE	0	0.0	0.4	2.4
7	TWIN TOWER	0	0.0	12.5	71.3
8	SPECIALTY CENTER PHASE I	0	0.0	5.4	30.9
9	SPECIALTY CENTER PHASE II	0	0.0	2.1	12.0
10	SOUTH CAMPUS MOB	0	0.0	1.6	9.1
11	SOUTH GATEWAY GARAGE	0	0.0	0.3	1.6
12	SWEDISH TUMOR INST.	0	0.0	0.1	0.8
13	A-WING/B-WING CORRIDOR	0	0.0	0.2	1.0
14	CATH. LAB/SUPPORT SERVICES	0	0.0	1.1	6.3
15	ADMINISTRATION ADDITION	0	0.0	0.4	2.3
16	DAYCARE ADDITION	0	0.0	0.1	0.6
	SUBTOTAL - DOMESTIC USAGE	25.2	143.8	47.4	270.7
	IRRIGATION	7.2	41.1	6.0	34.2
	TOTAL WATER USAGE	32.4	184.9	53.4	304.9

- * PEAK (INSTANTANEOUS) DEMAND
= 3 x AVERAGE DAILY FLOW
- ** EXISTING BUILDINGS

LEGEND:
MG/YEAR - MILLION GALLONS PER YR
GPM - GALLONS PER MINUTE

Due to current water usage and some general assumptions for parking garage water use, the projected water demand has been estimated based upon four facility types. These are Hospital Buildings, Medical Office Buildings, Irrigation System, and Parking Garages.

Parking garage water use was estimated based on the assumption that parking garage will have one rest room facility and will have hose bibs located throughout for use in periodic washing down of the parking decks for cleaning purposes.

Estimating instantaneous peak demands on a water system, in other words, estimating the highest water demand at a particular instance, is difficult. Exhibit 25 shows peak demands as a cumulative factor of three times the average daily water flow for each of the existing and proposed (Plan C) facilities at Northwest Hospital. Statistically, as the community grows, and the number of water users increases, the distinction between peaks and valleys of water demand diminishes and actual water demand becomes more uniform over times of the day. Based upon the cumulative total of peak demand estimates in Exhibit 25, the estimated total peak water usage would not lower the water pressure below 40 psi, which is considered acceptable. Also, any reduction in water pressure at peak demand would only affect the system in reduction of static pressure for a very short period of time.

Mitigating Measures

All new buildings and additions to existing buildings on Campus will be subject to review by the Seattle Water Department and the Fire Department during the permit process. This review will address impacts due to increased demand on the water distribution system and the ability of the water supply system to provide adequate fire flow.

Future medical office buildings (154,353 square feet) are projected to consume 4.2 million gallons of water each year.

Future parking garages (418,000 square feet) are projected to consume 0.7 million gallons of water each year.

Future hospital buildings (252,156 square feet) are projected to consume 21.0 million gallons of water each year.

Irrigation water use on Campus is projected to decline by 1.2 million gallons a year below current consumption levels.

A further reduction in irrigation water usage will be realized as other portions of the Campus landscape are converted from turf to natural (xeric) nonirrigated areas. The current landscaping direction on Campus is in the use of Northwest native drought-tolerant plants. As proposed Campus projects are developed, the existing water-intensive plantings will be replaced and the new xeric concept implemented.

Once the majority of the Campus has been converted to the xeric plant scheme, it will be possible to incorporate a fully automatic irrigation shut-off system for those limited areas still requiring supplemental water. There are devices available that override the entire system, such as radio control transceivers and automatic rain shut-off devices that are able to shut off the system if preset levels of precipitation have been reached. This further sensitizes watering systems for seasonal and daily weather variations.

Domestic water consumption can also be reduced by use of high efficiency toilets. These toilets require 1.5 gallons per flush, representing a savings of two gallons. High efficiency toilets will be required by the City of Seattle in all new construction after 1993.

To improve the static water pressure differential between the Campus water supply system and the City of Seattle's water distribution system, magnetic water meters and low head backflow preventer devices could be used in lieu of the existing flow meters and spring-loaded backflow preventers. These measures, by reducing pressure loss, could improve the water flow capacity on Campus by approximately 7 or 8 percent.

With development of the West Medical Office Building, additional fire hydrants will be required at 300' spacing on North 115th Street, along with other road improvements from Meridian Avenue North to the western boundary of the Campus. These hydrants will provide additional fire water protection for the Campus.

Turning on the valve to the City water pipe at the North 120th Street connection may increase the static pressure within the Campus water system. Also, leaving this connection on will provide additional backup to the water system.

A planned City water line extension (in pressure zone 580), in conjunction with a proposed apartment building development on Stone Way North between North 125th and North 120th Streets, will extend a 12" water main from North 125th Street and Aurora Avenue North down Stone Way North to the intersection of North 115th Street. Northwest Hospital's connection to this line would likely allow fire hydrants on Campus and on North 115th Street the ability to flow in excess of 2000 gpm.

It is recommended that any relocation and replacement of the existing 10" loop private water supply line system during this plan's development be made with 12" or larger pipe. These measures will allow the Campus water system the ability to develop a greater fire flow capacity.

One option to the existing water service arrangement on Campus would be to remove or bypass the water meters at the point of connection to the City water mains and provide smaller individual water meters to all of the facilities on Campus to monitor all domestic and irrigation water use.

Unavoidable Adverse Impacts

The proposed plan will result in additional demand for consumption of water. Estimates of the impact on the City of Seattle Water Department is indicated in the Water Usage Summary Table (Exhibit 25). Impact of the development on the area's water supply can be reduced by implementation of the mitigation measures outlined above; however, it cannot be eliminated.

No Action Alternative

Under the "No Action Alternative," no significant increase in water consumption or peak-hour water demand would occur.