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Montana State University
BOZEMAN

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By

Jan v.T. Wilking, Jr.

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Submitted to the School of Architecture as partial fulfillment of
the requirements for the degree of Bachelor of Architecture

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CONDITIONS CREATING A NEED

CONDITION CREATING A NEED

At the present time Gatton Field is inadequate to function properly as a stadium for the following reasons.

Lack of Seating

There are presently 9,200 seats at Gatton Field which is only 1,000 more than, when the school enrollment was 3,000. The entire 9,200 seats were filled on two different occasions during the last football season and for the U of M game it was estimated that a 15,000 seat stadium would have been filled. This lack of seats caused some bad feelings toward the Athletic Department by the people who could not get tickets.

The student-seating section was filled to capacity every game and for the high-interest games, students were forced to sit in the end-zone seating and on the opposite side of the field.

The season attendance for the 1967 season was 31,000 for the

four home games, and the gate receipts were \$32,000. This income was not enough to cover the travel expense of the visiting teams which the home team is required to pay. So in this respect, football at M. S. U. is a losing enterprise where at many universities football brings income to the school.

The present seating is parallel to the side lines of the field. This increases the difficulty of a person seated at one end of the field seeing play at the other end of the field.

Press Box

The present press box is very limited in size and it is located in the wrong position.

Every season there is a need for more space because of increase in the number of different functions that must use the space. There is a greater number of reporters from newspapers around the state coming to each game along with an increasing number of professional scouts.

The broadcasting facilities are barely adequate for radio and there are no provisions for television. There is a need for rooms for V.I.P.'s such as university presidents, athletic directors, or politicians.

The press box is presently located on the north side of the field. This is just opposite from where it should be for camera-men's use.

Traffic

On the days of football games there is a great deal of confusion concerned with the movement and parking of vehicles.

Almost all of the lots that are for stadium parking are also used by parking not related to the stadium. One such place is the parking lot behind the SUB. This is the parking lot for the Century Club, but it is also used by people going to other parts of the campus.

The movement of traffic is disrupted by the lack of adequate roads in this area and the mixing of both vehicular and pedestrian traffic.

As long as the stadium is at its present site, I feel this confusion will exist.

Weather Protection

The present design of the seating offers no protection from the cold wind of typical Montana Fall. This has caused extreme discomfort to many fans even forcing some to leave the games, as was evident at the last football game with the University of Montana.

This condition is magnified by the lack of an enclosed heated space to go to during the half-time.

Other Facilities

There is a very great need for more and better rest room facilities. At the present time rest rooms are located below the north stand, in the old gym, and in the field house. The men's rest room below the stand has three toilets and one seven-foot long urinal. I believe that the women's rest room has five or six toilets. Both of the rest rooms are very poorly lit and unsanitary. The toilet facilities in the old gym are not designed for large numbers of people. There are eight toilets and a six foot urinal,

but, the only access is through a three-foot wide door, which creates great confusion. The rest rooms are seldom used in the field house since the public can not use the back door and it is a long walk to the front door. Because of the inadequate facilities, many people miss the early part of the second half.

The condition of the track and the field is quite bad. So, in the future, the track must be completely rebuilt and the field must be recrowned and resodded.

For these reasons, Gatton Field is inadequate for the present attendance and in the future the attendance will increase for the following reasons.

Increase in Student Attendance

The student enrollment has been generally increasing and it is estimated that by 1975, the enrollment will be between 9,000 and 9,500. The percentage of the students attending games is somewhere between 67% to 75% at the present time. If this stays the same it would mean that close to 7,000 students from M. S. U. will attend the games at that time.

Increase in Non-Student Attendance

The attendance of non-students would increase just because of the increase of population if the percent of those attending stayed the same. But, I believe this percentage will increase. One reason for this increase would be a greater interest in football in general. There will also be more alumni in the state and if next year's schedule is any indication of the quality of football teams to play in home games, it in itself will generate more interest.

All of the roads in Montana are improving very greatly. With this increase in ease of travel, more and more people will come from around the state to see football games, especially if Montana State University has a stadium with proper facilities.



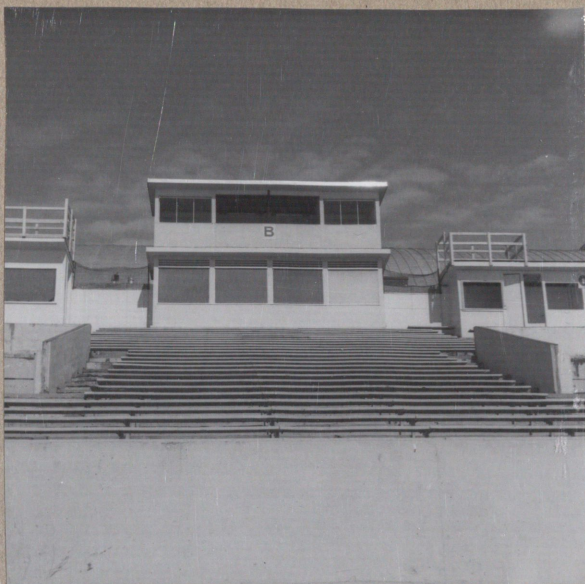
GRANDSTAND



STUDENT SEATING



STUDENT SEATING



PRESS BOX



PUBLIC TOILET



CONCESSION STAND

LOCAL CONDITIONS

Geographic Conditions

Bozeman is located in Gallatin Valley in the southwest portion of Montana. (See map page 15) Its exact location is $45^{\circ} 42'$ north latitude and $111^{\circ} 3'$ west longitude at an elevation of 4,785 feet above sea level. Mountains surround Bozeman to the east, south, and north. The Gallatin Valley opens to the west.

Vegetation

Between the elevation of 5,400 and 6,000 feet, the open grassland cover of the higher hills and benches is replaced by a growth of brush and evergreen timber. A dense growth of small Douglas Fir (Pseudotsuga douglasi) occurs in most places on the northern and eastern exposures of the mountain slopes and a more sparse cover of fir, Colorado Juniper (Juniperus scopulorum), and brush of various kinds on the south and west slopes.

For some distance below this zone, many mountain shrubs and

herbs are mingled with the grass and sagebrush cover of the lower benches and the valley floor. The more abundant and conspicuous of these plants are the balsam-root (Balsamorhiza sagittata); western wild bergamot (Monarda menthaefolia), locally known as "horsemint;" sticky geranium (Geranium viscosissimum); wild salsify (Tragopogon porrifolius); several lupines and a number of Potentillas.

Groves of Cottonwood, both the common western species and the narrow-leaved mountain species, border the major stream channels, together with some dense thickets of willows, as well as black haw, chokecherry, service berry, and red-osier dogwood (Cornus stolonifera). Most of the intermittent drainage courses of the higher parts of the area are choked with a dense growth of the same species. Wild rose and snowberry (Symphoricarpos occidentalis), commonly known as buckbush, are very common, generally bordering the roads, old ditches, or canal banks, and stream and coulee bottoms in the more moist sections and extending westward and northward in favored locations in the arid sections.

The common sagebrush (Artemisia tridentata), originally covered most of the uplands of the more arid sections, and it is still a dominant plant on the more eroded slopes and the rough lands.

The native grass associations have become modified and confused with the introduced grasses since settlement and irrigation. Previous to settlement and irrigation, a moderate growth of silver (white) sagebrush (artemisia cana) and an abundant grass growth covered the open hill slopes, benches, and parts of the lower lands of the eastern and southern sub-humid sections of the area. A thick stand of the dominant grass association, consisting principally of bluebunch (Idaho)

fescue (Festuca idahoensis), bluebunch wheatgrass (Agropyren specatum), junegrass (Koeleria cristata), with some western wheatgrass (A. pauciflorum), and other less abundant species are still growing on the unplowed hill lands above the influence of irrigation. Introduced species of the cultivated grasses, principally Kentucky bluegrass and common timothy have become widely distributed and have completely replaced the native grasses in many places.

Transportation

Frontier and Northwest Orient have two flights into Bozeman every day and there is a possibility of both expanding to four flights a day.

North^{ern} Pacific Railroad has two east-bound and two west-bound trains which serve Bozeman every day.

There are several bus lines that serve Bozeman. Greyhound buses come to Bozeman east-bound and west-bound twice a day. The Karst Stage and the Belt Mountain Transportation Company make one trip to Bozeman each day.

There are two major highway systems which pass through Bozeman. U.S. Highway 10 or Interstate 90 east and U.S. Highway 191 south serves Bozeman with connections to U.S. Highway 89 north and Montana Highway 287 north.

Geology

Geologists describe the Gallatin Valley as a former lake bed during late Tertiary times. It is stated that, following the formation of the lake in the valley, immense showers of fine volcanic dust, probably wind-borne, fell upon the surface of the lake

and upon the land. This resulted in the deposition of lake- the bottom sediments reaching a thickness of more than 2,000 feet. Most of the sediments are fine grained and they furnish the parent material for the greater part of the present soils. Since deposition of this material and the formation of an outlet for the release of the impounded waters, considerable surface erosion and cutting by streams has taken place.

Economic Conditions

Gallatin County and Bozeman are supported by three main economic activities - Montana State University, agriculture in the form of wheat and cattle, and tourism. Montana State University is the largest single business in the area. The University was founded in 1893 as a land-grant institution. It has since grown to about 6,800 students. The economic impact of the institution has given Bozeman a real boost. The university not only draws state and federal funds to Bozeman, but it also draws people and their money to the area in connection with the various campus activities, entertainment features, and conventions. Montana State University officials estimate that the school contributes \$22 million annually to the economy of Bozeman.

Population

Bozeman's population (U.S. census)

1940	- 8,665
1950	- 11,325
1960	- 13,336

The population increased 28.4% in the period 1950 - 1959.

These figures do not include the single college student. If the rate of increase stays the same for the next two decades:

1970 - 17,130
1980 - 21,980

GALLATIN COUNTY POPULATION (U.S. CENSUS)

1940 - 18,269
1950 - 21,902
1960 - 26,045

The population increased 19% in the period 1950 - 1959. If the same rate continues:

1970 - 31,050
1980 - 37,050

MONTANA STATE UNIVERSITY

67-68	School Year	6768
68-69	" "	7107
69-70	" "	7350
70-71	" "	7616
71-72	" "	7997
72-73	" "	8391
73-74	" "	8787
74-75	" "	9177
75-76	" "	9568

These estimates are possibly outdated.

Climate

The climate in general is similar to that of other inter-mountain valleys in the Northwest. It is continental in character and is subject to wide extremes of seasonal and daily temperature, a difference of 30° F. sometimes occurring within 24 hours. Winds are variable in both movement and direction; in the daytime, the winds may be prevailing from the west and southwest, and at night very often shift to the southeast. Locally some of the coldest winds in winter are from the east. During the winter, warm "chinook" winds are also a variable occurrence, at times causing sudden disappearance

of snow by direct evaporation.

The mean annual temperature at M.S.U. is 43 degrees F. Extreme periods of cold weather (-20 to -30°) may last a week or more. In the thirty years summarized, there have been four winter months (one month in seven years on the average) during which Bozeman temperature averaged less than 10° F., and two months which averaged below zero. During the same period, however, the January temperature average twice has exceeded 30° F., so mild weather is not unusual. Most winter precipitation falls as snow.

Although very hot days occur frequently during the summer, the nights are invariably cool and pleasant. The temperatures of either the hot days of summer or the intense cold periods of winter are not so severe as temperatures in the more humid parts of the United States, probably because of differences in atmospheric pressure, humidity, or both.

The last killing frost may be expected the latter part of May; however, it may occur considerably earlier or even as late as the latter part of June. The first killing frost generally occurs about the middle of September, but, it has been known to occur early in August at Three Forks and about the middle of July in Bozeman. The average frost-free season extends over a period of 114 days at Bozeman.

The average annual precipitation at Bozeman is 17.35 inches, much of which comes in the form of snow. The average snowfall being 73.1 inches.

The Gallatin Range to the south of Bozeman and to less extent, the Bridger Range on the east border seems to influence or control

many local showers, especially during the summer.

Hail storms are of infrequent occurrence, but, many do much damage to crops. The greater part of the annual rain fall comes during late spring and early summer. May and June are normally the months of heaviest rainfall.

CANADA

BLAINE INTERNATIONAL
PEACE PARK

SLATHEAD
LAKE

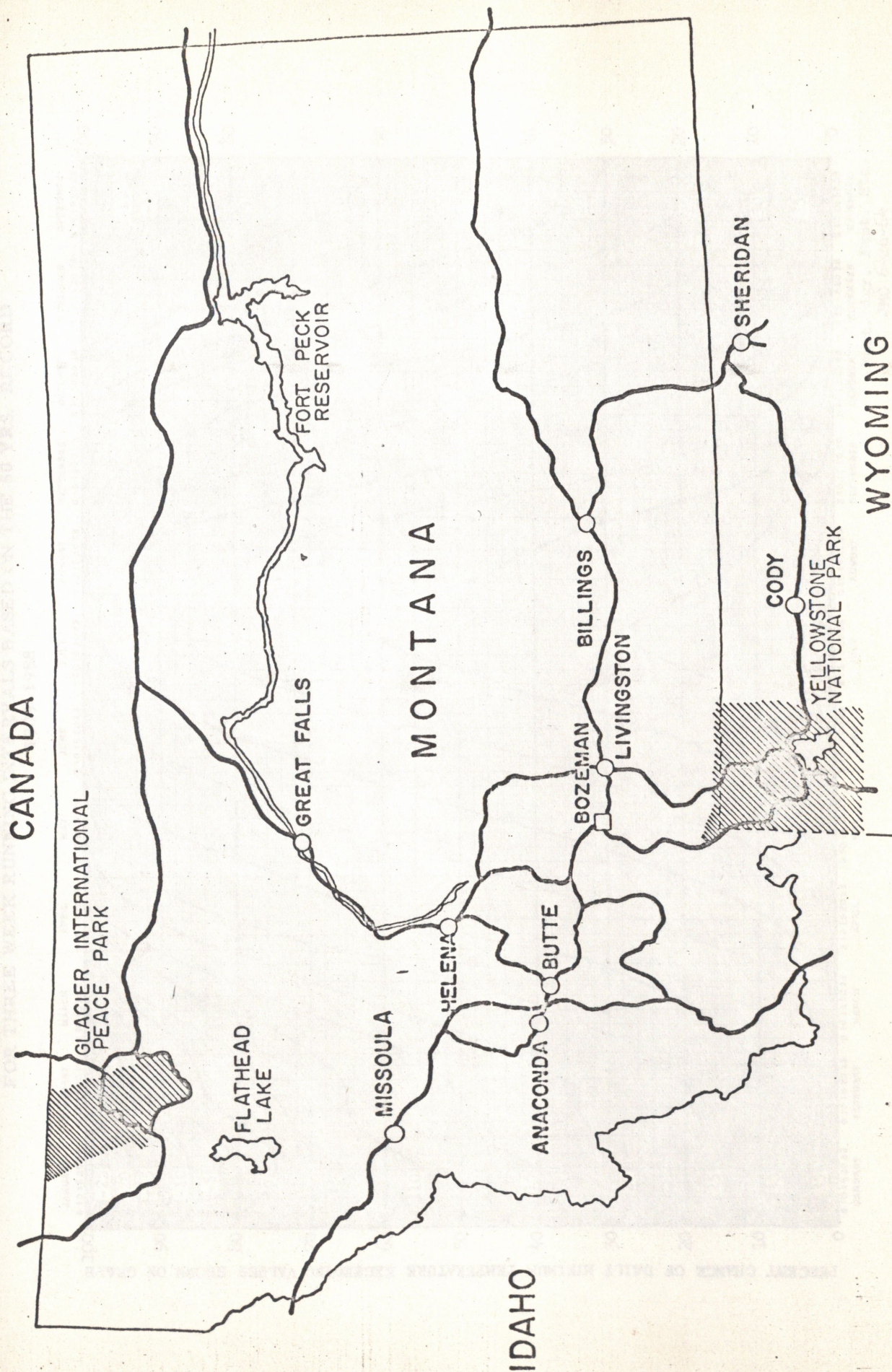
MISSOULA

ARACONON CANYON

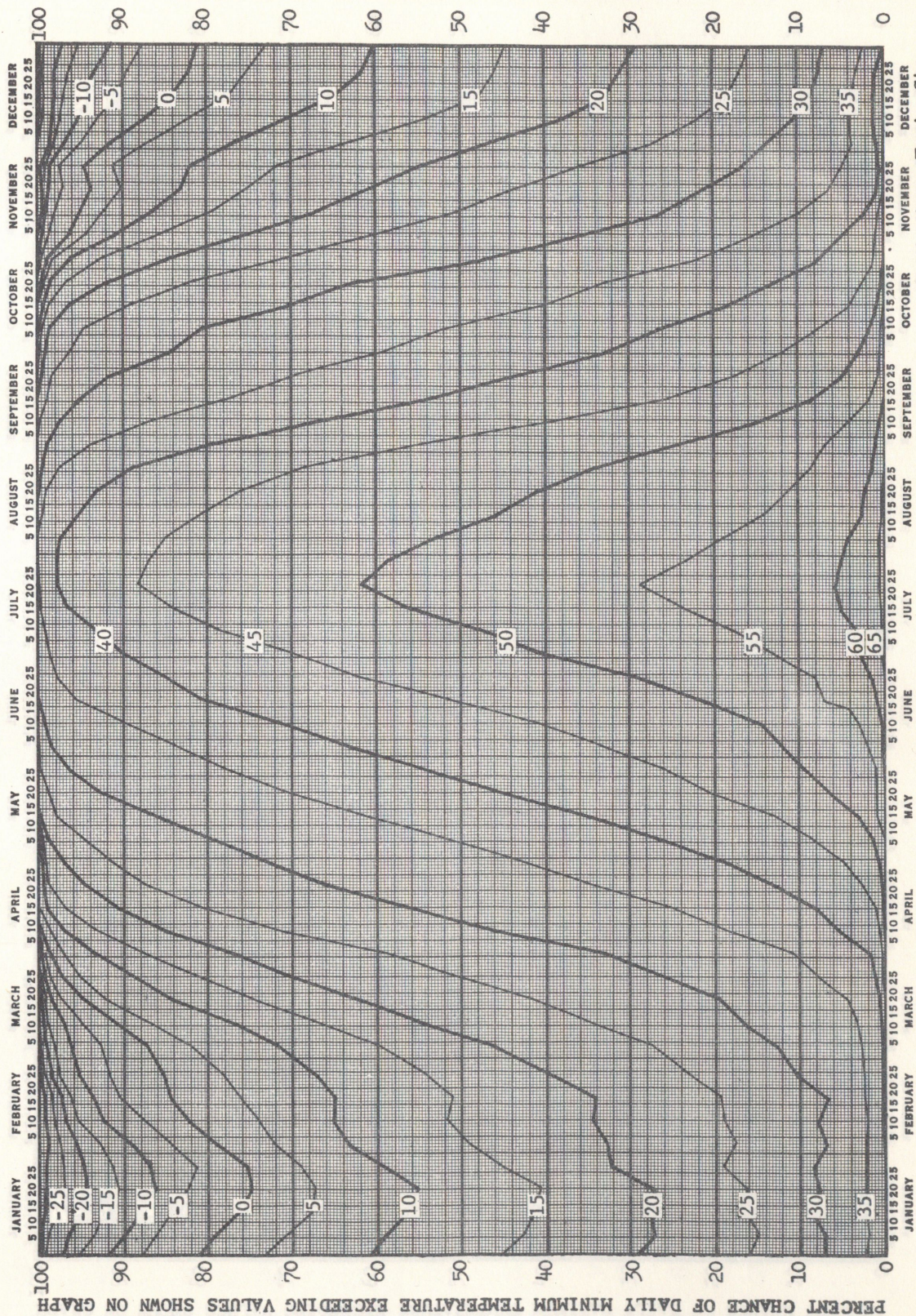
IDAHO

WYOMING

WYOMING



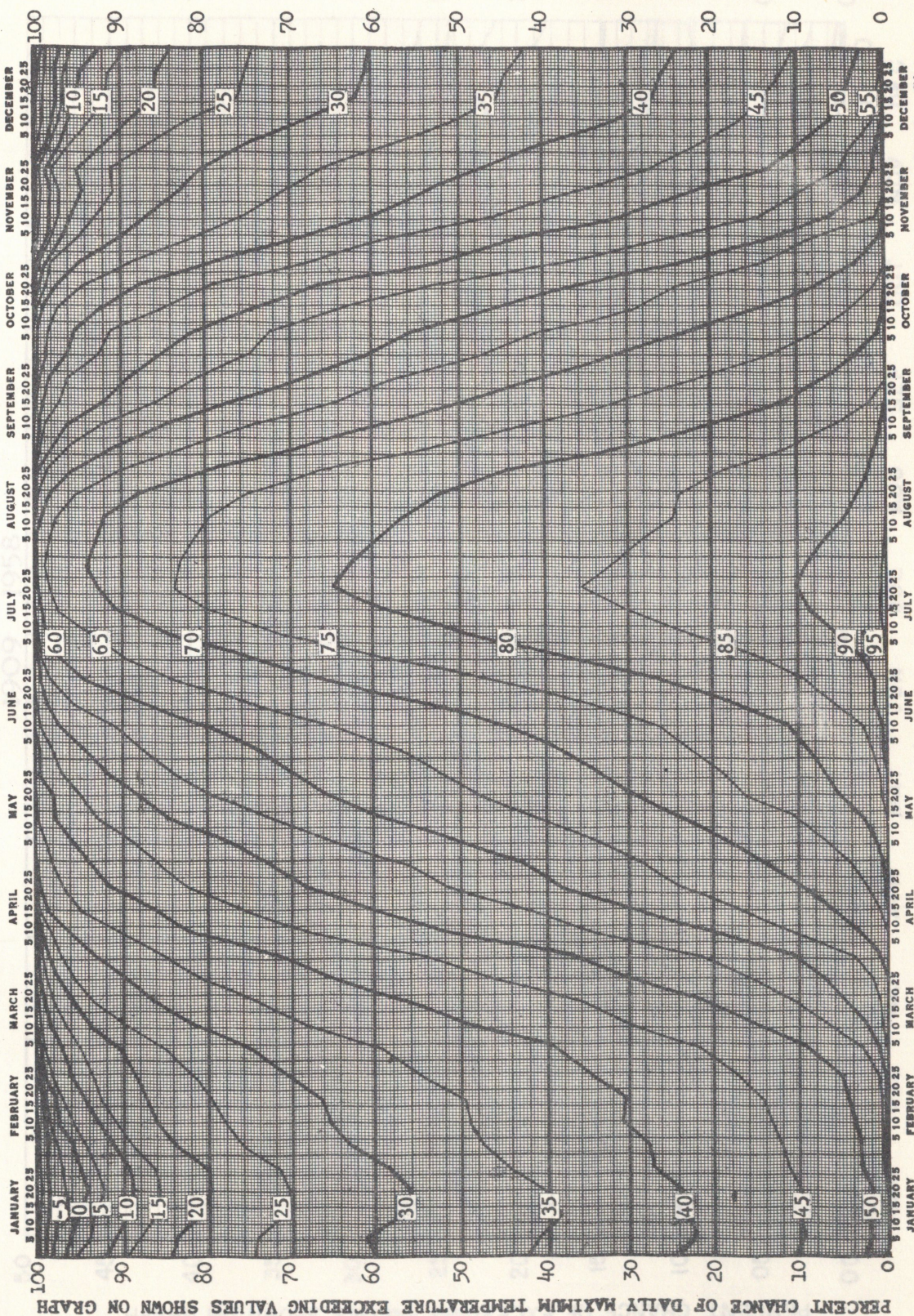
BOZEMAN, MONTANA
 DAILY MINIMUM TEMPERATURE (°F) PROBABILITY COMPUTED WEEKLY
 FOR THREE WEEK RUNNING INTERVALS BASED ON THE 50 YRS. RECORD
 1909-1958



Mont. Agr. Expt. Sta.
 JMC 6-26-64

BOZEMAN, MONTANA DAILY MAXIMUM TEMPERATURE (°F) PROBABILITY COMPUTED WEEKLY FOR THREE WEEK RUNNING INTERVALS BASED ON THE 50 YRS. RECORD

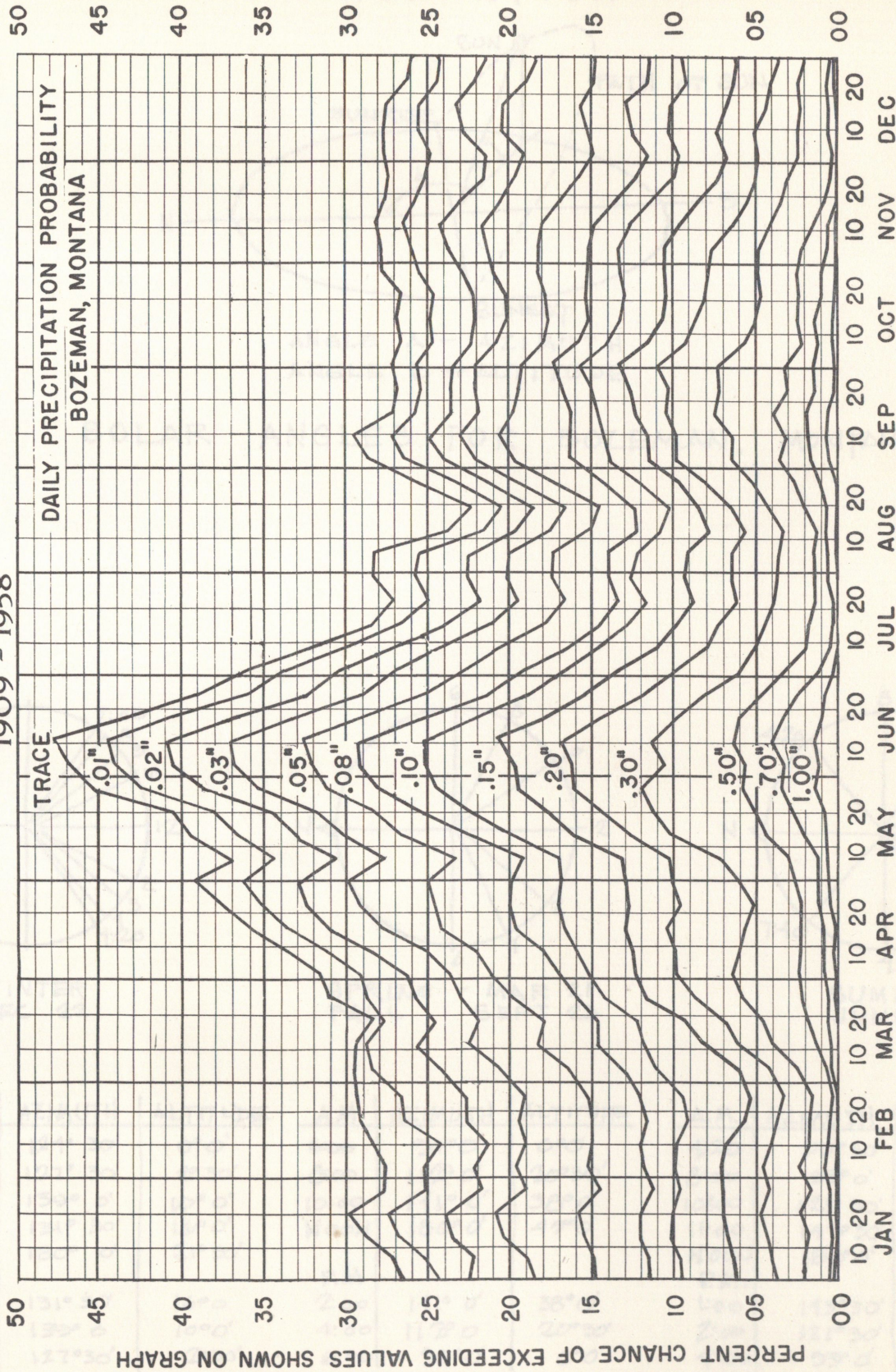
1909-1958



Mont. Agr. Expt. Sta.
 JMC 6-26-64

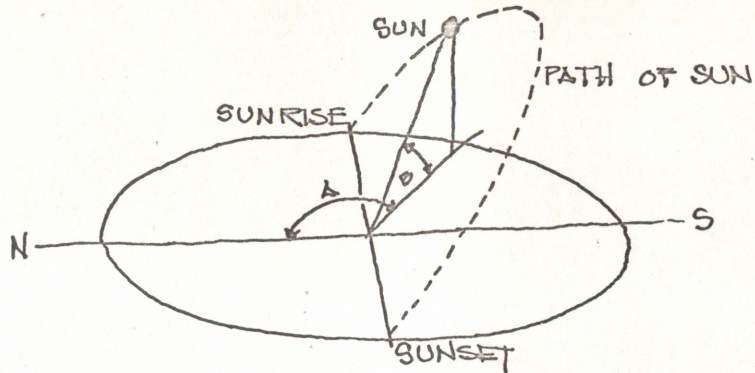
BOZEMAN, MONTANA

DAILY PRECIPITATION PROBABILITY COMPUTED WEEKLY
FOR THREE WEEK RUNNING INTERVALS BASED ON THE 50 YRS. RECORD
1909 - 1958



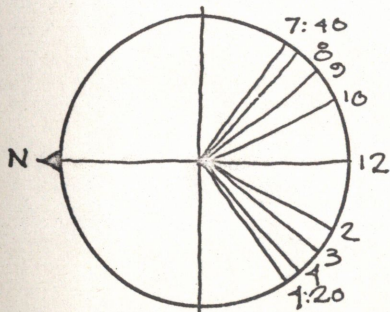
Mont. Agr. Expt. Sta.
JMC 6-27-64

EXPLANATION

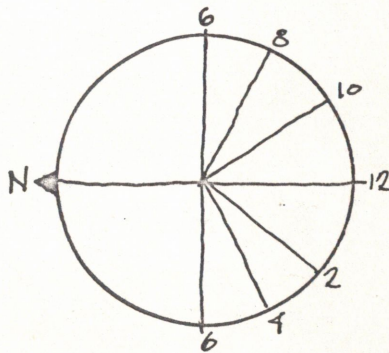


ANGLE A - AZIMUTH
ANGLE B - ALTITUDE

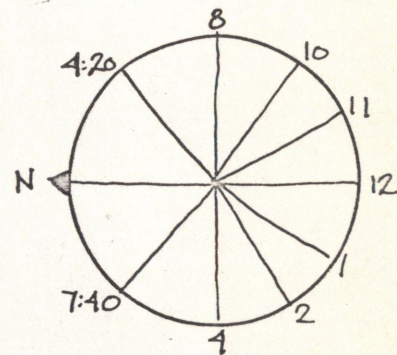
SOLAR ANGLES FOR BOZEMAN, MONTANA



WINTER
DEC 22



SPRING - MAR 21
FALL - SEPT 23



SUMMER
JUNE 22

A.M.	AZIMUTH	ALTITUDE
7:40	124° 30'	0° 0'
8:00	127° 30'	2° 30'
9:00	139° 0'	10° 0'
10:00	131° 30'	16° 0'
NOON	180° 0'	21° 30'
P.M.		
2:00	131° 30'	16° 0'
3:00	139° 0'	10° 0'
4:00	127° 30'	2° 30'
4:20	124° 30'	0° 0'

A.M.	AZIMUTH	ALTITUDE
6:00	90° 0'	0° 0'
8:00	112° 0'	20° 30'
10:00	141° 0'	38° 0'
NOON	180° 0'	47° 0'
P.M.		
2:00	141° 0'	38° 0'
4:00	112° 0'	20° 30'
6:00	90° 0'	0° 0'

A.M.	AZIMUTH	ALTITUDE
4:20	55° 30'	0° 0'
8:00	93° 0'	37° 30'
10:00	121° 30'	57° 30'
11:00	143° 30'	65° 30'
NOON	180° 0'	68° 30'
P.M.		
1:00	143° 30'	65° 30'
2:00	121° 30'	57° 30'
4:00	93° 0'	37° 30'
7:40	55° 30'	0° 0'

SITE CONDITIONS

Orientation of Site

The site, 1320 feet by 1320 feet, which is 1,742,400 square feet or forty acres, is located in the NW $\frac{1}{4}$, S 13, T2S, R5E, MPM, in Gallatin County.

It is bounded on the north by Kagy Boulevard, on the west by an extension of Eleventh Street, on the east by an extension of Seventh and on the south, there is a natural boundary, an irrigation ditch.

Topography

The elevation of the site varies from 4935 feet above sea level in the south-west corner to 4915 feet above sea level in the other three corners. The ground has an average slope of 1 to 68. This appears flat to the human eye. There is a four-foot-deep

irrigation ditch running along the south boundary and there are several small drainage ditches running across the site.

The area around the site is lower on three sides. The only direction where the land is higher than the site is to the southwest.

This provides good drainage and makes the site appear as a small hill.

Parking

There are several parking lots that are within a seven-minute walk from the site.

- | | |
|-------------------------|-------------|
| a. behind the SUB | 300 spaces |
| b. East of Gatton Field | 335 spaces |
| c. North of field house | 342 spaces |
| d. dorm parking lot | 500 spaces |
| e. South of field house | 1168 spaces |

There are plans of expanding the parking lot south of the field house to park 2000 cars in the near future.

The total spaces within a seven minute walking range including the expansion of the lot south of the field house is 3477.

These spaces along with the large number of people living within a comfortable walking distance will greatly reduce the number of parking places that must be provided on the site.

Walking Distance

A person can usually walk on a dry, concrete sidewalk at about $2\frac{1}{2}$ miles per hour, or $\frac{1}{4}$ mile every six minutes.

Walking time at $2\frac{1}{2}$ miles per hour:

1370 feet	$6\frac{1}{4}$ minutes
1900 feet	$8\frac{1}{2}$ minutes
2700 feet	$12\frac{1}{2}$ minutes

(see map)

Traffic Patterns

At the present time the site may only be reached from north on Eleventh Street and from east on Kagy Boulevard. Both streets terminate at their intersection. During the summer the college is planning on extending Seventh from Grant to Kagy. This will also provide a foot path from the east side of the campus. Both the City Plan for Bozeman prepared by S. R. DeBoer and the Proposed Campus Plan, recommend that Kagy be extended from its termination at Eleventh Street to Nineteenth Street. If this were done, access to downtown would be provided by: Twelfth, Fifteenth, Sixth, Third, Willson Streets, and Sourdough Road.

Presently there are no pedestrian paths leading to the site. There will be need for these paths along Eleventh and the extension of Seventh, and along Kagy from the intersection of Third.

Soil Analysis

The soil on this site is classified as dark-colored, well drained farming soil. This type of soil occurs only in the area bordering the Gallatin and Bridger Ranges on the southeastern border of Gallatin Valley. The topsoil ranges in color from dark brown to black, and in texture from coarse loam to silty clay, but they are dominantly silty.

The soil contains little or no free lime within a depth of

three feet, and may be slightly acid in reaction at the surface.

The soil in this area is called Bozeman silt loam and contains no gravel to a depth of six feet. It is presumably wind blown or loess material of local origin.

Bozeman silt loam's surface layer is very dark grayish-brown, somewhat laminated, or fine granular silt loam from eight to twelve-inches thick. The five to six-inch subsurface layer is medium-brown fine silt loam or silty clay loam that is rather compact, coarsely granular, and faintly prismatic. Below this material, the subsoil is yellowish-brown silty clay loam which in most places is rather friable and porous. In some places the material in this layer is brown, hard, compact, prismatic, silty clay. Beginning at a depth ranging from twenty to thirty inches below the surface, the lower subsoil layer is light-gray, coarse silt loam which is very calcareous.

The deep, fairly compact, silty character of this soil, together with its northern slope exposure, does not facilitate warming up early in the spring, hence bacterial action and nitrification are somewhat retarded.

Adjacent Environment

North of the site is the Montana State University campus. Bordering Kagy Boulevard just across from the site is the field house parking lot, Dyche Field, and the intramural fields. The land on the east is also university property, but as yet this area is undeveloped. It has been set aside for a University Park. The area to the south and west is being used as farm land at the present time, but the Newman Club has bought half of the land which borders

the site on the west side. They are planning on building a Newman Center on this land.

Immediate and Distant Views

To the east, south, and west, the immediate view is a very pleasant one, consisting of rolling farmland, sparsely spaced large trees, and scattered farm buildings. There are several large, interesting Cottonwoods by the southwest corner of the site.

The distant views are very spectacular in every direction. To the west is a large expanse and then the rugged peaks forming an interesting horizon. The view to the south, east, and northeast is one of beautiful mountains. The skyline in the northwest formed by the high rise dorms and married student housing and the large dome of the field house is interesting.

The best view in the fall is to the rolling foothills of the south where the changing Birch and Aspen have created a magnificent array of color.

Wind

The prevailing wind during the day is from the west or southwest and during the night the wind usually shifts and comes from the east and southeast. The coldest winds during the day come from the east. During the winter, warm "chinook" winds come from the north.

Present Use

The site is presently being used as an experimental farm and as the site for the electronic research lab. On the experimental

farm they grow many different types of crops. There is also an area 250 feet square that is used to grow about forty different species of bushes and small trees.

Most of the electronic research lab equipment is stored in two log cabins and two large trucks. There are two sixty foot high antennae and several smaller antennae on the site.

Vegetation

There is no natural vegetation on the site because of the experimental farm. The crops that are raised by the farm change every year except for the experimental growing of about forty different species of shrubs and small trees.

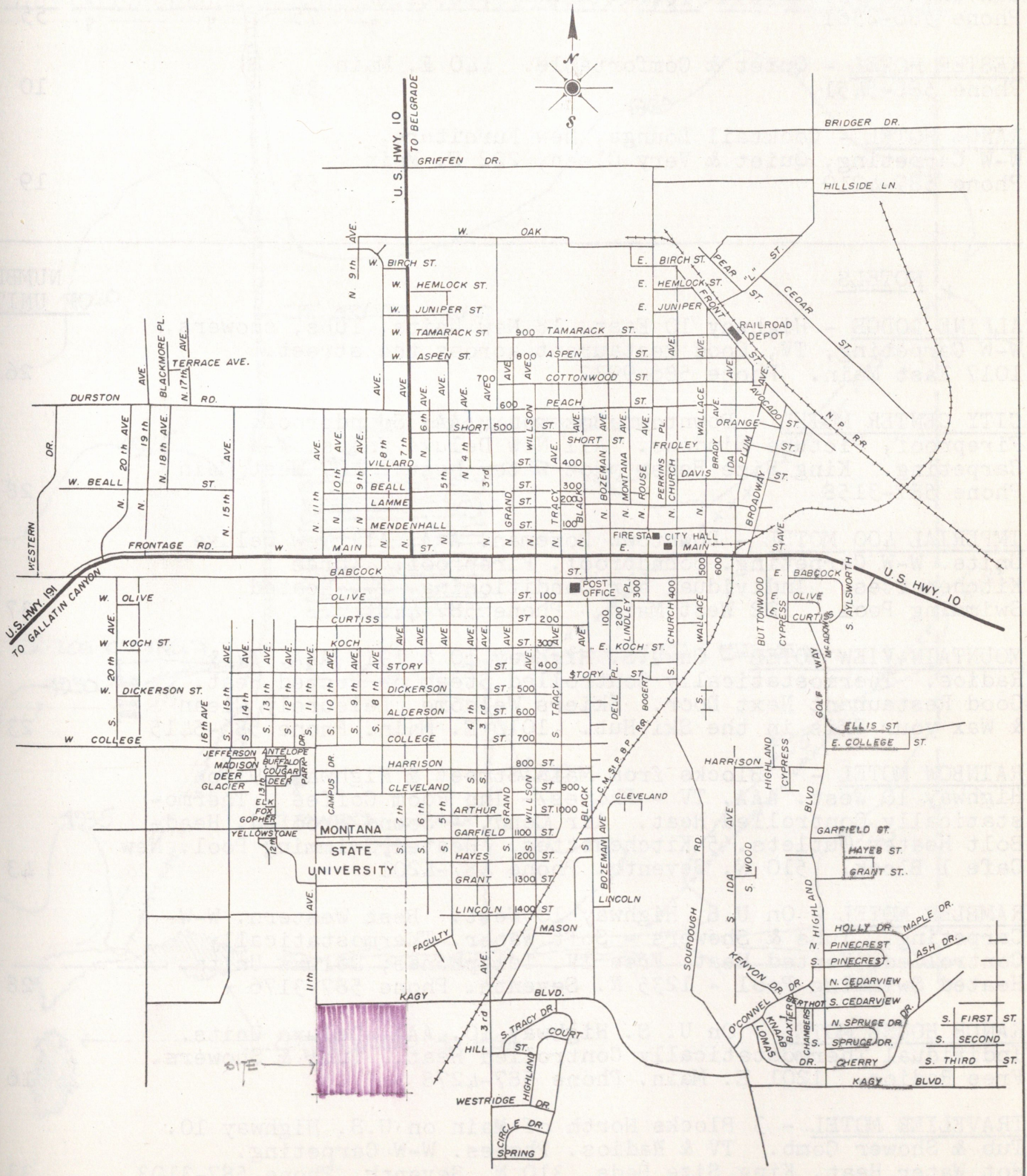
There is a large group of Cottonwoods growing along the irrigation ditch just south of the site and several more groups of Cottonwoods can be seen near the site.

There is not a natural evergreen tree within one-half mile of the site.

Utilities

At the present time there is an electrical power line coming from the campus along the east side of the field house parking lot. It crosses Kagy Boulevard and then turns west parallel to the north boundary. When it reaches the northwest corner of the site it turns south and continues until it reaches the electronic research lab. (See map.)

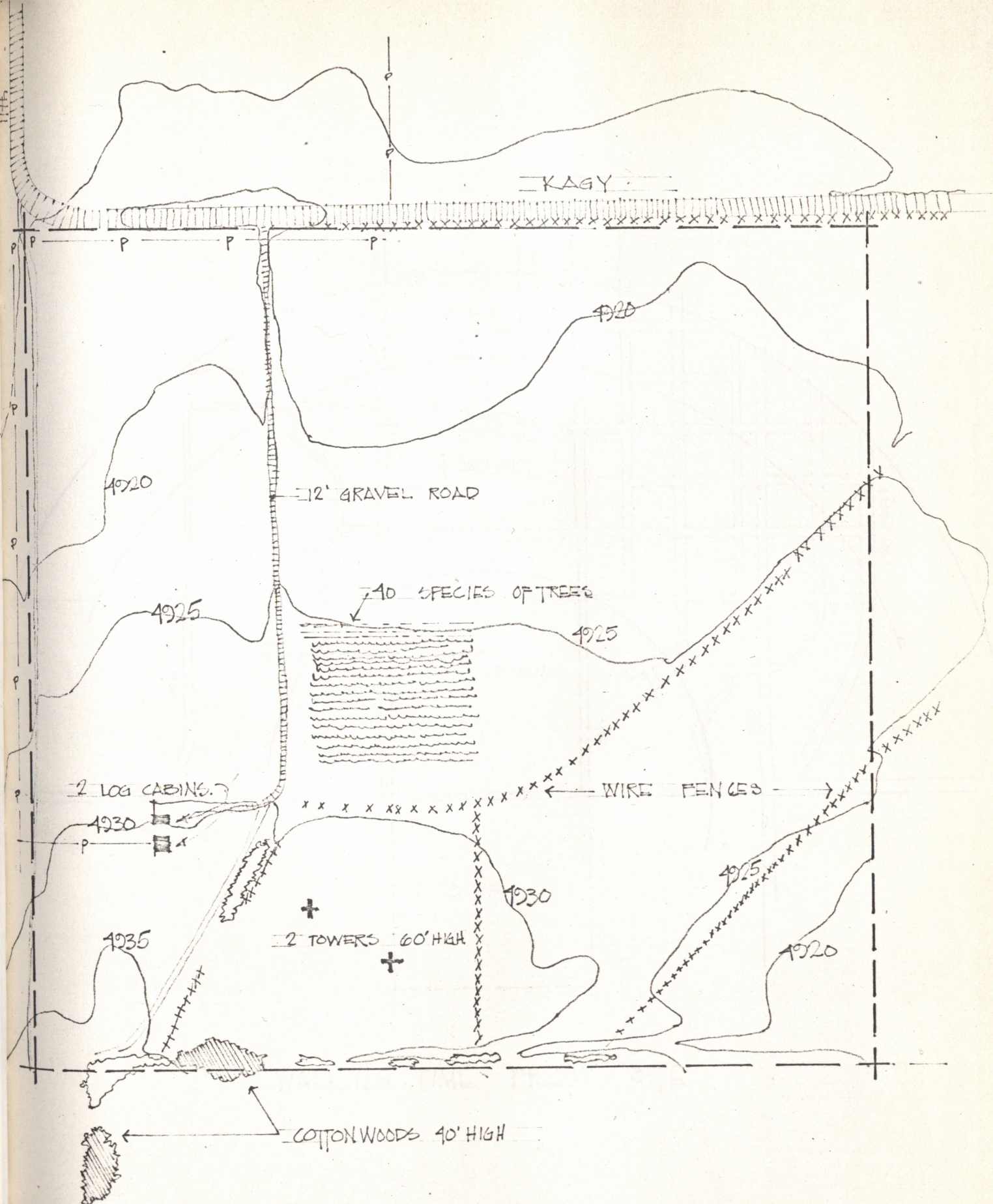
MAP OF BOZEMAN MONTANA

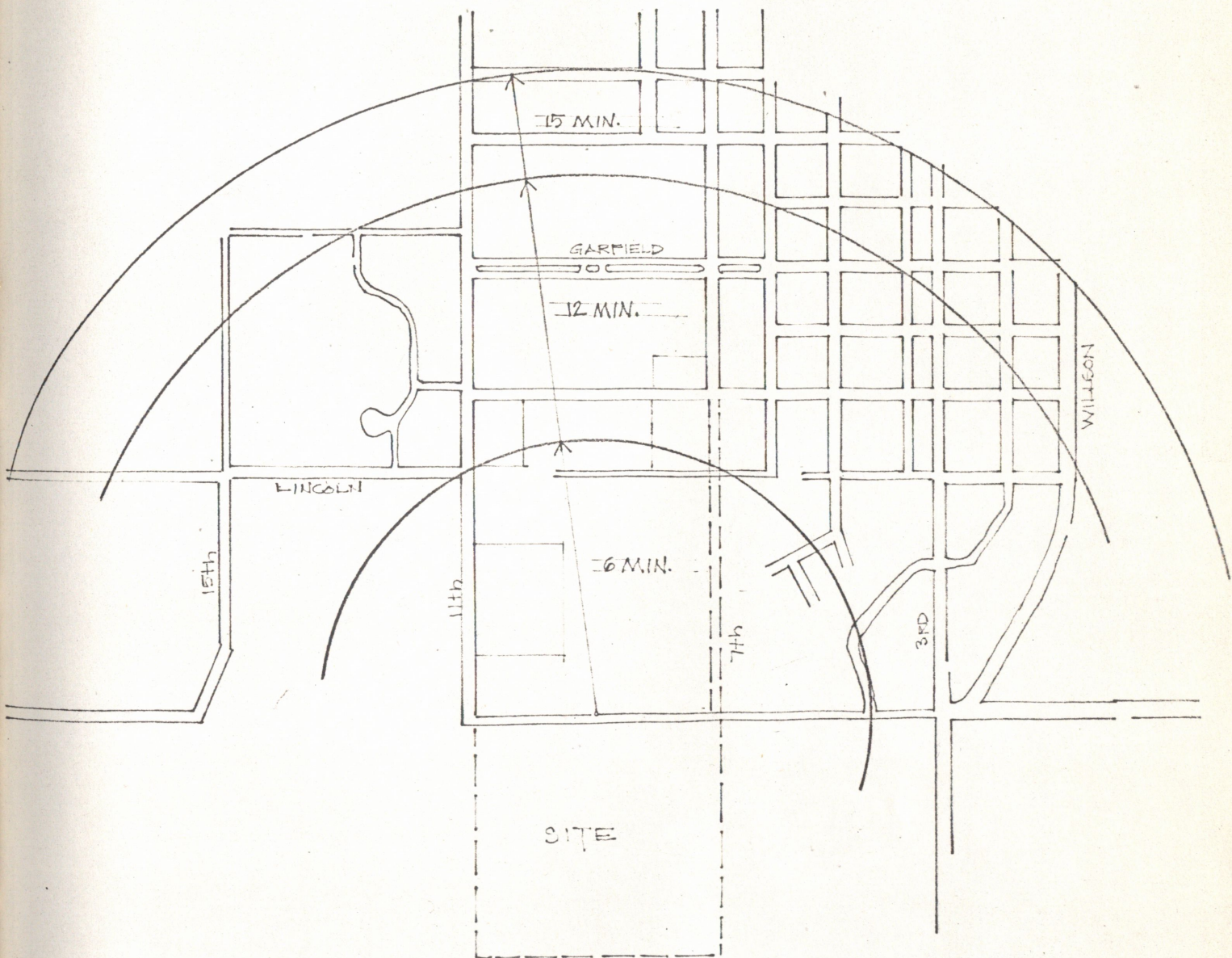


<u>HOTELS</u>	<u>NUMBER OF ROOMS</u>	<u>WITH BATH</u>
<u>BAXTER HOTEL</u> - Cocktail Lounge, Dining Room, Coffee Shop. Complete Convention Facilities. Room TV. 105 West Main, Phone 586-2351	73	40
<u>BOZEMAN HOTEL</u> - Two Cocktail Lounges, Nightly Entertainment, Dining Room, Coffee Shop. Complete Convention Facilities. Rooms W/TV. 321 E. Main Phone 586-2381	75	55
<u>KESTER HOTEL</u> - Quiet & Comfortable. 440 E. Main Phone 586-5451	36	10
<u>RANGE HOTEL</u> - Cocktail Lounge, New Furniture, W-W Carpeting, Quiet & Very Clean, 222 E. Main Phone 587-4219	55	19

<u>MOTELS</u>	<u>NUMBER OF UNITS</u>
<u>ALPINE LODGE</u> - Highway 10 East. 18 New Units, Tubs, showers, W-W Carpeting, TV, Good Restaurant across the street. 1017 East Main. Phone 586-9932	26
<u>CITY CENTER MOTEL</u> - Downtown Bozeman, AAA, Soundproof, Fireproof, Picture Windows. All New Deluxe Units. W-W Carpeting. King Size Beds. Hot water heat. 407 West Main Phone 587-3158	28
<u>IMPERIAL 400 MOTEL</u> - Downtown Bozeman. AAA, All New Deluxe Units. W-W Carpeting. Soundproof, Fireproof, Three Kitchenettes. Individual air Conditioning. TV. Heated Swimming Pool. 122 West Main. Phone 587-4481	37
<u>MOUNTAIN VIEW MOTEL</u> - On U.S. Highway 10 & 191. AAA. TV & Radios. Thermostatically Controlled Steam or Vented Heat. Good Restaurant Next Door. Skiers Welcome. Leisurely Clean & Wax your Skis in the Ski Hut. 1010 E. Main. Phone 586-5415	23
<u>RAINBOW MOTEL</u> - 5 Blocks from Main Street & Highway 191 on Highway 10 West. AAA. TV - Phones - Inn Room Coffee - Thermo- statically Controlled Heat. Air Cond. - Sound Proofed. Head- Bolt Heater Outlets. 5 Kitchenettes. Heated Swimming Pool. New Cafe 1 Block. 510 N. Seventh. Phone 587-4201	43
<u>RAMBLER MOTEL</u> - On U.S. Highway 10 West. Best Western. W-W Carpeting. Tubs & Showers - Soft Water. Thermostatically Controlled, Vented Heat. Free TV. Telephones, Deluxe Units. Heated Swimming Pool - 1235 N. Seventh. Phone 587-3176	28
<u>RANCH HOUSE MOTEL</u> - On U. S. Highway 10. AAA, Deluxe Units. Individual Thermostatically Controlled Heat. Tubs & Showers. Free Radios. 1201 E. Main. Phone 587-4278	16
<u>TRAVELIER MOTEL</u> - 3 Blocks North of Main on U.S. Highway 10. Tub & Shower Comb. TV & Radios. Phones. W-W Carpeting. Hot Water Heat. King Size Beds. 310 N. Seventh. Phone 587-3103	33

ALL FIRMS IN GOOD STANDING WITH THE BOZEMAN CHAMBER OF COMMERCE





WALKING TIME FROM SITE



DORMS + MARRIED STUDENT HOUSING



FIELD HOUSE



POWER PLANT + BRIDGER RANGE



FOOTHILLS TO SOUTHEAST



FOOTHILLS TO SOUTHWEST



LOG CABINS & TOWER



ANTENNAE



ANTENNAE & LOG CABINS



FROM PRESS BOX



FROM FIELD HOUSE PARKING LOT



FROM CORNER OF KAEY & 11TH



FROM CORNER OF KAGY & WILLSON



FROM THE SOUTH EAST.

The stadium will be designed to seat 20,000 people with the possibility of expansion. Every attempt should be made to keep all of the spectators as close as the football field as possible.

FUNCTION

to direct the vision of the spectators toward the center of the field at the fifty yard line.

The first row of seats should be at a height of at least eight feet above the level of the fifty yard line and at a minimum of eight feet from the side lines.

General

The primary function of the Stadium for M. S. U. is to provide an area where spectators can watch inter-college football. There is a possibility of high school football games, other college sports, such as soccer or lacrosse, or any activity requiring large group gatherings using the stadium. But, these other activities shall not affect the functional design for football. Track meets are not planned to be held in the stadium. The stadium shall be generally oriented in a north-south direction. The precise orientation should be determined by the angle of the sun on October 15, at 2:30 P.M. The stadium should be so orientated that the shadows will fall directly across the field at 2:30 P.M. on October 15.

The loud speakers for the public address system must be so located as to cover the entire stands and field with possible expansion considered. The field must be included in the coverage for

the instances where the stadium may be used for events other than football.

Seating

The stadium will be designed to seat 20,000 people with the possibility of expansion. Every attempt should be made to keep all of the spectators as close to the football field as possible. All seats should be so oriented to direct the vision of the spectators toward the center of the field at the fifty yard line.

The first row of seats should be at a height of at least eight feet above the level of the side line and at a minimum of eight yards from the side line.

A special section will be designed for the band and the handicapped.

Entry to Stadium

The size of entries will be governed by the Uniform Building Code requirements.

The entry should be designed to have people enter through turnstiles with area provided for ticket takers beside the turnstiles. For egress, a completely open area must be provided. This area may be chained shut when spectators are entering the stadium.

Entries should be located so people can enter on all sides.

Entry to Field

There are several facilities that require access to the playing field; the team rooms, the official's room, storage for the field equipment, and limited access from the seating area.

There must also be an entry for vehicles from outside the stadium.

Ticket Booths

Ticket booths must be provided near the entries to the stadium. These should be placed so as not to interfere with the traffic entering the stadium.

Concession Stands

Several areas for the sale of refreshments are required. These should be designed for efficient customer service especially during the twenty-minute half-time. Concession stands should be placed to be accessible, but, care must also be taken that the people at the concession stands do not interfere with the traffic going into the seating area.

Equipment will be needed to warm food and to serve both hot and cold drinks, so utilities for equipment must be provided. Equipment for the cleaning of the area must also be provided.

Storage area is needed for both the equipment and the concessions.

Concession Dispersion

A large area is required that is suitable for preparing soft drinks and food to be dispersed in the stands by the individual concessionaries. It should be located to have easy access to the stands. The room will require equipment for mass preparation of soft drinks and food. The proper utilities must be provided for this equipment.

First Aid Room

This room is for emergency first aid only. Access is required from the seating area and from the outside. Provisions should be made so that an ambulance can be driven close to this room.

The room will be equipped with two cots, storage area, and a toilet room.

Stadium Control Office

The purpose of this room is to provide space for the instruction of ushers and security officers, stadium management, and to house an inter-communication system to maintain contact with the following locations: concession booths, concession dispersion center, ticket booths, entries, team rooms, each desk of the press box, the public address booth, first aid room, and both sides of the field.

There must be access to the outside and the seating area.

Team Quarters

The teams will dress in the field house and be bussed to the stadium. This will eliminate the need for a room for storage of equipment and shower facilities.

The room will be used before and after the pre-game warm-up and during the half-time. Four major areas will be required: coach's room, team area, training room, and toilet facilities.

The coach's area will be used for conferences, the team area will be used for instruction and the training room will be used in caring for injuries or taping. The coach's room, training room, and the toilets will have access to the team room. The team area must

have access to both the field and outside the stadium.

The team quarters should be located in the end of the stadium because of the psychology effect on the spectators of the team running onto the field.

This area must be heated and well ventilated.

Official's Room

The purpose of this room is to provide a room where the officials can change before and after the game. Showers and toilet facilities should be provided along with lockers and benches.

The room should be heated and well ventilated.

Public Toilets

It is rarely practical to provide adequate toilet facilities for the rush which occurs between the halves. Some authorities have estimated that the proportion of men to women at athletic contests is 65 to 35 and that 25 to 33 percent will use the toilets during the contest. It is stated that a larger percentage of men than women will use the toilets. Men will spend an average time of two minutes in the toilet, whereas women's use will consume three and one-half minutes.

If a stadium of 20,000 people is composed of 13,000 men and 7,000 women and 20 percent of these men use the toilets during the twenty minute intermission, there will be 2,600 men to be accommodated. If the average time is two minutes, there will be an average of 260 men in the toilet rooms in the entire intermission. Some authorities have estimated that six urinals and one toilet for each 1,000 men,

and seven toilets for each 1,000 women will be sufficient. If this rule were applied, there would be a total of 78 urinals and 13 toilets available. In the case of women, if fifteen percent use the toilet during the intermission, and an elapsed time were three and one-half minutes, there would have to be an average of 92 persons in the toilet rooms for the entire twenty minutes. If seven toilets per 1,000 women were provided, there would be a total of fifty toilets.

These figures would appear to be insufficient. Nevertheless, it has been proven that facilities of less than seven per thousand have proved adequate at some stadiums.

The convenient location of the rest room is just as important as the number of facilities. Arrangement must be made so that the round trip from the seats can be made quickly and without congestion.

These facilities must be well ventilated and well lit. Because of the typical hard surface materials in the room and the large number of people congregating at one time, special consideration should be given to acoustically treating the surfaces.

Press Box

The functions and the area required by these functions that are housed in the press box are increasing.

Area must be supplied for the following: public address and score board controls, visiting scouts, coaches from both teams, newspaper reporters, statisticians, radio and television announcers, guests, cameramen for television and motion pictures.

These people will need toilet facilities, a dark room, snack bar, telephone booths, teletype and typewriters.

The areas will be divided in three different levels. The top level will be open with a rail around the perimeter. This area will be used by the cameramen. The middle level will be used by guests, coaches, P.A., and scoreboard controls, radio and television announcers. The lower deck will be reserved for newspaper reporters, scouts and statisticians.

AESTHETIC CONSIDERATIONS

AESTHETIC CONSIDERATIONS

The aesthetics of a stadium for Montana State University will be affected greatly by the site, emotions of the people using it, and the image of the activity which goes on within the stadium.

The site is slightly higher than the surrounding terrain, with no other large structures, man-made, or natural, in the immediate area.

People going to football games are usually of high spirits and quite excited. The stadium should be designed to enhance the emotional state rather than diminish it. A gay and festive atmosphere should be the feeling that is given by the stadium.

When one thinks of the sport of football, one thinks of a contest in which the outcome depends on the strength and balance of the two teams. These qualities could be reflected with a rugged masculine structure.

As a person approaches the stadium, he will experience several sensations related to the distance he is away from it.

A person will first see the stadium at quite a distance because the site is a natural pedestal and there are no major structures near the site that could obscure the view of it.

The stadium must appear to be in harmony with the site and not just as some large dominating form just set in the middle of an asphalt sea. By using land forms and a good landscaping design, the stadium could appear as a natural element of the site.

The overall shape and silhouette will be all that is distinguishable at this distance.

These elements will set the scheme for the entire design, so they must have a reason just as Francis Bacon in 1620 said, "There must be a reason for all things." The reason for the shape and silhouette is that they are a reflection of the function of the stadium.

The shape and silhouette will be composed of dynamic forms that will give the generic quality of a stadium.

The image that a person gets from this distance will be quite important because it will usually be viewed from this distance since it is set away from the campus and it will be used only four times a year for intercollegiate football. For people who will not use the stadium, this is the only impression of it they will have.

For those who will use the stadium, there will be a certain point when they approach the stadium that they will be able to recognize the individual forms and elements that will contribute to the artistic quality.

At this point a person becomes aware of elements contributed

by two other design fields other than architecture. They are graphic and landscape design.

The graphic designs will be used to direct and inform people, but they will have other functions as well.

These graphic designs will appear on the outside of the stadium, in the concourse, and seen from the seating area. These will contribute to the overall unity if they are similar. All of these graphic designs should use letters of the same alphabet and the same type of numerals. The colors used should be bright and rich to evoke excitement. The forms of the letters should be bold and denote strength.

The landscape design will help the structure relate to the site. Since the stadium will be used mostly in the fall, the type of plant material that is used should have maximum interest for this time of year. These plantings can introduce much color to the area and help the stadium relate to human scale.

Here a person will notice the individual elements of the overall form. These elements must relate to the overall form in order to unify the entire composition. Here the feeling of excitement and strength can be shown by having large contrast, deep shadows and dynamic shapes and lines.

At this time, the viewer must be aware of the entrance, for if he is not, he will become confused and lose some of his response to the architecture. To attract attention, the entry should be the point of maximum interest.

At the entry, a person will have his first intimate contact with the structure. This area is a transition between outdoors and indoors, a change from limitless space to an enclosed volume. The

entry must prepare the person for this change in scale by relating to both.

Once the transition has been made, the feeling inside must be one of shelter rather than one of being trapped. This area is a transition between the outside of the stadium and the semi-confined seating area. If, when a person first enters this transitional area, he can see the seating area, this transitional area will have no meaning to him.

A development of points of interest should direct the person to the entry of the seating area. But, if the transitional area has too much interest, the final objective will be lost. There must be just enough interest to prepare a person for the climax of entering the seating area.

The enclosed area must be expressed on the outside to prepare a person for it. If he is surprised to the feeling of this space, it will lessen the climax of entering.

The proper interest can be provided by the use of the color of the graphic designs and the texture of materials.

Once the person has reached the seating area, his interest is directed to the playing field.

In the seating area the feeling of excitement will be affected by the other spectators. If the stands are not completely filled, a visual excitement can be given by painting the benches bright colors.

When interest in the game lags, or during the half time, the aesthetic quality can be enhanced by providing distant views of interest.

ECONOMIC CONSIDERATIONS

ECONOMIC CONSIDERATIONS

School Architect's Estimate

Seating - 90,000 sq. ft. @ \$7.00/sq. ft.	\$630,000
Press Box - 2,500 sq. ft. @ \$20.00/sq. ft.	50,000
Concession, toilets, locker rooms, etc. - 6,000 sq. ft. @ \$13.00/sq. ft.	78,000
Field	10,000
Concourse - 70,000 sq. ft. @ \$.50/sq. ft.	35,000
Total Construction Cost	<u>803,000</u>
Design Cost	60,000
Parking - 4,000 spaces @ \$30.00/space	<u>128,000</u>
Project Cost	<u>\$993,000</u>

Cost of Other School's Stadiums

	OREGON	UTAH STATE	WEBER STATE
SEATING	40,000	20,000	17,200 ²
COST	\$2,225,000	\$1,000,000	\$710,300

	OREGON	UTAH STATE	WEBER STATE
HOW FINANCED	Reserve funds- \$8000,000. Popular Subscription- \$1,000,000. Special gifts and loans- \$425,000. (Student Fee- \$19.50) ¹	Student Fees- Enough to amortize 3½ million 1 million stadium 2½ assembly center for B.B.	\$10 student fee
WHEN CONSTRUCTED	1966-67	1967-68	1965-66
COST/SEAT	\$55.00 +	\$50.00 +	\$40.00 +

- ¹ Student fee helped build the reserve
- ² 3,600 existing seats - total capacity 20,800

All of these schools have larger press boxes than will be required at Montana State University. The team facilities are much more complete because they include shower and drying areas, storage for team equipment, and a better equipped training room. But since the construction costs are higher in Montana and the M.S.U. stadium will be built a year or two after these other stadiums, the construction cost will be higher. These differences will balance and the average cost per seat will be close to \$50.00 per seat. This is approximately what the school architect's estimate is.

Materials

Availability

The Bozeman area lacks many of the skilled building trades. The cost of materials not fabricated or available in this area make many materials prohibited. Steel construction is one trade which is

too costly.

Maintenance

Any material exposed to the elements such as heat, cold, rain, snow, frost, hail, and wind will deteriorate. Absolute permanence without maintenance has not been attained.

Exposed steel will require periodical painting, the period depending on the quality of the painting and regional climatic conditions.

Concrete requires much less maintenance. The cost of concrete stadiums in the past show that concrete construction has proven to be quite satisfactory.

Finance

The financing of the stadium will come from two sources: student fees and donations.

The land is already owned by the University, so it will not be included in the cost of the stadium.

The Athletic Department estimates that about \$250,000 could be raised from the alumni and the general public.

This would provide about twenty-five per cent of the cost of a 20,000 seat stadium. The rest must come from student fees.

An increase in student fees must be first voted on by the student, then approved by the administration, who will present it to the Board of Regents for approval. If approved by the Board of Regents, it is sent for legislative approval.

At the present time it is not known if even the students are in favor of this fee increase.

Two other Big Sky Conference schools have just approved

increases in student fees. Idaho State University students have just approved their increase to finance a $\$2\frac{1}{2}$ million enclosed sports complex. This building will be for football, basketball, and track. At the University of Idaho, the financing of a $\$7\frac{1}{2}$ million sports complex was approved.

Income

The income of a stadium is primarily obtained from the admission charge, but, it may be supplemented by rental of the concessions area.

At the present time, gate receipts average one dollar per person in attendance including the non-paying students. If a 20,000 seat stadium is built and it is filled for each of the four home games, an income of \$80,000 is possible.

Rental of the stadium for other uses would supply additional income.

COLLEGE COLLEGE
EXERCISE
MATHS

COTTON CONTENT
EZEBAZE
MUTHERS LATE

ENCLOSURE

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Interviews:

1. Bourdet, Gene - Director of Athletics
2. Johnstone, William - Vice-President for Administration
3. Rose, H. C. - Dean of Professional Schools
4. Van Teylingen, Andrew - Montana State University Architect
5. Whalen, Martin - Director of Physical Plant

FOOTBALL STADIUM FOR M. S. U.

PROGRAM: Design a stadium for approximately 16,000 spectators with the possibility of expansion for an additional 8,000 spectators. The teams will dress in the field house and be bussed to the stadium.

INTENT: Since the structure has a limited use, my primary concern was to provide the most economical structure, yet to design the most comfortable and enjoyable environment for viewing football.

STRUCTURE: The choice of an earthen bowl for the structure of the lower seating was chosen for the following reasons: (1) Earthmoving has developed into an efficient and economical engineering operations., (2) A natural barrier from the elements is provided by depressing and completing surrounding the seating., (3) The particular shape of the bowl combined, with the fact that the playing is depressed will cause a rise in temperature of 10-20 F in the enclosed area. It is not known at what depth the water-table is. The closest test were at the field house where the water-table is 20 feet below the surface. I have depressed the playing field 15 feet which results in a larger cut than fill so the additional dirt will be deposited in the Southeast corner of the site to level the parking lot.

CIRCULATION: The circulation areas are designed so as to facilitate the most efficient egression of people at the completion of the game. The time required to completely empty the stadium is about 10 minutes which is within the recommended time. However, to complete the efficient movement of people in and around the stadium area a good pattern for circulation and egression of vehicular movement is a necessity. With the extension of Kagy Boulevard there are seven streets by which one may reach downtown Bozeman(19th, 15th, 6th, 3rd, Willson, and Courdough Road).

PARKING: On the site parking will be provided for 2600 cars, 430 spaces are in an area that can be reserved for special groups(the century club, Blue and Gold, the Bobcat boosters) or visiting V. I. P.'s. According to the future campus plan there are several other areas of parking within a 10 minute walk of the stadium; Behind the S.U.B., 300 spaces, East of present Gattin Field

335 spaces, North of the field house 342 spaces, East of the dorms 500 spaces, South of the field house 1200 spaces. These provide a total of 6070 spaces. Considering many of the spectators, such as those living in the dorms and on fraternity row will walk to the game this will be adequate parking even with the second stage.

TOILETS AND CONCESSION: The toilet and concession facilities are designed so that they may be used during the 20 minute half-time period without the spectators missing any of the second half play.

PRESS BOX: The different functions which are contained in the press box were separated since there is no need for physical contact between them and this would greatly reduce the cost of the second stage of construction since they can stay where they are. By staying on the main pedestrian level they can be serviced by vehicles. All of the partitions in the press boxes are movable so the function of any one of them could be easily changed.

ORIENTATION: The ideal orientation of a football field is to have the longitudinal axis perpendicular to the shadows during the half-time of a game at the middle of the season. On October 15th at 2:30 P.M. the sun is South 44 West. This stadium is orientated North 45 West.

SEATING: In order to provide the best view of the game the sight lines of each row are 4 1/2" above the sight line of the row just before it. In the first stage seating is provided for 16,200 people and in the second stage seating for 8,400 people giving a total of 24,600 seats.

LANDSCAPING: Special consideration was given to the selection and placement of the landscape elements. These plants were selected for their interest during the fall season when the stadium will be used.

1. *POPULUS TREMULOIDES* Quaking aspen is a slender straight tree with gray-green or gray-white bark. The round leaves are glossy and "tremble" in light breezes. The tree was selected for its yellow to orange fall color.
2. *BETULA Papyrifera* Canoe or paper birch is a small to medium tree generally pyramidal in shape. Its autumn leaf color is yellow but it has year round interest because of its white bark.
3. *ACER PLATANOIDES* 'SCHWEDLER' Schwedler maple is a medium to large tree of round form. The Schwedler maple was selected for its crimson leaves. These are planted to contrast with the pinus sylvestris and the populus tremuloides.

4. PINUS SYLVESTRIS Scotch pine is an evergreen of round-topped and irregular habit. This tree has year-round interest because of its bluish-green needles and copper-orange color of its upper trunk and larger branches.
5. COTONEASTER ACUTIFOLIA Peking cotoneaster was selected to hide the chain link fence used for control. It has a dark glossy green leaves during the spring and summer which become dark red during the fall.
6. MAHONIA REPENS Creeping mahonia is a low broad leaved evergreen with leathery holly-like leaves of dark bluish-green color.

Jan Wilking

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