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TED SCHWINDEN, GOVERNOR

COGSWELL BUILDING

STATE OF MONTANA

(406) 449-3946

HELENA, MONTANA 59620

October 26, 1981

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Honorable George Thurman, Lieutenant Governor, State of Montana, Helena
Department of Fish, Wildlife and Parks, Wildlife Division, Helena
Department of Fish, Wildlife and Parks, Ecological Services Division, Helena
Department of Fish, Wildlife and Parks, Region II, 3309 Brooks, Missoula
Department of Highways, Engineering Division, Helena
Department of Natural Resources and Conservation, Energy Planning Division, Helena
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U.S.F.S., BPA, Soil Conservation Service, 818 Burlington Avenue, Missoula, MT 59801
Honorable John Melcher, United States Senate, Washington, D.C. 20510
Honorable Max Baucus, United States Senate, Washington, D.C. 20510
Honorable Ron Marlenee, House of Representatives, 1641 Longworth Bldg, Washington, D.C. 20515
Dr. John F. McGregor, Prospect Heights Medical Center, 401 15th Avenue South, Great Falls, MT 59405
Dr. Raymond Grondahl, 3035 Moulton St, Butte, MT 59701
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Billings Gazette, 401 N. Broadway, Billings, MT 59101
Planning Board, 510 N. 28th St., Billings, MT 59101
Department of Housing and Urban Development, Office of Interstate Land Sales Regulation, 909 17th St., Denver, CO 80202
Friends of the Earth, Ed Dobson, Box 882, Billings, MT 59103
Montana Stockgrowers Association, Box 1679, First National Bank Bldg, Helena
Jim Goetz, Box 1322, Bozeman, MT 59715
Tribune Capitol Bureau, 515 N. Sanders, Helena
Lee State Bureau, Box 4249, Helena
Environmental Information Center, Box 1184, Helena
Northern Rockies Action Group, 9 Placer St., Helena
Resources Education Foundation, Inc., Box 5027, Helena
Western Environmental Trade Association, 1804 11th Avenue, Helena
Defenders of Wildlife, Attn: Hank Fischer, 947 Rimini Court, Missoula
Montana Wildlife Federation, Box 4373, Missoula, MT 59806
Montana Chamber of Commerce, Box 1730, Helena, MT 59601
Montana Realtors Association, 600 N. Park, Helena
Sanderson/Stewart/Gaston Engineering, Inc, 1649 Avenue D, Billings, 59101
Water Quality Bureau, DHES, Box 20296, Billings, MT 59101
Air Quality Bureau, DHES, Cogswell Bldg, Helena
Solid Waste Management Bureau, DHES, Cogswell Bldg, Helena
City of Billings, Box 1178, Billings, MT 59101
Suburb Partnership, 208 N. 29th; Suite 205, Billings, MT 59101
Carroll F. Goodwin, HUD, 1405 Curtis St, Executive Tower Inn, Denver 80202
Cumin Associates, 528 Grand Avenue, Billings, MT 59101

This environmental impact statement has been prepared for the proposed Briarwood Subdivision, Yellowstone County, and is being submitted for your consideration. Comments and questions will be accepted for 30 days after the date of this publication. All comments should be sent to: Subdivision Bureau, Environmental Sciences Division, Montana Department of Health and Environmental Sciences, Capitol Station, Helena, MT 59601

Sincerely,

Edward W. Casne

Edward W. Casne, P.E.
Chief
Subdivision Bureau

jg

MONTANA DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES

Draft Environmental Impact Statement

(An addendum to the U.S. Department of Housing and Urban Development Final Environmental Impact Statement)

BRIARWOOD SUBDIVISION

Developers: Suburb Partnership H. Thomas Llewellyn

Pursuant to the Montana Environmental Policy Act, Section 75-1-201, et. seq., MCA, the Sanitation in Subdivisions Act, Section 76-4-101, et. seq., MCA, and the Water Quality Act, Section 75-1-101, et. seq., MCA, the following environmental impact statement (EIS) was prepared by the Montana Department of Health and Environmental Sciences (DHES), Environmental Sciences Division, concerning the request for administrative approval of Briarwood, a proposed subdivision near Billings, Yellowstone County, Montana.

DESCRIPTION

Briarwood is a proposed planned unit development (PUD) located approximately 3 air miles south of Billings, Yellowstone County, Montana. It is situated approximately 4 miles from Billings' city limits via Blue Creek Road (State Highway 416) in the South Hills Urban Planning Study area. It occupies portions of Sections 22, 26, 27, and 28 of Township 1 South, Range 26 East, M.P.M. (see exhibit-map 1).

The master planned area will ultimately consist of 3,455 dwelling units of the single and multi-family variety. At a projected average family size of 2.75 persons, this would result in an additional 9,501 people in the Billings metropolitan area. Development is planned to proceed in 16 phases over a period of 13 years. A breakdown of the proposed phases, dwelling units, sewage flows and projected construction dates is shown in Table 1 of the appendix. In addition to housing, the site plan includes a golf course, park, recreational and open areas, and a shopping center.

The initial development as submitted to the Department of Health and Environmental Sciences (DHES) will consist of 437 single family lots. A total of 439 lots have been approved by the Yellowstone County Commissioners in filings one through four. These filings may be revised to plat only 300 lots instead of the 437 applied for.

PREVIOUS RELATED IMPACT STATEMENTS

The impact of Briarwood Subdivision on the existing community has been partially addressed in prior studies. In August, 1979, a group of landowners in cooperation with the Billings-Yellowstone City-County Planning Staff adopted the South Hills Urban Planning Study. This study,prepared by Cumin Associates, RSWA-Denver and Sanderson/Stewart/Gaston Engineering Inc.,(SSG) addressed the impacts

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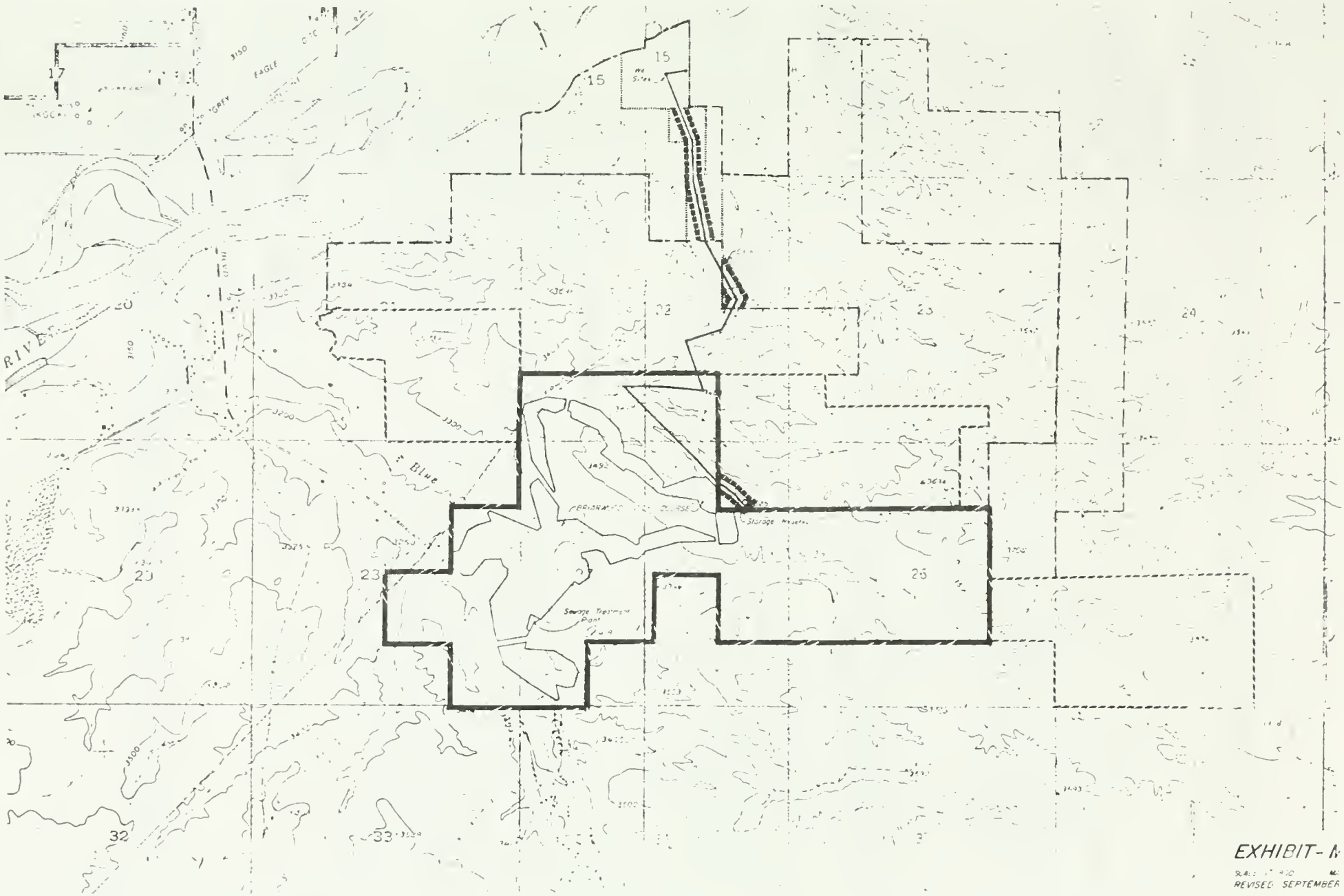


EXHIBIT-A

REVISED SEPTEMBER

of development in the South Hills area on both the physical and human environment. The study was general in nature and did encompass the Briarwood Subdivision.

In March of 1980, Cumin Associates prepared a partial Environmental Impact Assessment for Briarwood which was presented to the Billings-Yellowstone City-County Planning Board. Suburb Partnership, the developer, requested a zone change from Residential-15,000 (R-15000) and Agricultural (a) to Planned Unit Development (PUD) along with approval of their preliminary plat. This assessment was written as a supplement to the South Hills Urban Planning Study upon the request of the planning board. It specifically addresses the development's impact upon critical environmental areas such as the Blue Creek Riparian Ecosystem. The assessment also considers the community impact and criteria for public interest.

In addition to the above studies, the U.S. Department of Housing and Urban Development (HUD) prepared a Draft Environmental Impact Statement (DEIS) on December 23, 1980 for the entire Briarwood master plan. On March 23, 1981, a Final Environmental Impact Statement (FEIS) was circulated.

Due to the nature of the above environmental assessments, it is the decision of the Subdivision Bureau to prepare this addendum to the HUD Environmental Impact Statment. This addendum will address only those impacts upon the physical environment of which the Environmental Sciences Division of the DHES has jurisdiction. If the reader is interested in obtaining a copy of any of the above-mentioned reports, sources are listed in the Reference section at the end of this document.

WATER QUALITY AND QUANTITY, SOLID WASTE AND AIR QUALITY

Briarwood Subdivison will encompass a portion of Blue Creek, a small perennial stream. The Partial Environmental Impact Assessment prepared by Cumin Associates thoroughly addresses the Riparian Ecosystem of Blue Creek. Basically the golf course will be designed so that a minimal impact will result from development. The native grasses, shrubs and trees will remain undisturbed as much as possible. In areas where vegetation must be disturbed, any trees or shrubs that can survive will be moved. The planners feel that since public pedestrian and vehicular access is limited by the golf course, the benefit of a natural greenbelt area would be derived without overuse or abuse.

The remainder of this section addresses the impact of proposed water and sewage systems on water quality and quantity.

1. Sewage Disposal

A. Background Information

The method of sewage treatment and disposal was not discussed in the HUD FEIS. Water supply, storm drainage and sewage treatment

plans were not complete. Therefore, HUD rated these three items as a "serious environmental problem." Mortgage insurance was conditioned upon the submittal of engineered plans for water, sewage and storm water. This rating precipitated some negative comments from the Center for Disease Control and the Department of the Interior. These agencies felt that detailed plans should be submitted as part of EIS preparation. HUD did not concur with this opinion.

Since the distribution of the HUD FEIS in March 1981, the engineering firm of Sanderson/Stewart/Gaston, Inc. (SSG) has been retained to prepare complete plans and specifications for water supply, storm drainage and sewage treatment. Plans and specifications for the first 57 lots have been submitted to DHES for review. Application for approval of 380 additional lots has been made but detailed plans and specifications for this phase have not yet been submittted. SSG has recently informed us that only 300 lots will be platted in the initial filings.

The sewage collection system will consist of gravity mains for the most part, although a portion of the 1st filing will utilize a pressure sewer. The treatment facilities will be initially designed to serve 437 lots plus the club house for the golf course. The club house has been calculated at 13 residential equivalents for a total of 450 residential equivalents. The master plan for the South Hills states that each residential equivalent will have 2.81 population equivalents (PE). A PE generates 100 gallons per capita day in sewage (gpcd).

B. Description of the Initial Sewage Disposal System

The first four filings at Briarwood will generate 126,500 gallons per day (gpd) of sewage. The treatment will be by a septic tank and soil absorption system (ST-SAS). According to Paul Kinshella, project engineer from SSG, this system provides several advantages for the initial construction and operation for a new subdivision that will have to grow before a significant sewage flow is generated. Mr. Kinshella feels that the advantages of the St-SAS are as follows:

1. Will operate at any flow from no flow to full design capacity.

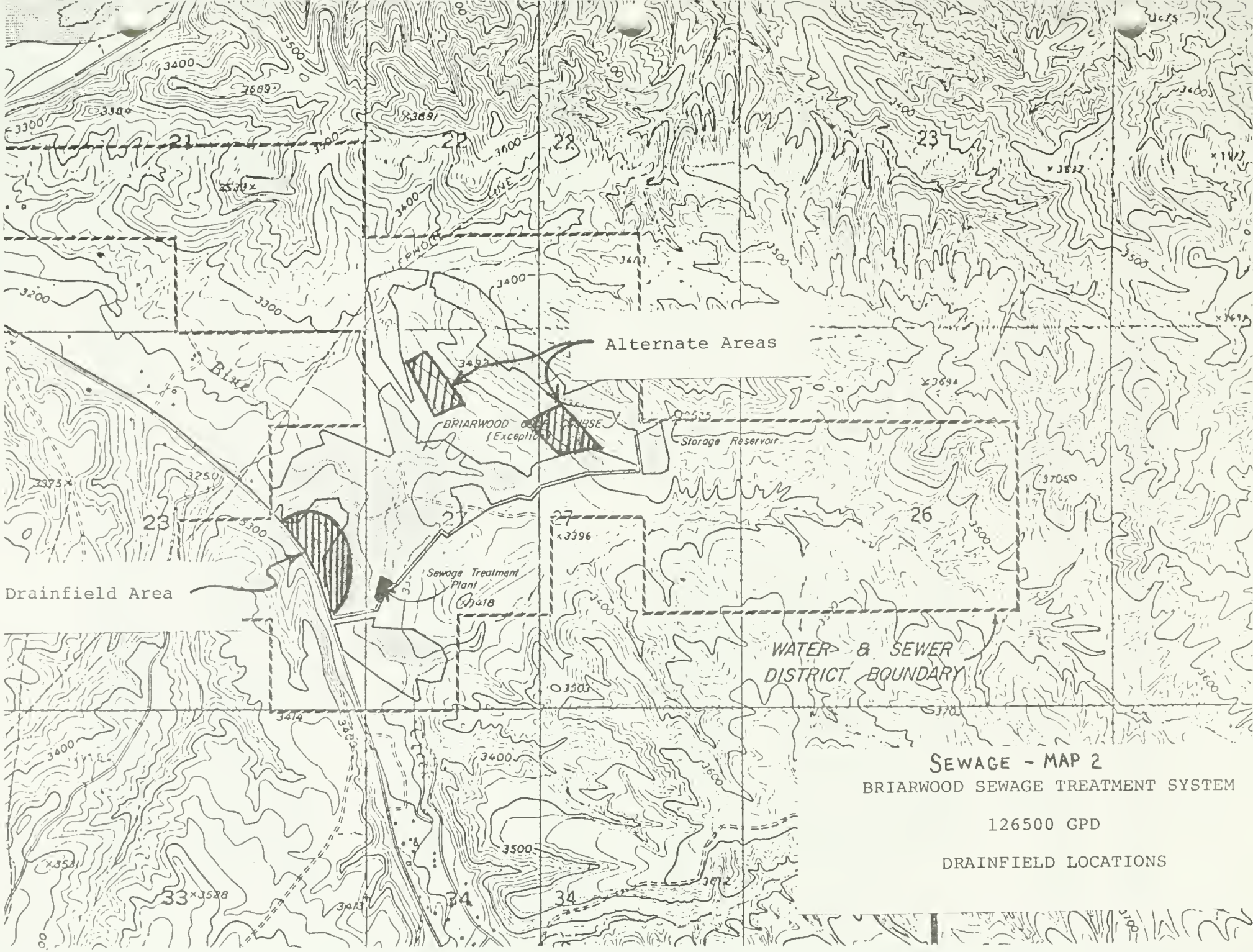
2. The system requires less operation and maintenance than an activated sludge plant.

3. Septic tank can be reused as flow equalization or a dosing chamber after an activated sludge plant is built.

4. A suitable site exists in the master plan area for the drainfield.

5. Alternative sites are available.

6. The drainfields could be alternated during the build up of the initial two phases, allowing rest periods of the soils.



SEWAGE - MAP 2

BRIARWOOD SEWAGE TREATMENT SYSTEM

126500 GPD

DRAINFIELD LOCATIONS

7. The line to the drainfields for the septic tank would be used in future plans to carry secondary effluent to the rapid infiltration system.

The area proposed for the soil absorption system is located across Blue Creek to the northeast of the subdivision as shown on Sewage Map 2. The septic tank and lift station are located in the sewage treatment plant site. (Sewage Map 2).

General soils information on the soil absorption system area is contained in the South Hills Urban planning Study. Preliminary on-site percolation rates vary from 3 to 18 minutes per inch with the average being 8.5 minutes per inch. The soils are not underlain by any groundwater or coarse gravel materials which would restrict the treatment of the septic tank effluent in the movement through the soil profile. All of the area to be utilized for the SAS is more than 100 feet from the high water elevation of a flow up to a 100 year event on Blue Creek. Final on-site soils data and seasonal high groundwater information must be submitted to the Department prior to approval.

The septic tank will have a 126,500 gallon capacity. The effluent from the septic tank will flow (by gravity dosing or pump) to the dosing-distribution system. The drainfields will be pressure dosed based upon the United States Environmental Protection Agency (EPA) "Design Manual." Pressure dosing provides an even distribution of the effluent to the drainline. Design loadings should be as outlined on page 214 of the EPA "Design Maual."

The dosing distribution arrangement will be distribution to the dosing chambers, and then dosing to the drainfields. The distribution vaults will have gates to cycle the flow to the different fields until sufficient flow is developed to utilize the entire drainfield. The location of the septic tank and lift station is depicted in Figure 1.

The golf course will be supplied with water from the domestic water system through this period. The water demand for the golf course through the irrigation period will be 800,000 gpd. The golf course lakes store 28 plus days of irrigation supply for the golf course which could be utilized without drawing on the domestic capacity during a period of high domestic demand.

C. Phase Two Sewage Disposal System

Table 1 lists the sewage flows projected for the various phases of Briarwood for the year 1981 through 1994. These flows are based upon the number of lots that would be on filed plats. The sewage flows will lag behind the flow that could be produced because all of the lots will most likely not be built upon before a subsequent filing is recorded. The sewage flows will be monitored to record an average daily flow.

Figure 2 shows the projected sewage flow through 1994 and the types and sizes of treatment that will be required. When the design flow exceeds 126,500 gpd, a 500,000 gpd oxidation ditch will be built.

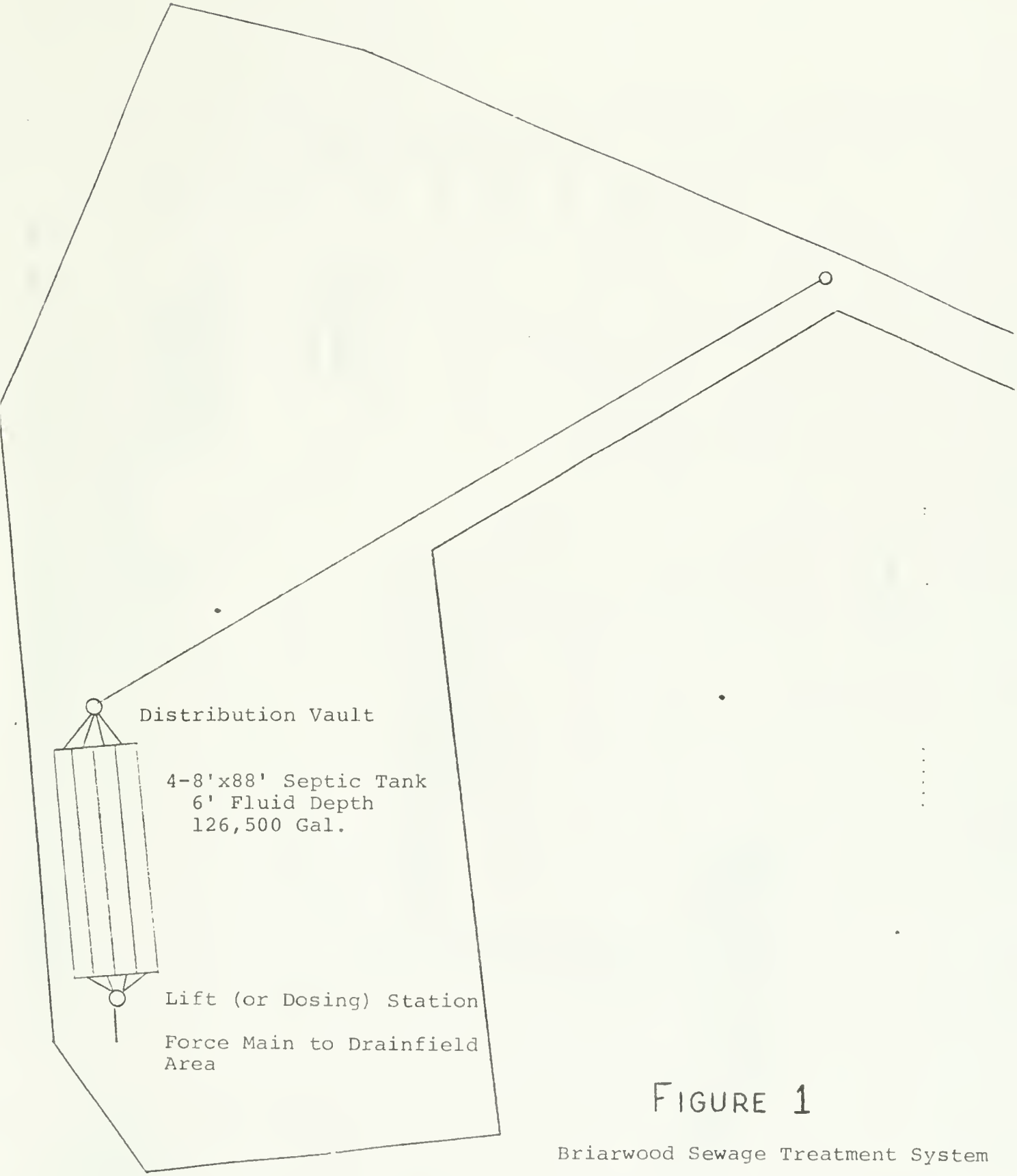
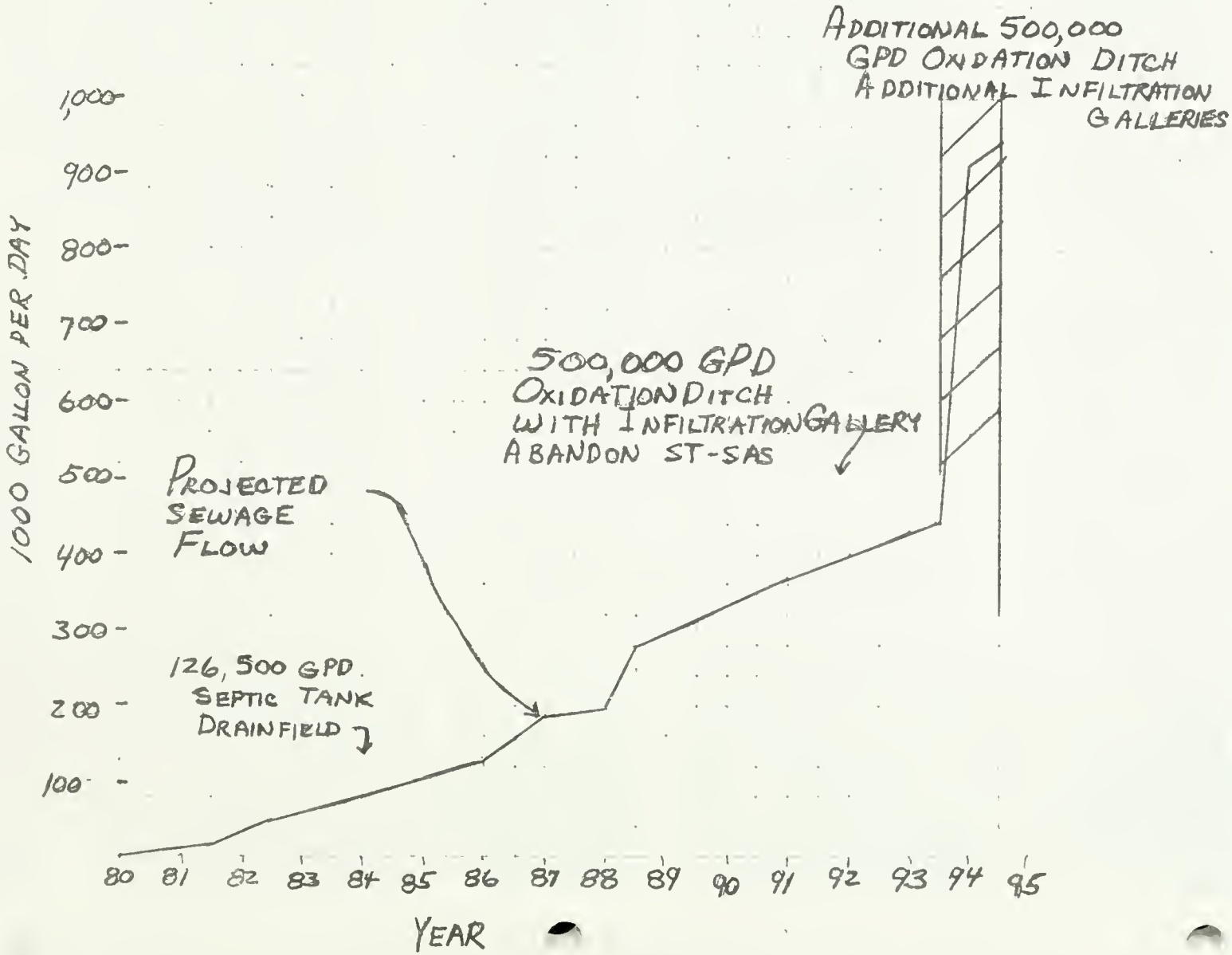


FIGURE 1

Briarwood Sewage Treatment System

126,500 GPD 1981 - 1986

FIGURE 2


ADDITIONAL 500,000 GPD OXIDATION DITCH
ADDITIONAL INFILTRATION GALLERIES
500,000 GPD OXIDATION DITCH WITH INFILTRATION GALLERY
ABANDON ST-SAS
PROJECTED SEWAGE FLOW
126,500 GPD SEPTIC TANK DRAINFIELD
1000 GALLON PER DAY
1,000
900
800
700
600
500
400
300
200
100
80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
YEAR

The oxidation ditch should be capable of producing effluent with BOD5 and TSS between 12 and 21 mg/l. The fecal coliform of the effluent should be less than 200 counts per 100 ml for the 7 day average and no two consecutive samples should exceed 400 counts per 100 ml.

Figure 3 shows the layout of the plant on the treatment site. The proposed major plant equipment will consist of the headworks with an influent measurement device, and bar screen. the oxidation ditch will be 10 to 15 feet in depth and have a jet aeration system. The jet aeration system allows better operation control of the oxygen concentration, velocity in the ditch and reduces the temperature loss in the ditch during cold weather when compared to a brush type aerator. The clarifier will be designed to operate with a 400 to 600 gpd upflow rate. Sludge will be recycled to the oxidation ditch with sludge wasted to the aerobic digester to maintain a constant sludge age. The effluent will pass through the ultraviolet disinfection unit to the lift station that will pump the effluent to the golf course lakes. Sludge will be aerobically digested and transported by truck to the landfill.

The operation will vary between summer and winter seasons. It is proposed that effluent will be sprayed on the golf course after 28 days retention in the golf course lakes during the irrigation season. A greater retention time may be required by this department. The golf course will require an additional 300,000 gpd make up water during the summer months. The winter operation will be to take the effluent from the lakes, which will allow higher temperature of the water and larger doses to be transported, to the infiltration site.

SSG has proposed that the infiltration area for the 500,000 gpd plant will have an average loading of 24 inches per week. This loading is based upon boulder pits installed in Yellowstone County which are loaded at rates of 72 inches per day or greater. The preliminary infiltration system design is to provide three "ponds" with infiltrative surfaces of 60 feet by 180 feet. Each pond might be loaded for one week and then rested for two weeks. The infiltration systems will have 10 feet separation between the pond bottom and the annual high ground water level. Final plans and specifications for this phase of sewage disposal must be submitted for review and approval. Figure 4 shows the location being considered for the infiltration site.

D. Final Sewage Disposal Facilities

When design flow exceeds 500,000 gpd, a second 500,000 gpd oxidation ditch will be installed parallel to the existing treatment facility. An additional clarifier will be added and the capacity of the aerobic digester increased to 325,000 gallons. The operation will change only in that the infiltration system will dispose of 200,000 gpd during the summer and 1,000,000 gpd during the winter. The domestic water system will not be supplying irrigation water to the golf course after the sewage flow reaches 800,000 gpd.

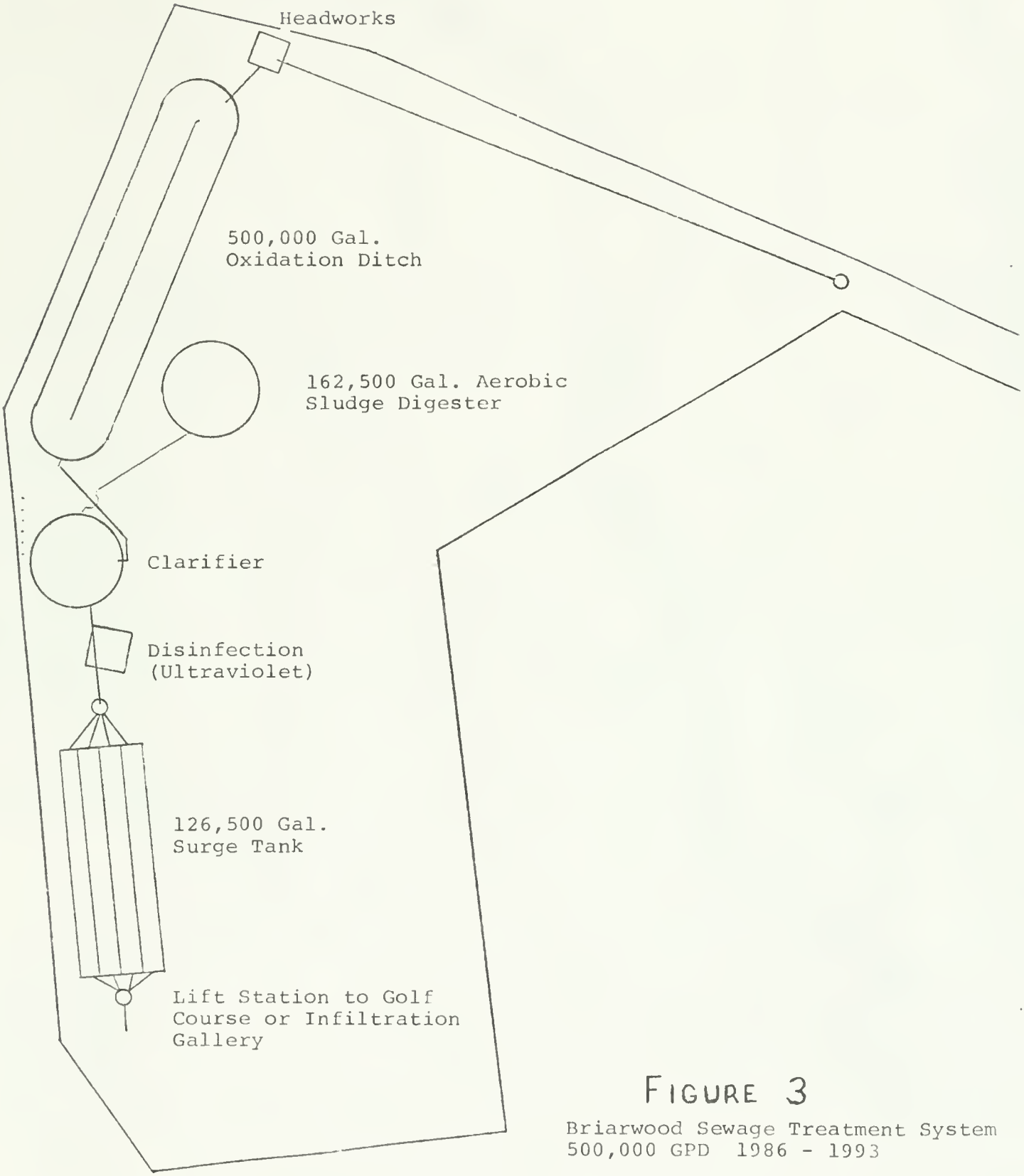


FIGURE 3

Briarwood Sewage Treatment System
500,000 GPD 1986 - 1993

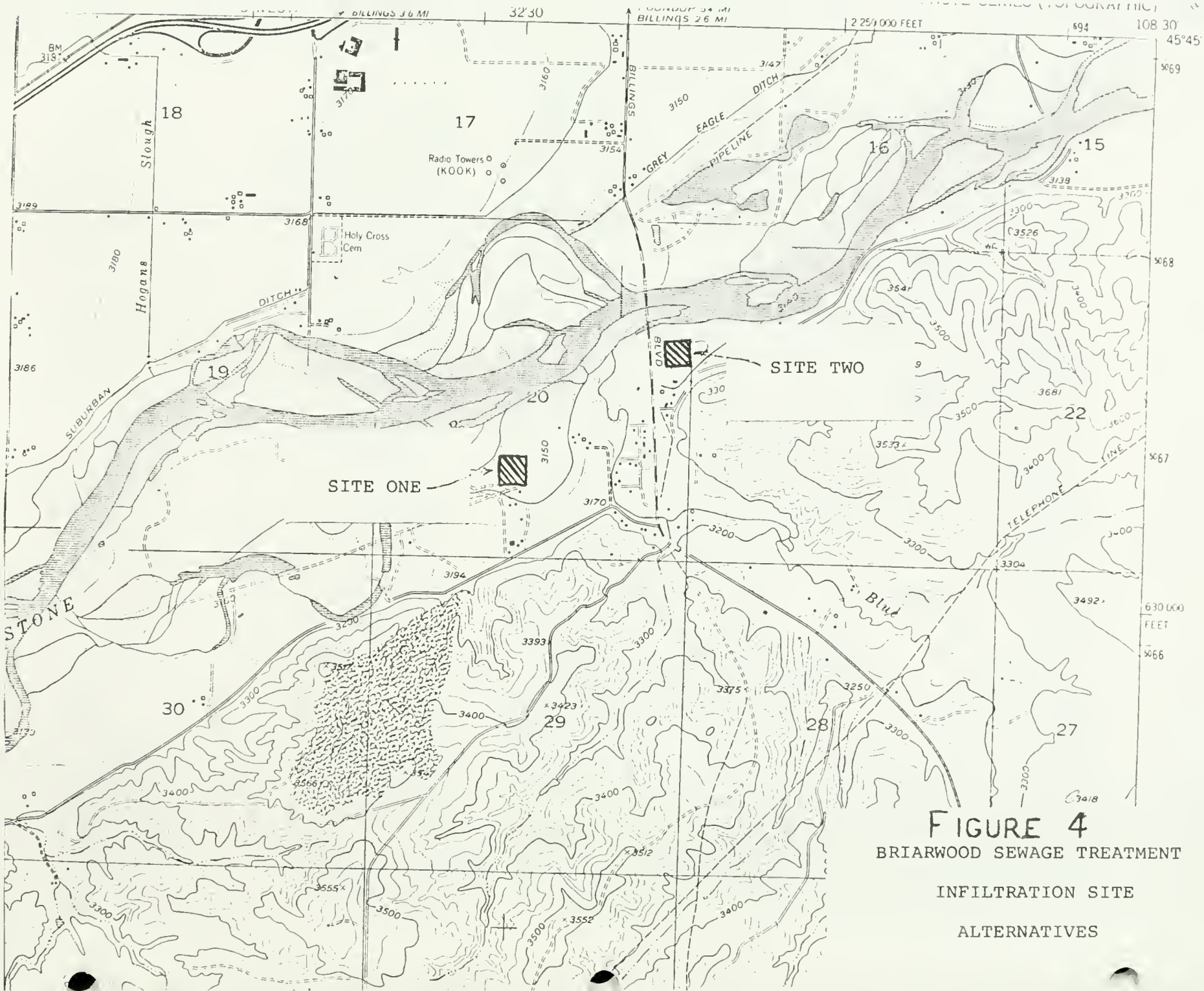


FIGURE 4
BRIARWOOD SEWAGE TREATMENT
INFILTRATION SITE
ALTERNATIVES

Three additional 60 feet by 180 feet infiltration "ponds" are proposed. The loading cycle might remain the same with one week of loading at 24 inches per day and two weeks of resting. The ultimate sewage treatment system is depicted in Figure 5. The DHES cannot make a decision on the adequacy of any part of the proposed sewage treatment system until final plans and specifications are submitted for review.

2. Water supply

A. Description of the Proposed System

The water supply facilities consist of an infiltration gallery located in the river gravels along the south side of the Yellowstone River. The infiltration lines collect the water in a wet well from which it is pumped to the subdivision following chlorination. Gravity storage tanks located near the subdivision ride on the distribution system. The infiltration gallery and pump house is located in Section 15 of R26E T1S. The gravity storage tanks are located in Section 27. Approximately 12,200 ft. of 16" ductile iron pipe, Class 52, connect the pump house and the storage tanks. The location of this system is depicted on Exhibit-Map 1.

The infiltration system consists of two T-shaped collection galleries placed in a sandy gravel area approximately 250-500 feet from the south bank of the Yellowstone River. This sandy gravel area is bordered on the south by shale hills. The major source of recharge for this gallery is the Yellowstone River. The top of each infiltration "t" is 200 feet long and parallels the Yellowstone River. The pipe used for this line is 12" SDR35 PVC pipe which has been perforated. The lines perpendicular to the river which connect to these headers and drain the water toward the pump house are also perforated. These lines are 250 feet long and consist of 15" perforated PVC pipe. All the perforated lines are laid in a washed rock bed approximately 3-1/2 feet square. The rock is 1-1/2" in diameter. This rock bed is wrapped with marafy filter fabric. This rock bed is laid on shale which is located 13 to 18 feet below the top of the sandy gravel area. A plastic liner is placed on all shale contact surfaces. Water from the infiltration galleries drains into a wet well located below the pump house. Two 600 gpm 520' TDH vertical turbine pumps are located over this wet well. A second wet well will be constructed for future use into which two additional pumps can be placed. Gas chlorination facilities are provided in this pump house to disinfect the water. The two chlorinators to be used have capacities of 50 lbs. per day and a 100 lb. per day chlorinator will be provided but not installed. The chlorinator setup also includes an automatic switch-over module so that if one cylinder runs dry the other one will automatically feed chlorine. A water meter is also located in this pump house. The gravity storage tanks consist of two 60,000 gallon steel tanks for a total gravity storage capacity of 120,000 gallons. The storage tanks' elevation will produce pressure which may exceed 100 psi at some points in the distribution system. Where the pressure does exceed 200 psi, pressure reducing valves will be used. Plans and

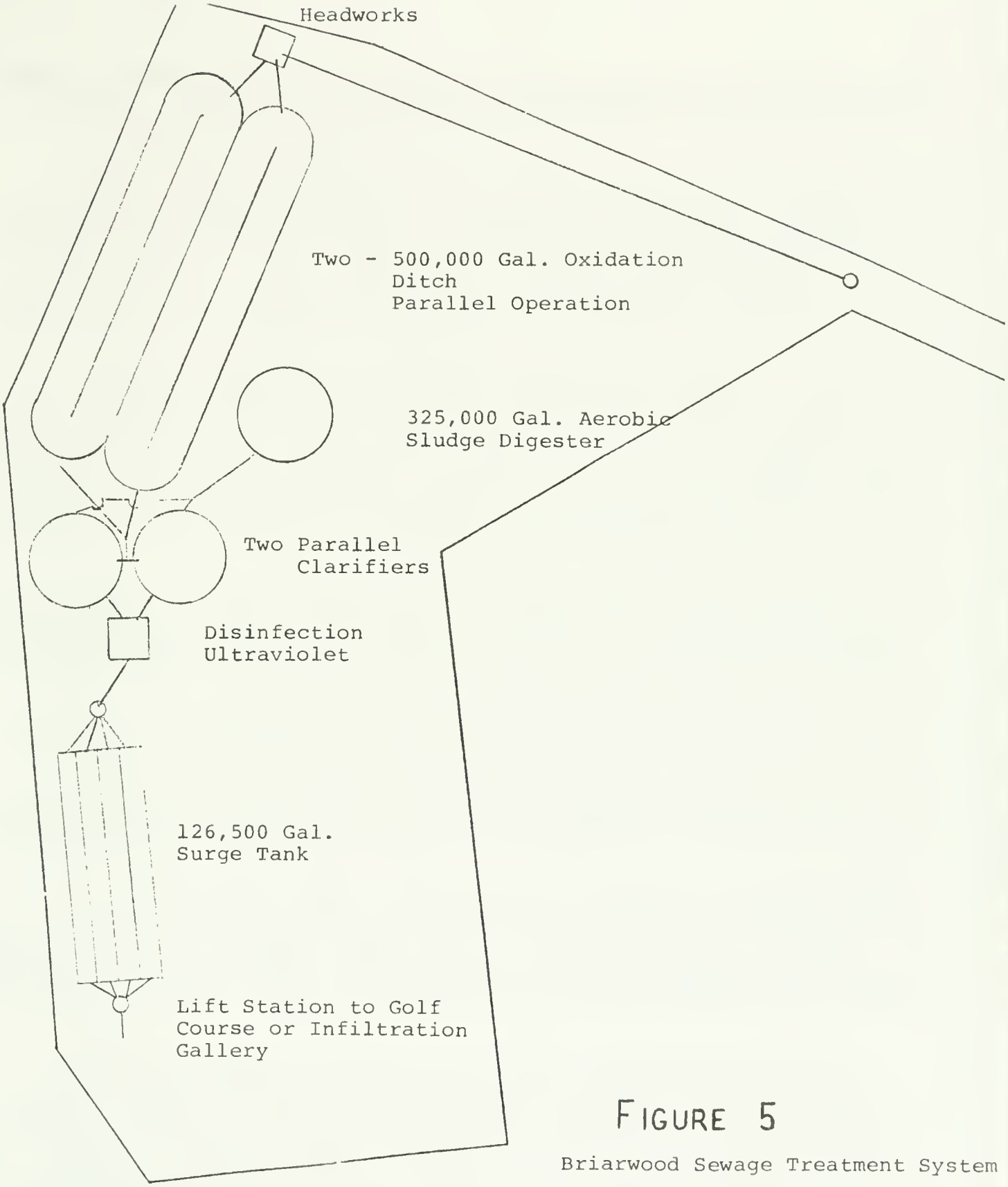


FIGURE 5

Briarwood Sewage Treatment System

1,000,000 GPD Beyond 1993

specifications have been submitted to the Water Quality Bureau of DHES for review. Approval of the system as described is not yet finalized.

B. Quality and Quantity

A water sample was obtained from an existing well in the sandy gravel area and was analyzed for a complete list of chemical and radiologial parameters. Table 2 of the appendix presents the results of this analysis. This sample should be an accurate representation of the water quality to be produced by this infiltration gallery. This analysis shows that the water meets all of the maximum contaminant levels set by the Federal Safe Drinking Water Act.

It also is conditionally acceptable in its concentration of common ions, although some parameters exceed recommended levels. The sodium level of 298 mg/l and sulfate level of 600 mg/l may be of particular concern to some people. High sodium may be of interest to persons on sodium restricted diets. Sodium restricted diets are essential in treating congestive cardiac failure, hypertension, renal disease, cirrhosis of the liver, toxemias of pregnancy and Meniere's disease. It is therefore recommended that health officers, physicians, and consumers be informed of the sodium content.

In large amounts, sulfate, in combination with other ions, gives a bitter taste to water. Concentrations above 250 mg/l may have a laxative effect, but 500 mg/l is considered safe. domestic waters in Montana containing as much as 1000 mg/l sulfate are used for drinking in the absence of a less mineralized water supply.

This water source could be classified as very hard and may react with soap to form precipitates and scale.

Both the iron content and total dissolved solids level exceed the recommended EPA secondary drinking water standards. However, the concentration of these parameters is not excessive and may not be a noticeable inconvenience.

The designed water supply facilities are capable of pumping 1200 gpm into the system. A water rights application has been filed with the Department of Natural Resources and Conservation for 1600 gpm. This water right has been granted and as long as the South Hills Association files a notice of completion within the appropriate length of time, there should be no problem as far as water rights are concerned.

A hydrology report on this location was prepared by Resource Engineers and Associates in Helena and was used in a design of the system to determine the amount of water which should be able to be obtained through this infiltration gallery system. Their analysis of the location and the transmissivity and storage coefficients of the sand and gravel the gallery is constructed in show that even using the most conservative numbers, there would be in excess of 1600 gpm of water produced.

C. Water Usage

Water produced by this source will be used for the domestic needs of the subdivision, fire protection, and irrigating the golf course. Again, water can be supplied at a rate of up to 1200 gpm and there is 120,000 of gravity storage available to the subdivision. The combined 2-hour maximum sustained demand that can be supplied by the pumps in the storage reservoir is 2200 gpm. The source pump house can supply 1.73 mg/d in a 24-hour pumping period and 1.15 mg/d in a 16-hour pumping period.

Needed fire reserve is estimated at 750 gpm for 2 hours for a total of 90,000 gallons. This quantity of water will be able to be supplied by the gravity storage and source facilities even during a peak usage time.

The golf course will be irrigated totally with water from the domestic water system through 1985. After 1985 it is proposed that treated sewage will be used to augment the golf course irrigation. During this initial phase the water demand of the golf course is estimated to be up to 800,000 gpd. Two lakes designed into the golf course will be used to store the irrigation water. The combined capacity of these lakes will store a 28-day golf course irrigation supply.

Average domestic consumption, not including irrigation, was estimated at 100 gallons per capita per day. If irrigation is included and maximum per capita consumption were 500 gallons per capita per day, 425,000 gpd would be needed to supply the first 300 lots. Even with the irrigation demands of the golf course being taken out on a maximum domestic usage day, sufficient water supply would be available. With the storage present in the lakes on the golf course, water withdrawn for golf course irrigation could be done only during low usage times or could even be delayed for a period of days. Peak instantaneous domestic demand for the first 300 lots should not exceed 500 gpm, therefore the supply capacity is adequate to meet this peak demand without drawing from the storage reservoirs. The fire flow reserve should be able to be maintained in the storage reservoirs.

At peak buildout of 3,455 dwelling units, the domestic water demand will increase considerably. The irrigation demands for the golf course should remain unchanged while fire protection should be increased to satisfy the possibility of multiple fires.

Average domestic consumption including, lawn irrigation may increase to as much as 4,837,000 gpd with peak instantaneous demands of up to 5000 gpm. Coupled with fire flow and existing golf course irrigation demand, peak water usage of approximately 7000 gpm could be realized. This demand will be met through additional water storage tanks and increased water supply at the source.

3. <u>Solid Waste Disposal</u>

A. Amount of Waste Generated

According to the partial Environmental Impact Assessment prepared for Briarwood by Cumin Associates, a population of 8,638 would generate approximately 21,595 pounds of solid waste a day. If an ultimate population of 9,501 were reached, this value would escalate to 23,752 pounds per day.

In 1976 Henningson, Durham and Richardson (HDR) prepared a statewide solid waste management study. According to their report, the waste generation rates in urban areas are potentially as high as 5.7 lbs/person/day for areas of 5,000 and greater population. If the expected 8638 population is reached, the waste generation rate could actually be as high as 49,237 lbs/day. If the ultimate population of 9501 is reached, the rate would escalate to 54,156 lbs/day.

B. Proposed Method of Disposal

Solid waste would be collected by private haulers operating under a contractual fee arrangement. Waste would then be disposed of at the City of Billings landfill west of Blue Creek road. According to the 1976 study prepared by HDR, the Billings' landfill has a useful life time to the year 2025. The City of Billings' landfill is licensed by the Solid Waste Bureau of the DHES.

In past years, Yellowstone County has paid a fee to the City of Billings so that individuals as well as private haulers can utilize the landfill. Recently, controversy has arisen between the city and county as to appropriate fees. Therefore, we have requested clarification from the City of Billings as to their acceptance of solid waste from Briarwood.

Chapter 16.16.309 of the Sanitation in Subdivisions Regulation states that "Developers shall use an existing approved solid waste disposal site in their district or county." If the discrepancies between city and county government are not resolved, there are two alternatives. First, Yellowstone County may choose to operate its own landfill or Suburb Partnership may choose to operate a landfill exclusively for Briarwood. Either of these options would be costly and time consuming since a new site must be evaluated and approved.

Siting a landfill in the Briarwood Subdivision would involve setting aside adequate acreage to dispose of up to 10,037 tons of solid waste/year, and this requires considerable use of available land resources. Adequate planning would have to be included to provide buffer areas, operating funds, and end uses for the landfill area, all potentially significant impacts to the proposed subdivision. In any event, it would be most beneficial to this or any development within Yellowstone County if the Billings City landfill could be utilized.

4. <u>Air Quality</u>

A. Existing Conditions

See HUD Final Environmental Impact Statement.

B. Probable impact of the Proposed Action

Development of the project site will have an impact on air quality particularly in terms of total suspended particulates during the construction phases due to earth moving and site preparation. These impacts will be of short duration.

The primary air quality impact will be the emission of carbon monoxide from automobile trips to and from the site. The approximate number of vehicle trips that will be generated is 15,000 per day.

The local CO impacts of the development can best be determined by utilizing any U.S. EPA approved air quality model. In lieu of any formal air quality modeling, it would appear that the primary air quality impact of the development will be to create localized CO concentrations along the primary access route in and out of the proposed development project.

C. Measures to Mitigate Adverse Impacts

During the construction phases, the potential suspended particulate problem which might occur during earth moving activities can be mitigated through the use of standard dust control techniques used by the contractors. It should be recommended that all contracting documents relative to this phase of the project include the provision for use of dust control techniques.

Since the potential air quality impact will be felt primarily in vehicle produced carbon monoxide, mitigating measures must relate to either better emission control devices for the individual automobiles or better transportation system management.

D. Unavoidable Adverse Impacts

An increase in local levels of carbon monoxide will be an unavoidable impact.

GEOLOGY AND SOIL QUALITY, STABILITY AND MOISTURE

The geology and soils of Briarwood Subdivision have been previously addressed in the South Hills Urban Planning Study. We concur in the recommendation by HUD that soils investigations be prepared by a professional engineer on a filing-by-filing basis to properly mitigate problems caused by steep natural slopes, soil erosion, and expansive soils in the develoment.

1. Stormwater Runoff

A. Potential Impact Due to Development

As noted in the Final HUD Environmental Impact Statement, detailed stormwater drainage plans must be prepared by an engineer. A lack of erosion control measures during and after construction of Briarwood could result in additional sedimentation of Blue Creek. HUD

recommends that no development take place along the banks of Blue Creek.

B. Measures to Mitigate Adverse Impacts

A preliminary stormwater management plan has been developed by SSG.

Topography, homesites, open areas, drainways, road, streets, drain structures, street grades, storm flow patterns and destination have been detailed on a preliminary plat. The vegetation types are shown on the Vegetation/Wildlife photocopy (Figure 6), the soils are shown on the Soil Stability maps (Figures 7). The streets will be paved with major streets having curbs and gutters, and other streets having drainage swales. Copies of the proposed cross sections are included in the appendix.

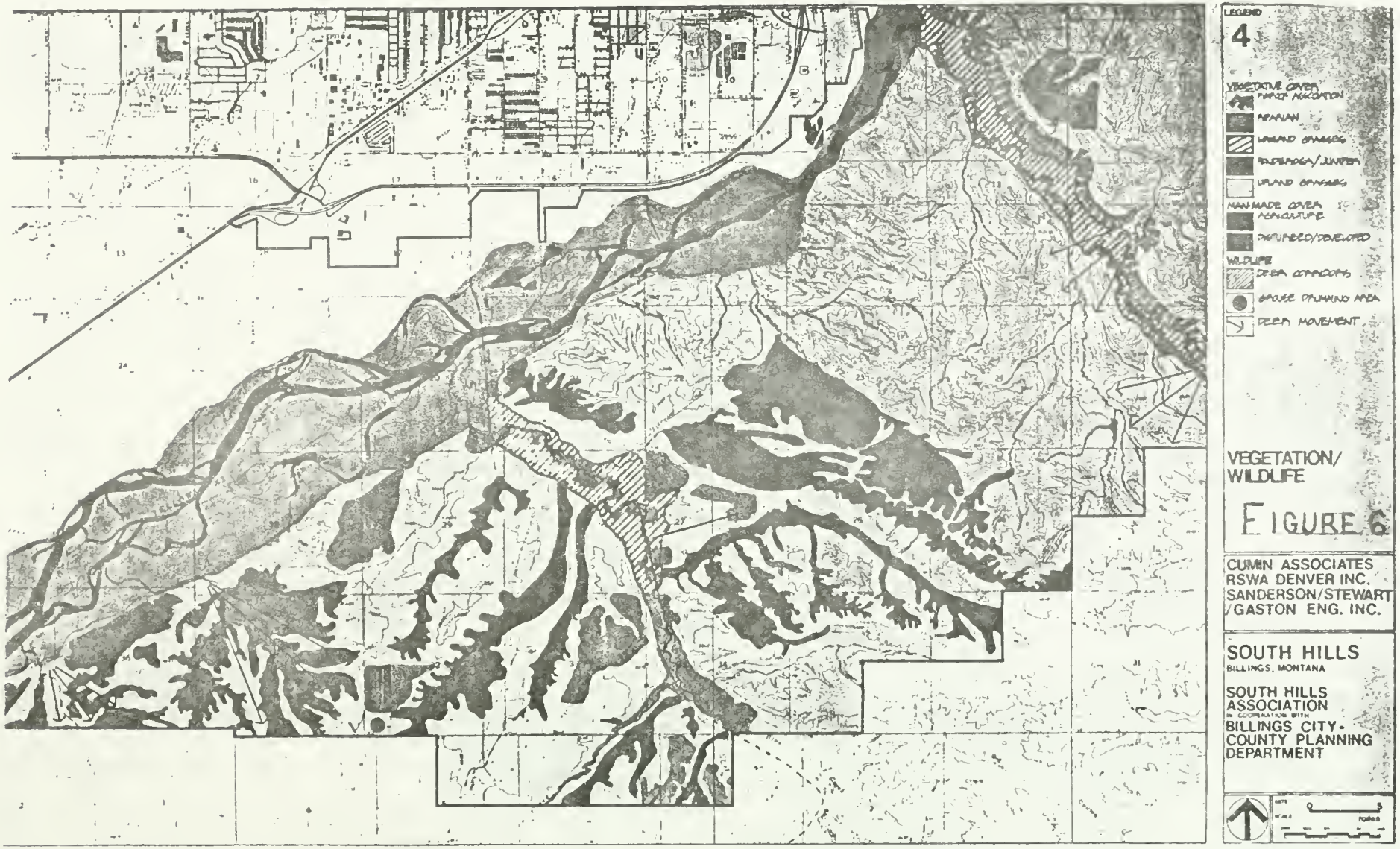
The drainage from Briarwood will be intercepted by natural channels at the first opportunity. These natural channels drain to the golf course. The flow will be slowed down and spread on the golf course fringe areas where they will lose their sediment load. It is anticipated that this will prevent the degradation of the flows in Blue Creek.

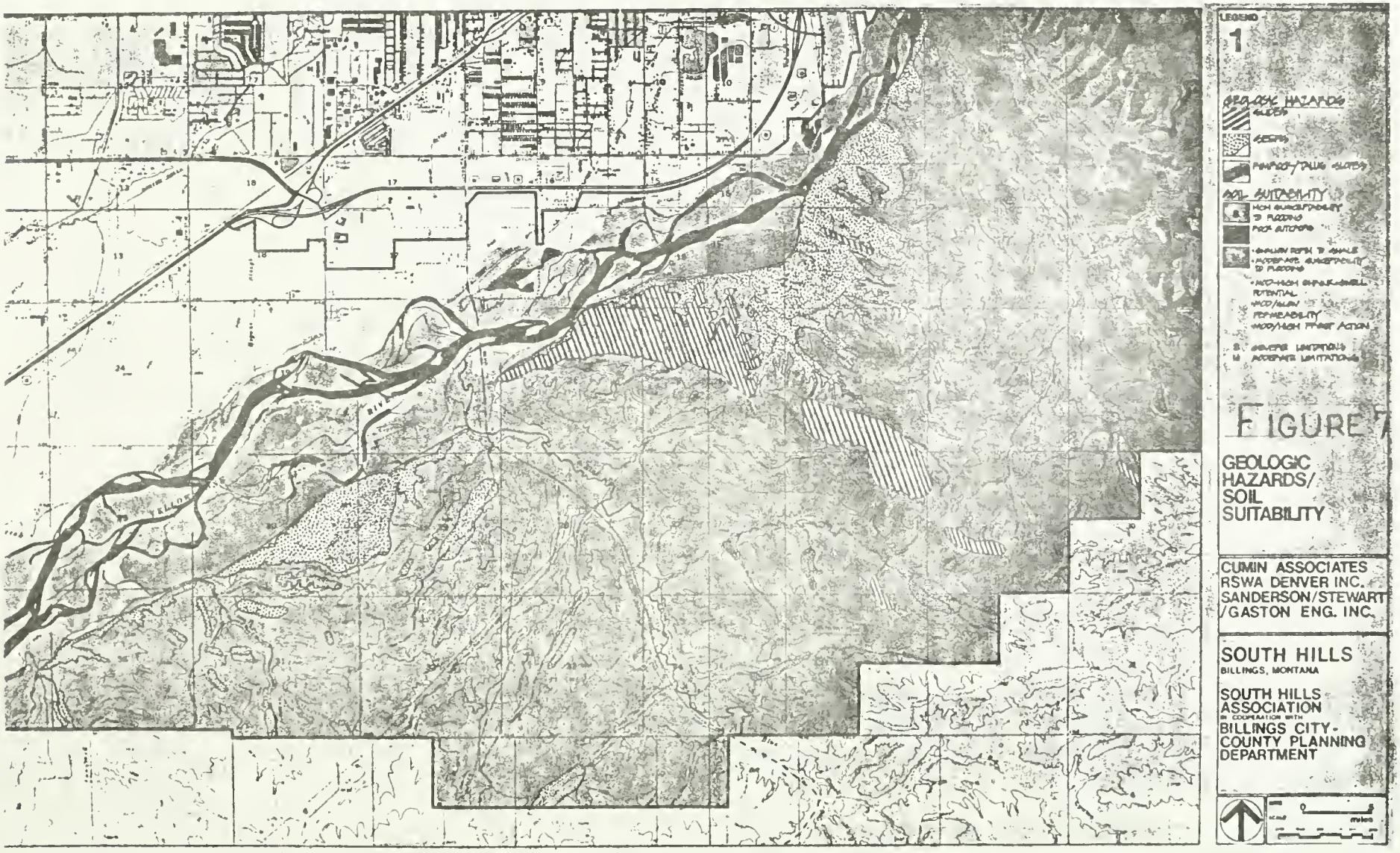
The flows shown on the preliminary plats are for the 2 year-6 hour storm, except for the drainage flowing into the subdivision. These are for a 25 year storm using the Johnson-Omang method. The Blue Creek bridge structure is designed to a 100 year frequency flow.

The 2 year-6 hour storm has an intensity of 0.16 inches/hour. The following table lists the C factors for various areas for an intensity of 0.16 inches/hour.

Single Family Residential	0.25
Parks-Golf Course	0.10

Culverts and other drainage structures have been sized to conduct stormwater runoff from the appropriate storm event. The appropriate plan for land development of this nature is to determine the historic amount of stormwater runoff entering Blue Creek. Then one must design storm drainage facilities so that any amount exceeding the historic flow is retained onsite.


LEGEND
4
VEGETATIVE COVER
PONDEROSA/JUNIPER
UPLAND GRASSES
MAN-MADE COVER
AGRICULTURE
DISTURBED/DEVELOPED
WILDLIFE
DEER CORRIDORS
GROUSE DRUMMING AREA
DEER MOVEMENT
VEGETATION/
WILDLIFE
FIGURE 6
CUMIN ASSOCIATES
RSWA DENVER INC.
SANDERSON/STEWART
/GASTON ENG. INC.
SOUTH HILLS
BILLINGS, MONTANA
SOUTH HILLS
ASSOCIATION
IN COOPERATION WITH
BILLINGS CITY-
COUNTY PLANNING
DEPARTMENT


LEGEND
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GEOLOGIC HAZARDS
SOIL SUITABILITY
FIGURE 7
GEOLOGIC HAZARDS/ SOIL SUITABILITY
CUMIN ASSOCIATES
RSWA DENVER INC.
SANDERSON/STEWART /GASTON ENG. INC.
SOUTH HILLS
BILLINGS, MONTANA
SOUTH HILLS ASSOCIATION
IN COOPERATION WITH
BILLINGS CITY-COUNTY PLANNING DEPARTMENT
miles

ALTERNATIVES

The DHES has three alternatives at this point in the review process.

1. Deny the proposed subdivision

2. Approve the proposed subdivision

3. Conditionally approve the proposed subdivision.

Alternative one would not prevent division of the area into 20 acre arcels and further division through exemptions. Scatttered, piecemeal development would be the likely outcome.

Alternative two may result in inadequate sanitary facilities and/or protection of the natural environment at this time. We consider this alternative premature.

RECOMMENDATION

Alternative three is recommended by the DHES and conditioned upon the following:

1. That final plans and specifications for sewage disposal, water supply and storm runoff be submitted for review and approval prior to the filing of each phase.

2. That the method of solid waste disposal is resolved prior to the filing of any phase.

3. That potential residents be notified of the sodium and sulfate concentration of the proposed water supply.

APPENDIX

Talbe 1	Projected Buildout Population and Sewage Flows
Table 2	Water Quality Analysis
Exhibit A-E	Highway Cross Sections

PROJECTED BUILDOUT POPULATION
AND SEWAGE FLOWS

TABLE 1

PHASE	YEAR	NUMBER OF DWELLING UNITS	NUMBER OF ADDITION PE	INCREMENTAL SEWAGE FLOW GPD	TOTAL SEWAGE FLOW GPD
1	1981-1982	57	160	16,000	16,000
2	1982-1983	88	247	24,700	40,700
3	1983-1984	87	245	24,500	65,200
4	1986	205	576	57,600	122,800
5	1986-1987	102	287	28,700	151,500
6	1987	110*	309	33,900	182,400
7	1988	60	169	16,900	199,300
8	1988-1989	266	747	74,700	274,000
9	1989-1990	125	351	35,100	309,100
10	1990-1991	126	354	35,400	344,500
11	1991	81	228	22,800	367,300
12	1992	110	309	30,900	398,200
13	1993	108	304	30,400	428,600
14	1993	45	126	12,600	441,200
15	1994	1,660**	4,665	466,500	907,700
16	1994	99	278	27,800	935,500

* RMF

** COMMERCIAL AND RMF

TABLE 2

September 16, 1981

Paul Kinshella
Sanderson, Stewart and Gaston
1629 Avenue D
Billings, Mt. 59102

Reference: South Hills Water System, Tom Llewellyn, ¼ miles West Briarwood Wells. Submitted August 14, 1981 for complete water chemistry to include gross alpha and beta radiation.

Parameter	milligrams/liter
Arsenic*	less than .005mg/l
Barium*	less than .1mg/l
Cadmium*	less than.001mg/l
Calcium	184.2mg/l
Chromium*	less than .02mg/l
Iron	.33mg/l
Lead*	less than .01mg/l
Magnesium	38.9mg/l
Manganese	.05mg/l
Mercury*	less than .001mg/l
Selenium*	less than .005mg/l
Silver*	less than .005mg/l
Sodium*	298mg/l
EMSIS 11103	
Alkalinity, total	340mg/l
Chloride	56.5mg/l
Fluoride	.65mg/l
Hardness, total	620mg/l $CaCO_3$
Nitrate nitrogen	.3mg/l
Sulfate	600mg/l
Conductance	1670umhos/cm@25°C
pH	7.30 standard units
Total dissolved solids	1186.6mg/l
SAR ratio	3.7
Gross alpha£	7.3 ± 5.8 pCi/l
Gross beta£	31 ± 21 pCi/l

£ Hazen

Submitted by,

R.A. Davidson

AMATEC SERVICES
R. A. Davidson, A.B.
Associate Director
encl:

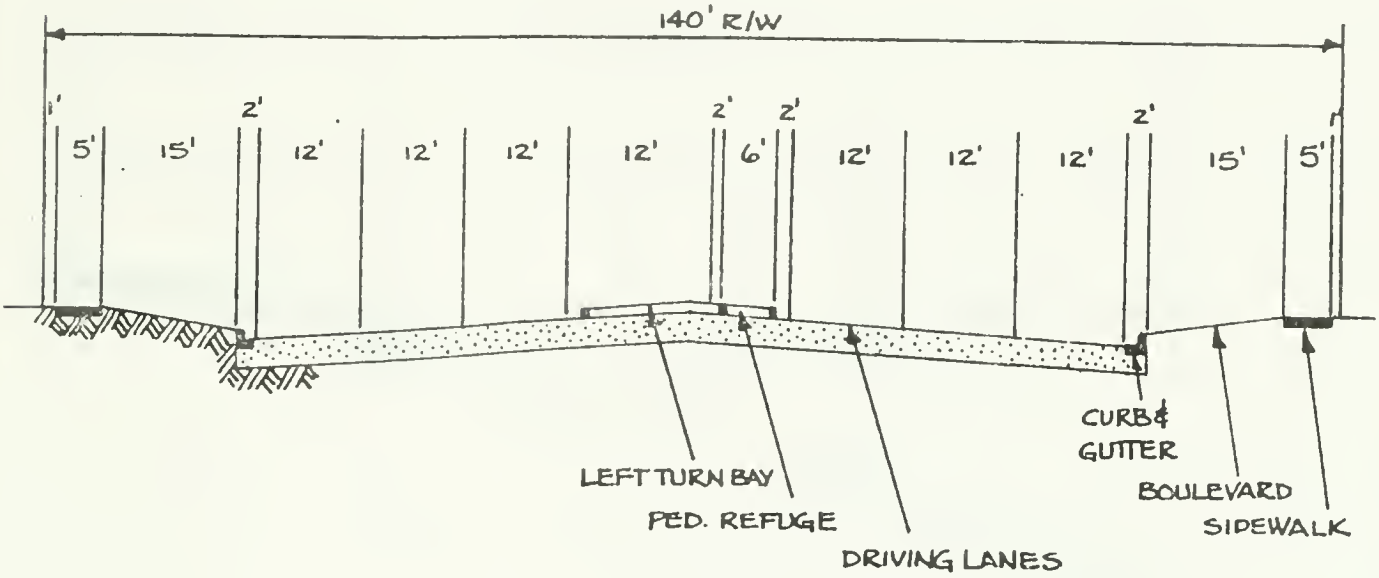
American Analytical Testing and Environmental Consultants

Sanderson/Stewart/Gaston Engineering, Inc.

Consulting Engineers and Land Surveyors
1623 Avenue D
Billings, Montana 59102
406/245-6366

Date 3-14-80
Job 78-195
By LWH
Sheet —/—

EXHIBIT A. PRINCIPAL ARTERIAL
(BLUE CREEK ROAD)



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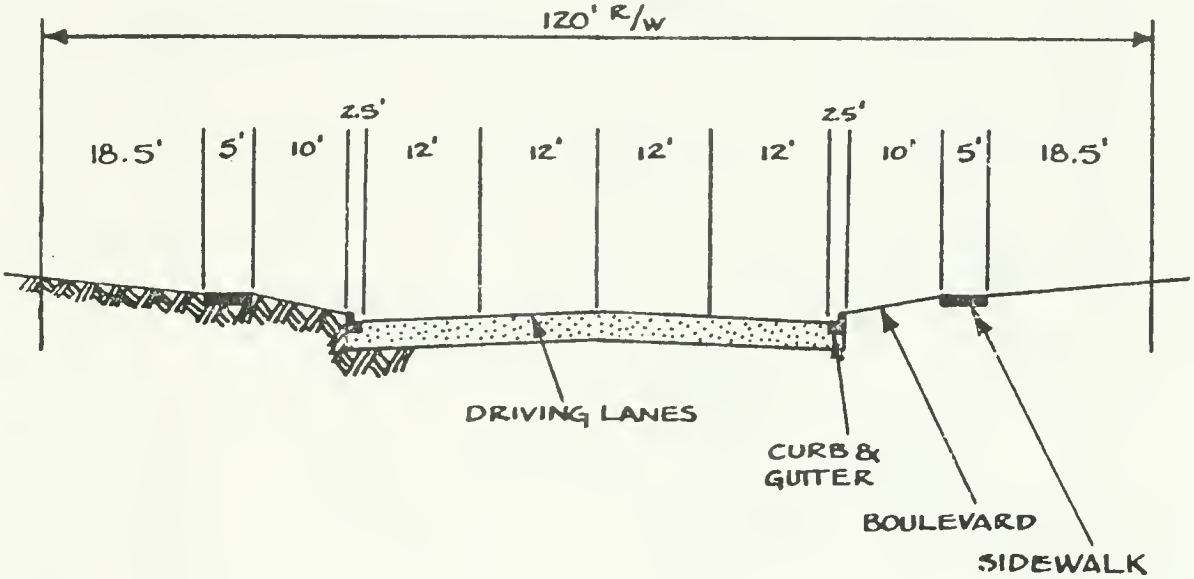
Date 3-17-80
Job 78,195
By LWH
Sheet —/—

EXHIBIT B. ARTERIAL



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Billings, Montana 59102
406 245 6566

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EXHIBIT C. MAJOR COLLECTOR

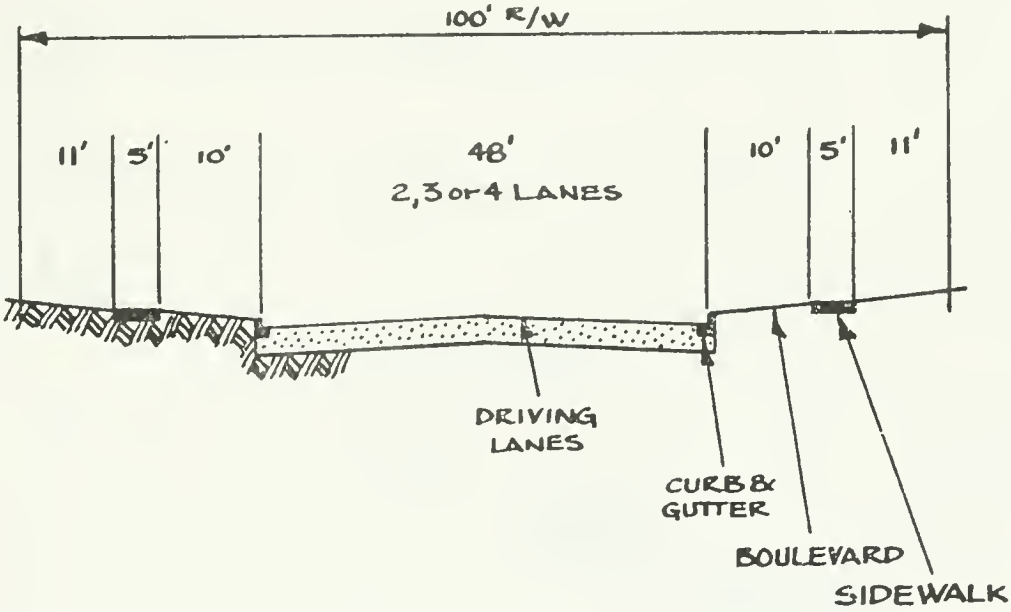

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EXHIBIT D. COLLECTOR

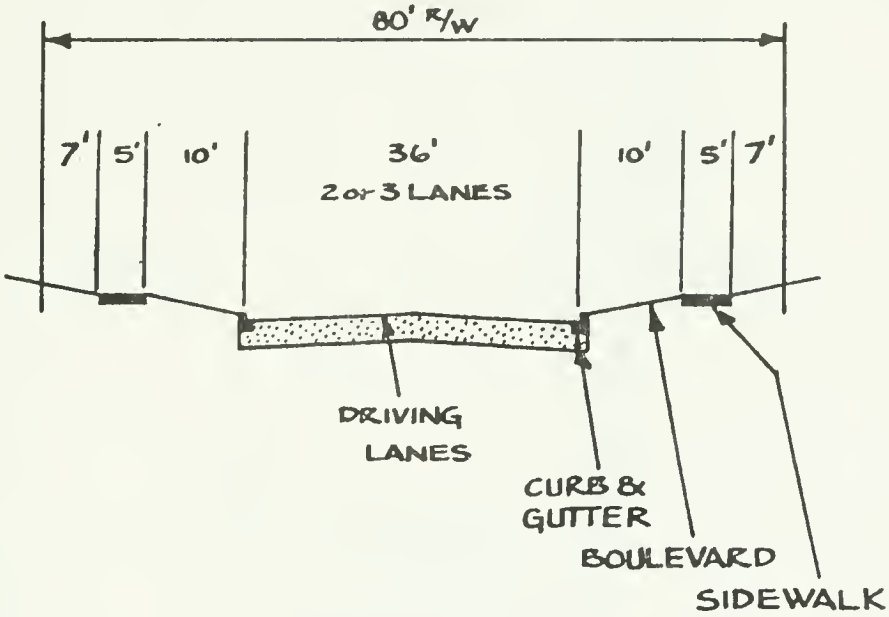

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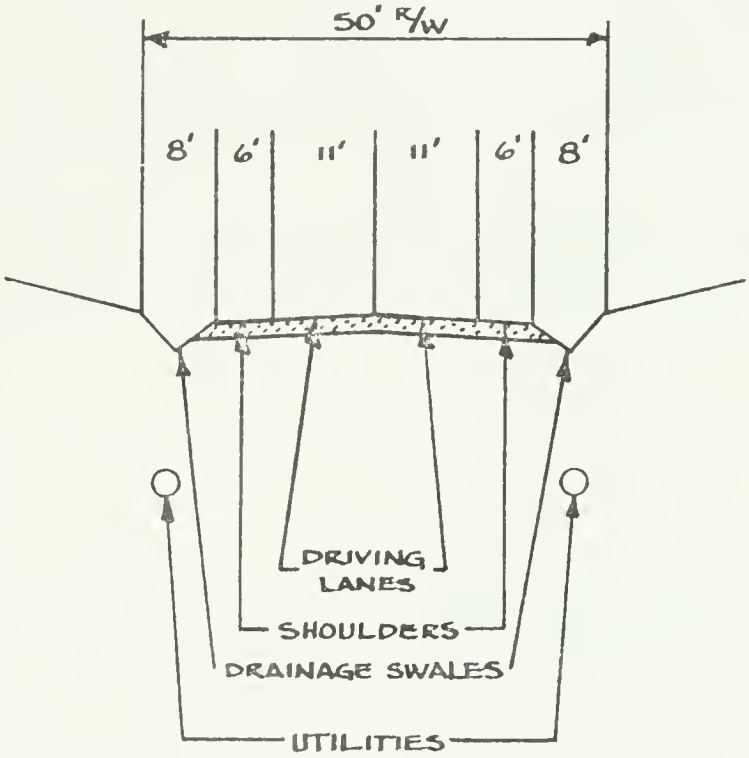
EXHIBIT E. LOCAL



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Partial Environmental Impact Assessment; Cumin Associates, March 1980

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