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**Hill Annex Mine State Park
Report**

January 1, 1993

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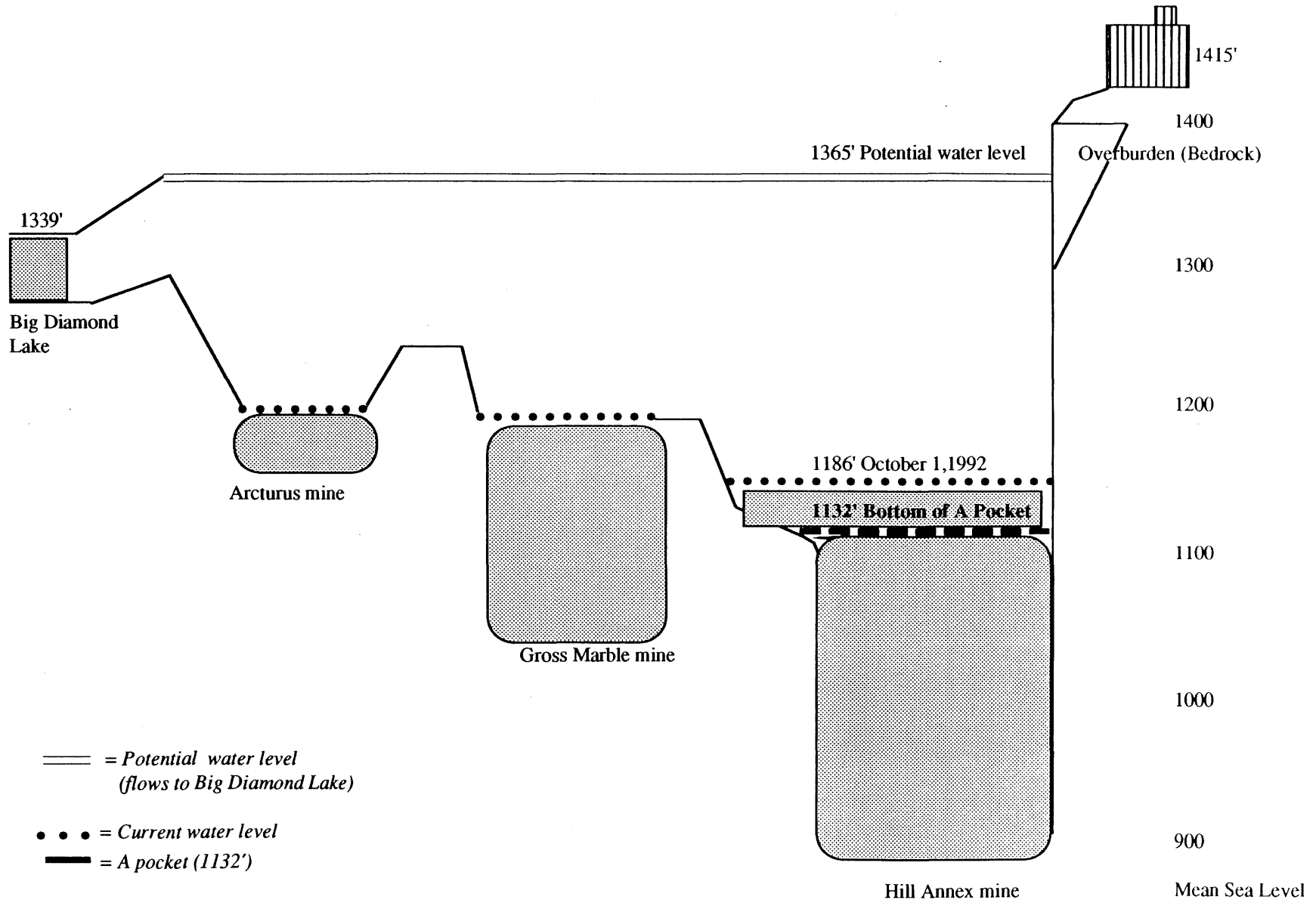
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Figure 1. Hill Annex Mine Water Levels



3a

Summary

Laws of Minnesota 1991, Chapter 254, Article 1, Section 5, Subdivision 5, mandated the Division of Parks and Recreation to maintain the water level of Hill Annex Mine State park at the bottom of 'A pocket' (see map, page 3a) and report **the pumping and operations cost associated with the pumping** to the legislature by January 1, 1993.

Since 1988, when the mine became a state park, the DNR has pumped over 4 billion gallons of water and lowered the water level 12-15 feet at an average annual cost of \$72,000.00. An additional 54 feet of water needed to be pumped as of October 1, 1992 to lower the water level to the bottom of 'A pocket'. Using one pump at the current pumping rate, water could be lowered to the desired level (bottom of 'A pocket') in 13.5 years for an average annual cost around \$72,000.00; two pumps operating at increased levels could lower water levels to the bottom of 'A pocket' in 1.8 years with an annual cost of \$144,000.

Introduction

Hill Annex Mine State Park, in Itasca County, was added to the state park system in 1988. The open-pit iron ore mine, the only abandoned intact mine in existence, is listed on the National Register of Historic Places and thus, presents a significant contribution to the history of mining. Further, the mine boasts of other natural resources such as peregrine falcons, ospreys and various fossils and plant species.

The natural and cultural resources in the state park are threatened: water continually enters the mine through ground water, surface runoff and overflow from adjacent mines. As of October 1, 1992, the water was 286 feet from the bottom of the mine, 54 feet above the bottom of 'A pocket', which completely covers the service hut and original repair shop and threatens other historic structures. If water is lowered to the bottom of 'A pocket', these structures will be visible and the tour route extended. In order to preserve the

integrity of the mine and protect this important cultural and natural resource, the water must be pumped from the mine.

Legislative History

Laws of Minnesota 1988, Chapter 686, Article 1, Sections 11 (k) and Sections 50-54 provide guidelines for Hill Annex Mine State Park. These sections designate the mine as a state park, delineate boundaries, and provide guidelines for operation, acquisition, equipment and appropriations.

Laws of Minnesota 1991, Chapter 254, Article 1, Section 5, Subdivision 5, mandates this report.

The commissioner shall operate pumping facilities at Hill Annex Mine state park sufficient to maintain a water level not to exceed the height of the area known as "pocket A" for the duration of the biennium to assess the pumping and operations costs associated with maintaining this water level. The commissioner shall report the projected pumping and operations costs of maintaining this level to the legislature no later than January 1, 1993.

Laws of Minnesota 1992, Chapter 513, Article 7, Section 5, subdivision 5 limits operation funding for Hill Annex Mine state park. Hill Annex Mine state park must be kept and operated with no state appropriations used for water pumping. No more than \$110,000.00 may be spent to operate the park in fiscal year 1993.

Hill Annex Mine description

Hill Annex is the 390 acre open-pit iron mine located in Itasca County, Section 16, Township 56 North, Range 23 West. The mine is located near the towns of Calumet and Marble, 15 miles northeast of Grand Rapids.

The mine has important historic and natural resources. Forty-eight buildings are on the historic grounds of Hill Annex including a heavy media plant, clubhouse, machine shops, truck repair shops, ticket booths and blasting shacks. All of these buildings are on the National Register of Historic Places. Hill Annex has natural resources as well. The mine boasts of peregrine falcons and ospreys who nest near or on the edge of the pit lake. Also, numerous plant species are on the site as products of reclamation completed during IRRRB's management. The pit itself provides an exposed view of various geologic strata and the Cretaceous layer houses various fossils such as shark's teeth.

Two private mines at higher elevations are west/southwest of Hill Annex and pose problems with water overflow into Hill Annex. The bottom of the mine is approximately at an elevation of 900 feet above sea level and as of October 1, 1992, the water level was 286 feet from the bottom of the mine and 54 feet from the bottom of "A pocket".

Hill Annex history

Hill Annex Mine is part of the School Trust Fund lands: land held in trust by the State and managed for the benefit of the public school system. In 1892 mineral exploration began and in 1913, a sixty-five year era of iron ore mining began. The Hill Annex mine produced 63 million tons of ore and was the sixth largest producer in the state, contributing over \$27 million in taxes to the State School Trust fund. Through this mining history, Hill Annex experienced vast technological changes in the mining process: from horse power to coal and eventually electric power.

One of 400 open pit iron mines across northern Minnesota, Hill Annex is the only abandoned *intact* open pit iron mine in existence. Other open pit mines have had their buildings raised and pits have filled with water, creating recreational lakes. In 1978, Jones and Laughlin Steel sold the Hill Annex Mine, including its buildings and equipment, to the Iron Range Resources and Rehabilitation Board (IRRRB) for \$1. The IRRRB developed interpretive displays and a mine tour as part of its ten year management.

Due to its major significance in the place of mining history, Hill Annex was placed on the National Register of Historic Places in 1986. Two years later, the mine became a state park. Over the past 5 years, approximately 78,400 visitors have experienced Hill Annex Mine State Park: either through visiting the interpretive center, touring the mine itself or both.

Attendance and Revenue

Hill Annex Mine State Park

Since becoming a state park, Hill Annex has had over 70,000 domestic and international visitors through its door and produced over \$130,000 in revenue. During the summer of 1992 people from 47 states and 20 foreign countries visited Hill Annex. Yearly breakdowns of attendance and revenue are presented in the tables below. Attendance in 1988, higher than the other years, includes six-months of IRRRB operation of Hill Annex mine characterized by massive advertising campaigns and significant numbers of free admission to the mine.

Table 1. Hill Annex Mine Annual Attendance

Year	Tour Attend.	Non-tour Attend.	Total Visits
1988	13,672	8,064	21,736
1989	10,461	5,526	15,987
1990	9,453	4,002	13,455
1991	8,686	2,995	11,681
1992*	7,763	7,804	15,567

*1992 tours were reduced due to budget constraints

Table 2. Hill Annex Mine Annual Revenue

Fiscal Year	Park Permit Revenue	Merchandise Revenue	Tour Revenue	Total Revenue
1989	n/a	5,965	22,973	29,938
1990	981	5,491	26,187	32,659
1991	459	11,184	23,411	35,054
1992	481	10,877	26,059	37,417

Other area attractions

Hill Annex Mine is unique to the state park system. Rather than hosting camping or hiking activities common at other parks, Hill Annex presents an interpretive experience similar to the Soudan Underground Mine State Park or Mystery Cave in Forestville State Park. Thus, rather than comparing revenue and attendance figures with "typical" state parks, it is preferable to compare Hill Annex with the above mentioned attractions.

Table 3. Other Area Attractions 1991 Attendance and Revenue

Attraction	Tour Attend.	Number of Tours	Average # of people/tour	Tour income
Hill Annex Mine	8,686	609	14.2	\$23,411
Mystery Cave at Forestville State Park	13,300	893	14.8	\$36,919
Soudan Underground Mine State Park	32,592	1500	21.7	\$98,622

Determining the length of stay at a site is an important indicator of interest and future visitation and income. Visitors at Hill Annex Mine State Park tend to spend approximately two and one-half hours at the site if on the tour and three-quarters of an hour if not taking the tour. These time frames are comparable with other attractions which provide tours and interpretive sites: visitors length of stay ranges from one-half hour to two hours at Soudan Underground Mine and three hours at the Forest History Center. The Forest History Center, which conducts regular visitor surveys, suggests that the amount of time on the site has increased from one to three hours over the past five years. The increase in visitor time at each site suggests an increasing interest, and potential revenue, at these attractions.

Expenditures

Pumping

Water continually flows into Hill Annex Mines either through ground water, surface runoff or overflow from other mines which threatens to destroy the resource. As of October 1, 1992, the water level was approximately 54 feet above the "A pocket" and rising about 1 inch per day, approximately 30 feet per year. At Hill Annex, the bedrock elevation is about 1300 Mean Sea Level (MSL). If water reaches this level, severe erosion can be expected since the water will be in contact with the overburden. Structures within 200 feet of the edge will be jeopardized, including the clubhouse, office, electrical shop and conveyor system.

Pumping at Hill Annex varied with its ownership. The IRRRB spent approximately \$50,000 annually for pumping, which was insufficient to remove all of the inflow. Despite pumping efforts, the water level rose approximately five feet per year between 1983 and 1986. Pumping halted from 1986 until 1988 and the water rose approximately 85 feet. When the mine became a state park in 1988, pumping resumed until funding ran out in June 1992. Since Hill Annex became a State Park, over 4 billion gallons of water have been pumped, dropping the water level 12-15 feet. These levels were obtained with usually with one pump continually running, for an average annual cost of \$72,000. One pump is capable of pumping 2,700 gallons per minute.

To maintain the water level at the bottom of "A pocket" and ensure protection of the resource at Hill Annex Mine State Park, as of October 1, 1992, the water level needed to be lowered at least 54 feet, to an elevation level of 1132'. Operating at current pumping levels, lowering the water level will take 13.5 years with one pump or 1.8 years with two pumps at 5400 gallons per minute.

Table 4. Hill Annex Mine Water Pumping Amounts and Costs

Calendar year	Gallons pumped per year	Calendar year pumping costs
1988 (1 month)	26,928,000	\$1,850
1989	1,337,164,050	\$89,895
1990	1,278,229,500	\$71,865
1991	1,012,297,500	\$56,497
1992*	638,685,000	\$32,688

*Pumping was stopped July 1, 1992.

If the mine is not pumped, a lake nearly four miles long and 950 acres in size will form between the three adjacent mines. Although no natural outlet exists, the water at this 1365 MSL will eventually flow into Big Diamond Lake east of the mines.

General Operations

Aside from pumping the mine, Hill Annex Mine State Park also incurs general operational costs associated with such a facility such as maintenance, staffing and interpretation. The base budget to operate Hill Annex requires three full-time and 13 seasonal staff for a total of 13,592 labor hours. Currently, Hill Annex is operating at 48% below its base budget with one full-time employee and five seasonal employees.

Budget Needs

Maintaining Hill Annex Mine State Park is a two part operation comprised of pumping operations and general operations. A projected budget for the 1994-95 biennium requires a minimum of \$464,050. \$150,000 was appropriated in the 92-93 biennium and has become part of the base budget for the division. Total unfunded operating needs for the 94-95 biennium are \$314,050 (one pump operating) or \$458,050 (two pumps operating). An additional \$357,500 (1988 figure) is required to restore the significant mine buildings associated with the public tour.

Table 5. Projected Pumping and Operational Budget Needs

Item	1994 (\$)	1995 (\$)
Dewatering (one vs. two pumps operating)	72,000-144,000	72,000-144,000
General operations		
Manager salaries	38,700	40,250
Maintenance and seasonal salaries	98,600	102,500
Supplies and expenses	20,000	20,000
Total per year	229,300-301,300	234,750-306,750
* Total for biennium	464,050-608,050	

* \$150,000 (for biennium) has previously been funded and is part of the base budget for the Division of Parks and Recreation

Dewatering proposals

At least three separate proposals for dewatering Hill Annex Mine have been presented to the Department of Natural Resources. One proposal suggests pumping the water to Swan Lake to improve the lake's water quality; another proposal suggests pumping the water to the Twin Cities via the Mississippi River to increase the metro water supply. The third proposal would use the water to generate electricity. Reference maps are provided on pages 11a, b and c. In addition to the three proposals the DNR has applied twice to the IRRRB for grants to assist with dewatering costs, but was denied both times.

Pumping to Swan Lake- Fulfilling a legislative request, the DNR's Division of Minerals conducted a study which explored the costs of pumping water from Hill Annex Mine to Swan Lake (see 11a). The study investigated two routes along existing topography and three different pipe diameters. Initial capital costs and operating costs range from \$276,000-508,000. No further action has been taken on this proposal.

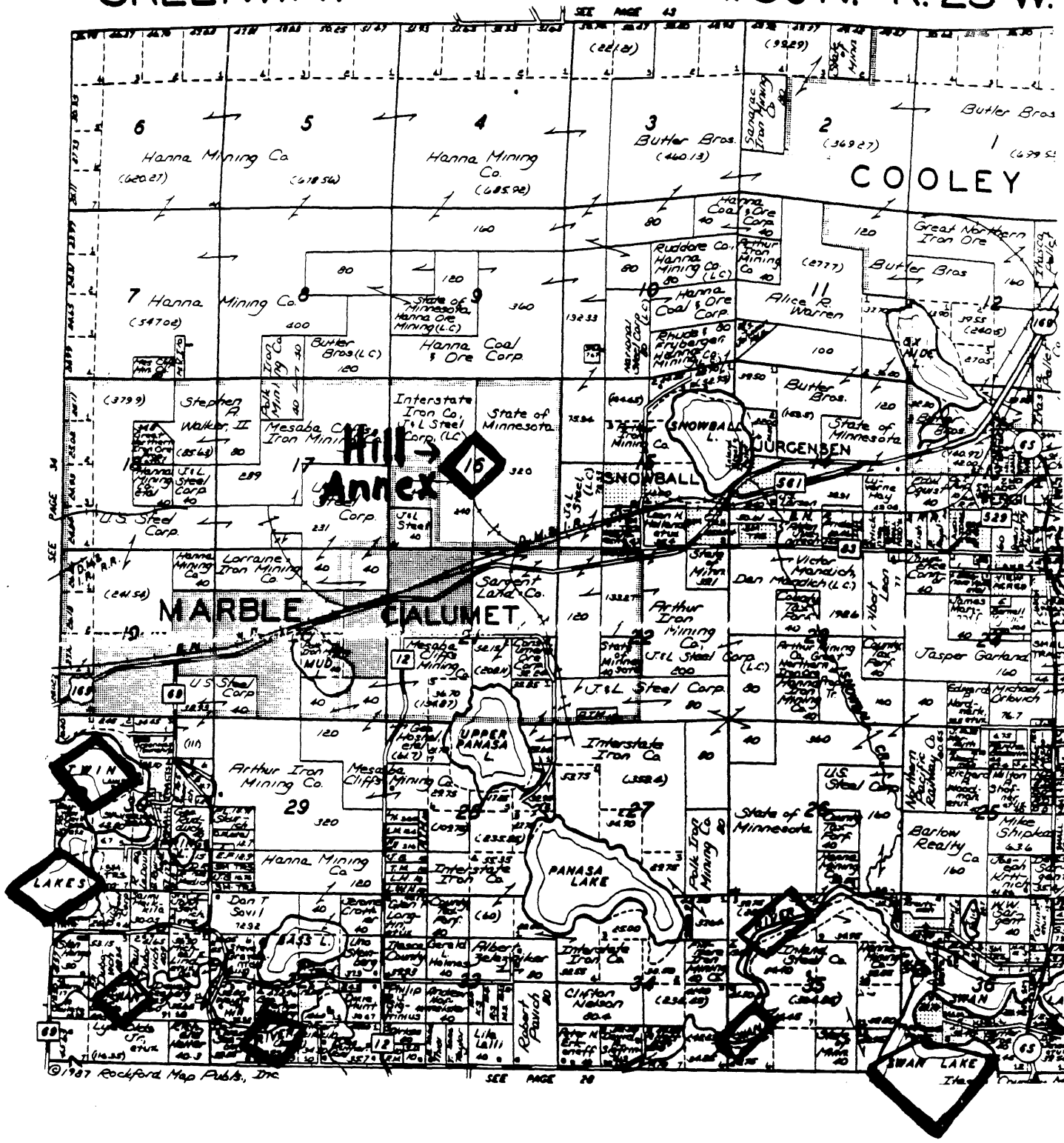
Pumping to the Twin Cities- In 1991, the Metropolitan Council conducted a study of alternative sources of water for the Metropolitan area. One of the alternatives was pumping water from Hill Annex Mine, and other abandoned mines, for emergency water and hydropower needs to the Metropolitan area. The water would be pumped .8 miles to Twin Lake, then flow through a short channel to the Swan River and eventually 5.5 miles to the

Mississippi River downstream of Trout Lake (see 11a and 11b). According to the report, operations and maintenance costs are estimated at \$592,000.00 annually. Construction costs hover around \$32 million, compared to the estimated \$200 million if water is obtained from local wells. The report recommends considering the abandoned mines as alternative water sources and encourages further investigation.

Hydropower facility- In January 1992, the DNR and Minnesota Power set out on a joint feasibility study of a large pumped hydropower facility at Hill Annex Mine. The project suggests pumping the water from Hill Annex mine to an adjacent and higher pit to create a reservoir of water available for hydropower generation. Such a system would create a water use cycle that will allow de-watering to occur in the main pit and provide a non-peak water supply for the proposed hydroelectric generating facility. The estimated cost at this time is \$47 million. The initial feasibility study completed December 7, 1992, concludes the project merits additional study. The report also recommends Minnesota Power hire an engineer to confirm the \$47 million dollar estimate, and if accurate, a detailed engineering study should be conducted.

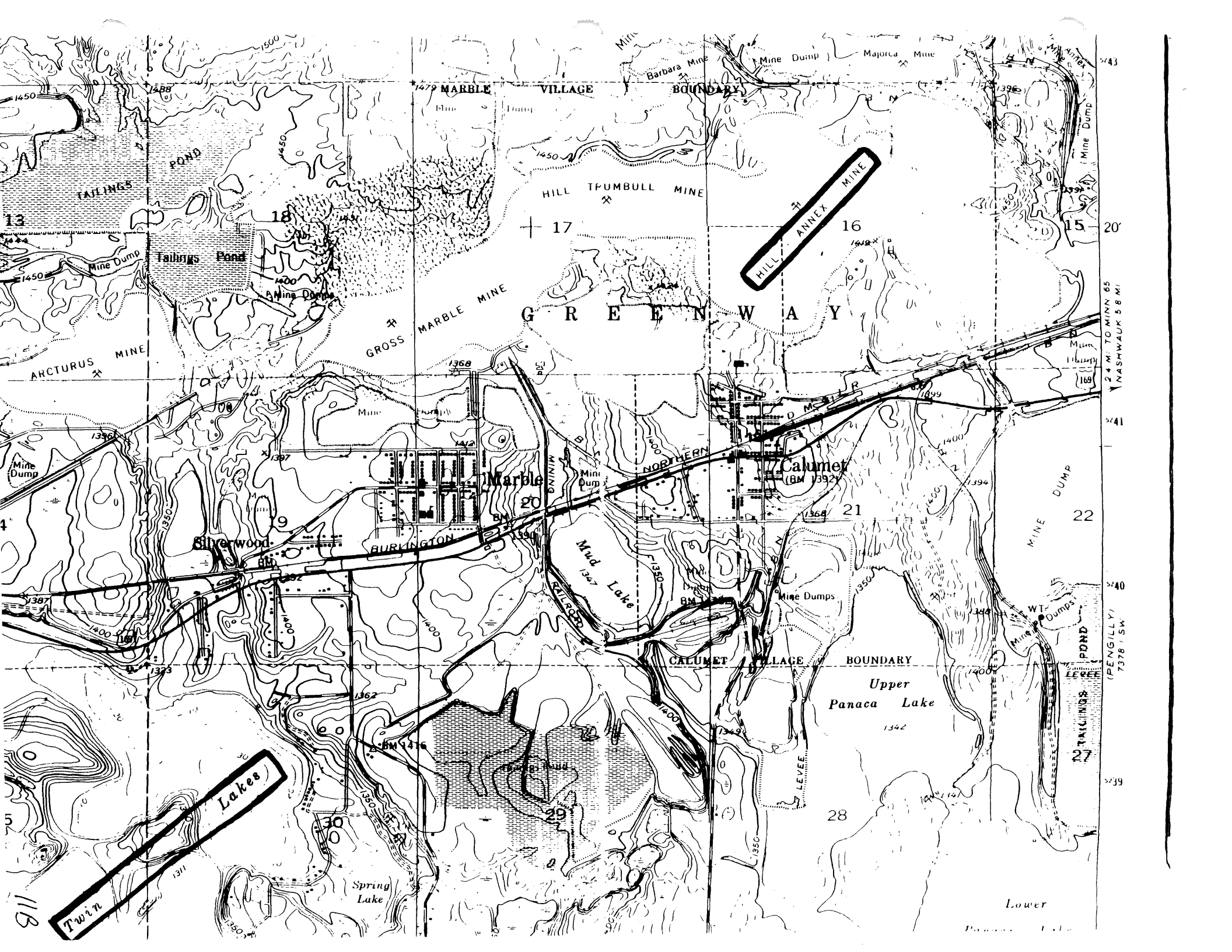
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11a



MARBLE VILLAGE

BOUNDARY

HILL TUMBULL MINE

HILL ANNEX MINE

GREENWAY

GROSS MARBLE MINE

ARCTURUS MINE

Calumet (BM 1392)

Marble

Silverwood

BURLINGTON

Mud Lake

CALUMET VILLAGE

BOUNDARY

Upper Panaca Lake

Twin Lakes

Spring Lake

28

Lower Panaca Lake

24 M. TO MINN 65
NASHWAUK 5.8 MI
241
240
239
(PENGILLY)
7378' SW

HILL ANNEX MINE TOUR



- MAJOR POINTS OF INTEREST**
- | | |
|---------------------------|-----------------------------|
| 1. Hill Annex Clubhouse | 15. "D" Loading Pocket |
| 2. Mine Observation Stand | 16. Explosives Storage Area |
| 3. Tire Storage | 17. Pit Garage |
| 4. Fuel Tanks | 18. "A" Loading Pocket |
| 5. Garage/Warehouse | 19. Pit Conveyor Belt |
| 6. Machine Shop | 20. Cretaceous Plant |
| 7. Oil & General Storage | |
| 8. Heavy Media Bins | |
| 9. Water Tank | |
| 10. Main Office | |
| 11. Electrical Shop | |
| 12. Heavy Media Plant | |
| 13. Rejects Conveyor Belt | |
| 14. Settling Basin | |
-
- HEAVY EQUIPMENT**
- | |
|------------------------|
| A. Steam-powered Drill |
| B. Railroad Cars |
| C. Electric Shovels |
| D. Churn Drill |
| E. Dump Truck |
-
- TOUR STOPS**