

ASSOCIATION OF
MISSOURI GEOLOGISTS

36th ANNUAL

FIELD TRIP

SEPT. 29 & 30, 1989

WHERE DO ALL THE

TAILINGS GO?

ASSOCIATION OF MISSOURI GEOLOGISTS
36TH ANNUAL MEETING AND FIELD TRIP

September 29 and 30, 1989

MINE TAILINGS: THEIR PRODUCTION, USES AND PROBLEMS

SOUTHEAST MISSOURI LEAD DISTRICT

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Special thanks to the following people for making their facilities available and cooperating in planning the trip.

Bill Tierney, Operations Manager
Centennial Operations, The Doe Run Company

Bill Bonnell, Park Superintendent
St. Joe State Park

Lee Cash, Owner
Lead Belt Materials Company

Brian Aubuchon, Supervisor
St. Francois County Landfill

Introduction

Since underground lead mining began about 1869 in Bonne Terre, Missouri, approximately 500 million tons of lead ore have been mined in the Southeast Missouri Districts. From this ore approximately 20 million tons of lead have been recovered. Considering that the lead occurs as galena and with the additional recovery of sphalerite and chalcopyrite, I estimate 40-50 million tons of material were removed from the ore. This leaves between 450 and 460 million tons of tailings scattered between the Old Leadbelt, Mine LaMotte, Indian Creek, and the Viburnum Trend. The obvious question is "Where do all the tailings go?"

In the case of the Viburnum Trend the tailings are all contained behind dams and pretty much in place. Magmont Mine is using some as mine fill to aid in the extraction of more ore. Friday afternoon we will visit the Fletcher tailings pond to view a modern facility.

Indian Creek tailings are also mostly on site in a modern tailings pond. However, over the years many tons have been used as agricultural lime in the adjoining counties.

In the Old Leadbelt and Mine LaMotte the question is more difficult to answer. In the 1800's much was probably discharged into the streams. The coarse nature of the jig tailings led to their disposal in large piles using the same methods used by saw mills for sawdust. The fine fraction was contained by dams much like the present. As we will see Saturday, tailings are an asset to the community when a little ingenuity is applied.

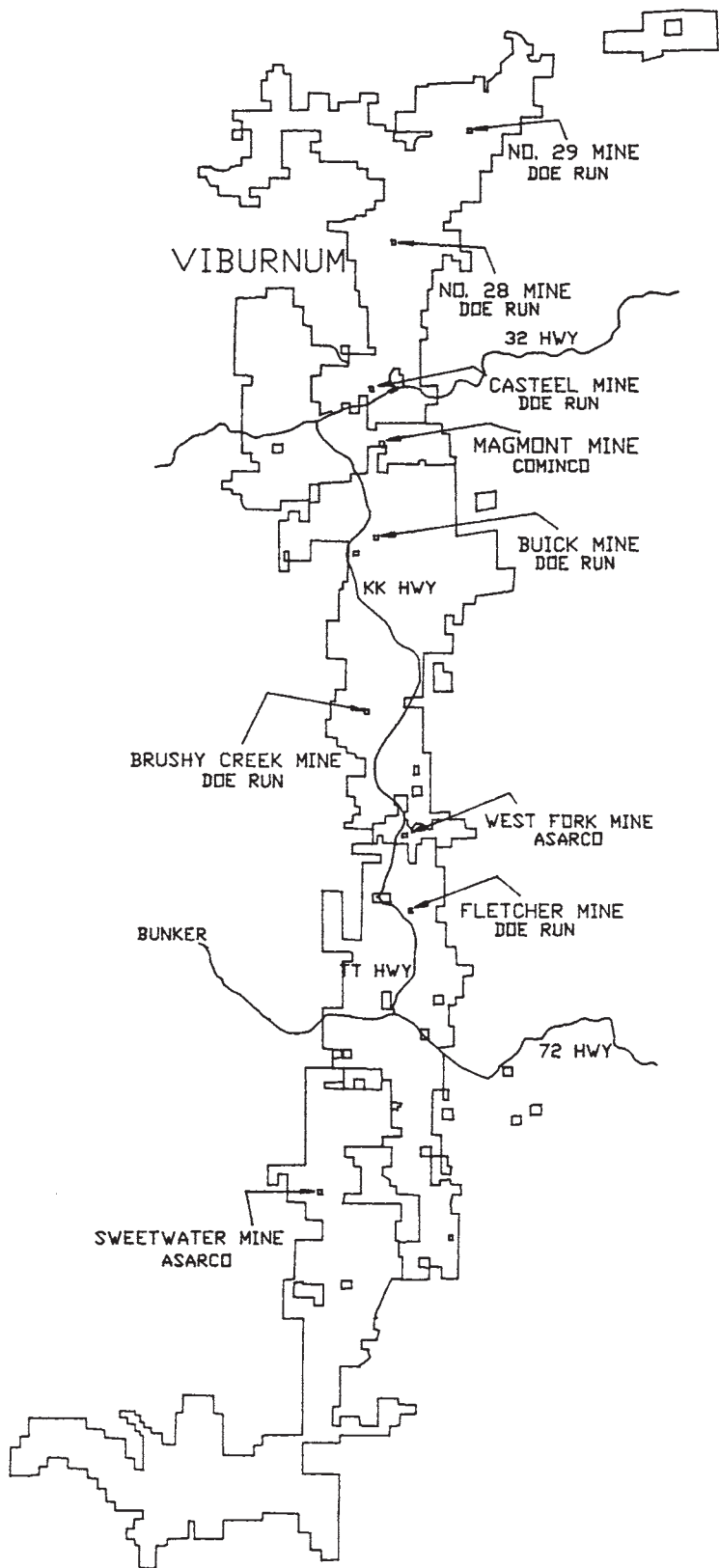
Recreation is a large use for the Leadbelt tailings areas. Besides St. Joe State Park, at Flat River, the Mine LaMotte pond has been developed by the Mine LaMotte Recreation Association, Inc. into a really first class water recreation area available to members. Besides the beach and swimming, there is water skiing, fishing, etc. Both Leadwood and Bonne Terre tailings areas are used for unsupervised ORV activities and St. Joe State Park draws ORV users from distant states. A recent motorcycle event had over 600 entries from as far away as California.

The other big tailings use is construction material. The most obvious, and the one we will see, is in blacktop. It is also used as fill material in building construction and in road grades.

Historically much was used as agricultural lime. There is still a small out-of-state demand supplied by Leadbelt Materials but mostly this use is now confined to the surrounding area.

VIBURNUM TREND

LAND HOLDINGS
AND MINES



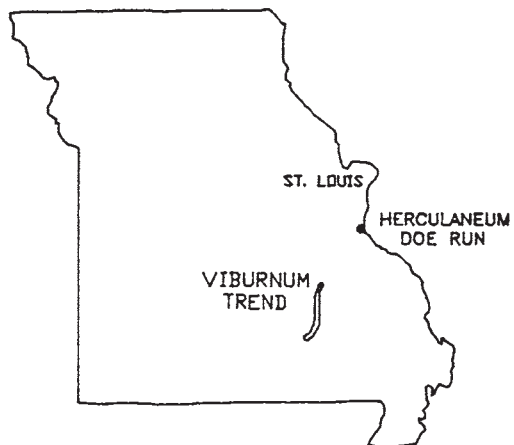
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SCALE



5 MILES



Road Log of Friday Afternoon Field Trip
September 29, 1989

A Drive down the Viburnum Trend to get an idea of its size and the distribution of the mines.

Meet at parking lot of the Viburnum Shopping Center at 12:30 p.m.

Distance Cumulative

0.0	0.0	Depart parking lot east on Vine Street
0.1	0.1	TURN RIGHT on St. Joe Street. This is the original rebirth of Viburnum starting in 1958.
0.6	0.7	Reservoir for mill make-up water on left.
0.2	0.9	Mine 28 and Viburnum Mill on the left. This mill was completed in 1960 and later expanded to a capacity of 12,000 tons of ore per day. TURN RIGHT onto Casteel Street.
0.1	1.0	Central Services Complex on the left. This is the central storeroom and shops for Doe Run.
0.9	1.9	TURN LEFT on to Highway 49.
2.1	4.0	Overpass where the ore haul road from Casteel Mine crossed Highway 49.
1.8	5.8	TURN RIGHT on Highway 32. This is the town of Bixby.
0.2	6.0	Cross railroad.
0.1	6.1	Road on left leads to the Magmont Mine operated by Cominco American about one mile south of this point.
0.2	6.3	Road on right is entrance to Casteel Mine operated by Doe Run. This is the newest mine opened by Doe Run in 1983.
1.8	8.1	TURN LEFT on Highway KK. The Magmont West orebody is just west of this junction. There are numerous diamond drill sites along KK for the next mile. They are not easy to spot. You can still pick out two or three near the road about one-half mile down the road.

Distance Cumulative

- | | | |
|-----|------|---|
| 1.6 | 9.7 | Buick Smelter, operated by Doe Run, is on the left. This smelter is now on standby with the sinter plant and/or the refinery operating as needed to help out the Herculaneum Smelter. Just behind the smelter you can see the Magmont Mine. |
| 0.5 | 10.2 | In this area you can see Roubidoux float. None of this is in place but has been let down by solution of the underlying formations. |
| 0.9 | 11.1 | Beginning of new road. This road was built to accommodate trucks hauling concentrate from the mines to the rail-head at Buick. |
| 0.6 | 11.7 | Entrance to Buick Mine on the left. Buick was developed by MOLAC, a partnership between AMAX and Homestake Mining Company and is now operated by Doe Run. |
| 1.6 | 13.3 | Reynolds County line. |
| 1.9 | 15.2 | Miner Hollow. This valley was settled by a family headed by Plumas Miner. It is well named as Brushy Creek and Buick Mine came together here. |
| 0.5 | 15.7 | Highway J on the left. |
| 0.9 | 16.6 | Gravel road on left is part of program by Mark Twain National Forest to improve access roads for timber management. |
| 0.4 | 17.0 | Karkaghne Scenic Drive, better known as the Karkaghne Trail, which joined the Centerville Ranger Station with the Salem Ranger Station. |
| 0.8 | 17.8 | Entrance to Brushy Creek Mine on the right. The Brushy Creek Mine is on limited production at this time and the mill has been modified to recover copper from high grade copper ore trucked in from various other Doe Run mines (especially Casteel). |
| 3.9 | 21.7 | Bridge over West Fork of the Black River. |
| 0.1 | 21.8 | Entrance to West Fork Mine operated by ASARCO. This is the newest mine on the Viburnum Trend. It reached full production this year. |

<u>Distance</u>	<u>Cumulative</u>	
1.8	23.6	TURN LEFT on Highway KK.
0.3	23.9	End of new road.
0.3	24.2	TURN LEFT on forest road 2236.
0.2	24.4	TURN RIGHT into entrance to Fletcher Mine.
0.1	25.5	Parking lot. Park and assemble at entrance to mine office for tour of mill and tailings area.

Best Route From Fletcher Mine to Farmington

As is the case in this part of the state, there are a number of possible routes, all equally bad. The one I personally like best is as follows:

Leaving Fletcher Mine, TURN SOUTH on TT.

TURN LEFT (east) on Highway 72 to Highway 21.

TURN LEFT (north) on Highway 21 to Highway N.

TURN LEFT on Highway N to Highway 21.

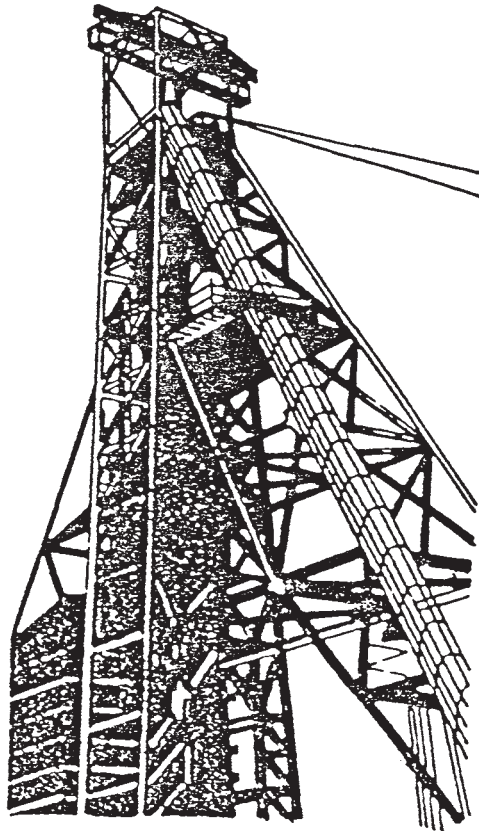
TURN RIGHT (south) on Highway 21 to stop sign.

TURN LEFT (north) on Highway W.

When Highway W crosses Highway 67, you are there.

Tradition Inn is on the left.

THE DOE RUN COMPANY
WELCOMES YOUR VISIT TO ITS
SOUTHEAST MISSOURI MINING
AND MILLING DIVISION



We are pleased to have you as a guest of the Fletcher Operation of The Doe Run Company.

In order to make your visit more understandable, we have compiled in this pamphlet some facts about Doe Run, as well as a few statements about mining, milling and the general geology.

IMPORTANCE

Mining is a primary industry and its products are the basis for all other industries. Almost all human endeavor is dependent upon mining. For this reason, it is necessary that governments provide a climate in which mining industries can operate successfully. Increasing regulations and land withdrawals of potential exploration sites pose serious threats to the mining industry and future of our nation.

Lead mining has been important in southeast Missouri since the early 1700's. St. Joe, Doe Run's predecessor, began its operations in the Old Lead Belt, near the town of Bonne Terre in 1864 and has continued mining in Missouri to the present time. St. Joe, and now Doe Run, has been the leading U.S. lead producer since the early 1900's.

At the present time, Doe Run operates five mines in southeast Missouri and produces about 18,500 tons of ore per day. This amounts to about 230,000 tons of lead (60% of U.S. total), 35,000 tons of zinc and 90,000 tons of copper per year.

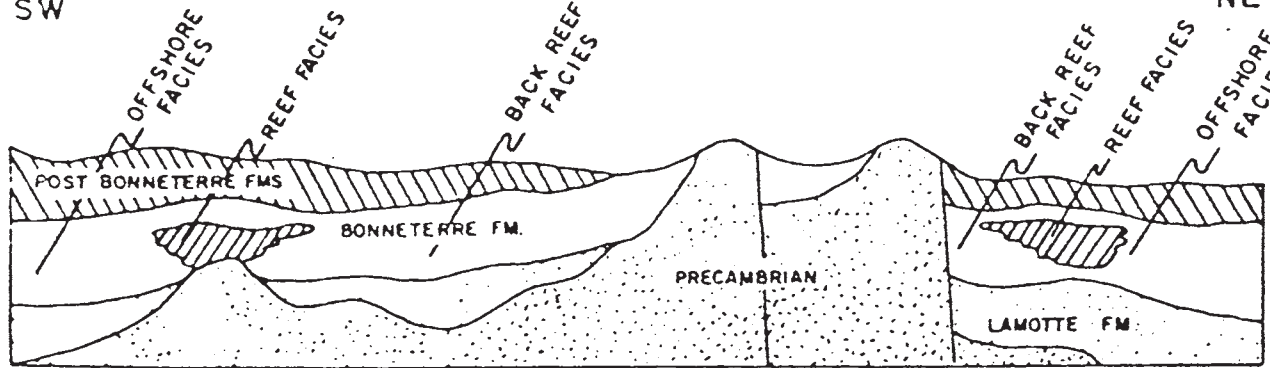
GEOLOGY

Mineralization is composed of galena, sphalerite and chalcopyrite with galena being the dominant mineral. Sphalerite and chalcopyrite vary radically from one location to another without any apparent zoning pattern. Mineralization occurs bedded and discordant to the beds. Much of the galena is coarsely crystalline and appears to be open space filling, although some replacement-type is present.

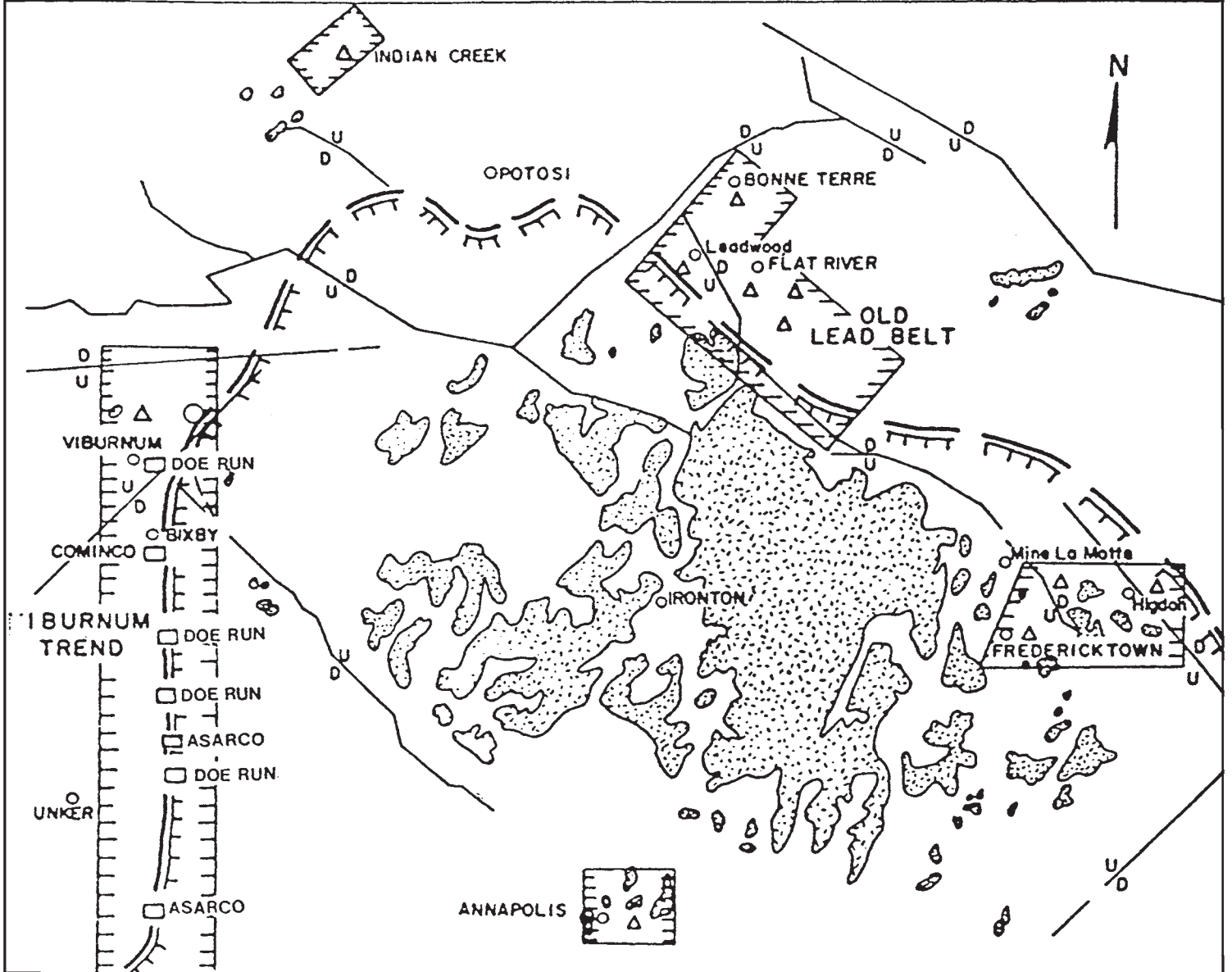
The attached map and generalized cross-section show some of the geologic features of southeast Missouri, as well as the location of the various mines and mining districts. The Bonne-terre formation is host for the ore. It is an Upper Cambrian carbonate unit, 300 - 400 feet thick, consisting of dolomite in the mining areas and limestone outward in the offshore direction. Three general facies, which are related to depositional environments, are shown on the cross-section. These are the back reef facies, algal reef facies and offshore facies. The mining district is related to the reef facies, although a large part of the ore does not actually occur in the reef.

SW

NE



DIAGRAMMATIC GEOLOGIC SECTION - SOUTHWEST - NORTHEAST



- OPERATING MINE OR MINES
- OPERATING MINE AND MILL
- △ INACTIVE MINE

EXPLANATION

- ▭ MINING DISTRICTS
- ▭ C & ORD. SEDIMENTS
- ▭ PRECAMBRIAN IGNEOUS
- FAULT
- ▭ EDGE OF BACK REEF FACIES

0 8 16 km.

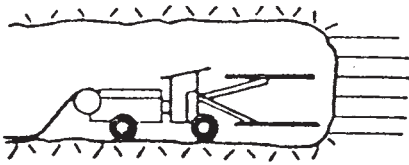
MAP OF MAJOR GEOLOGIC FEATURES AND LEAD DISTRICTS OF SOUTHEAST MISSOURI

MINING

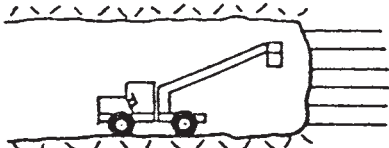
This mining system is an efficient open stope, room and pillar method lying approximately 1,000 feet beneath the surface. The rooms are 32 feet wide and pillars are 28 feet in diameter. Height of ground depends on thickness of the orebody, but usually the first pass is 20 feet high. Later layers removed averaged 15 feet in thickness.

The major mining equipment consists of three types: drill jumbos, front end loaders and 40 ton trucks. Hydraulic drill jumbos, with remote controls and parallel positioning extending booms, are used to drill the blast holes. These holes are drilled on patterns and charged with dynamite or ANFO (ammonia nitrate and fuel oil). The cost of dynamite is four times that of ANFO and, at Fletcher, about 70% of blasting material used is ANFO. Large 10-ton front end loaders load the ore into 40 ton trucks that transport the broken ore to the ore pockets at the shaft area. The primary crusher is located at the base of the ore pockets.

FLETCHER MINE FLOW SHEET



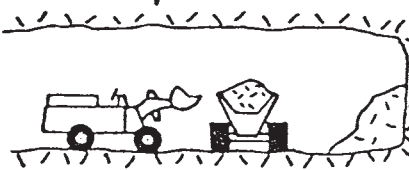
DRILLING: FOUR, JOY MS3 HYDRAULIC JUMBOS
EACH DRILLS 100+ HOLES PER SHIFT



CHARGING: FOUR, PETTIBONE HC-2000 TRACTORS NON-ELECTRIC BLASTING CAPS ARE PLACED AT BOTTOM OF HOLES ANFO IS PNEUMATICALLY LOADED INTO HOLES ANFO ACCOUNTS FOR 70% OF EXPLOSIVES USED



BLASTING: ROUND IS SHOT AT END OF SHIFT
BROKEN ORE IS LOADED OUT BY NEXT SHIFT
AVE. ROUND BREAKS 600 TONS
APPROX. 420 LBS. OF EXPLOSIVES USED



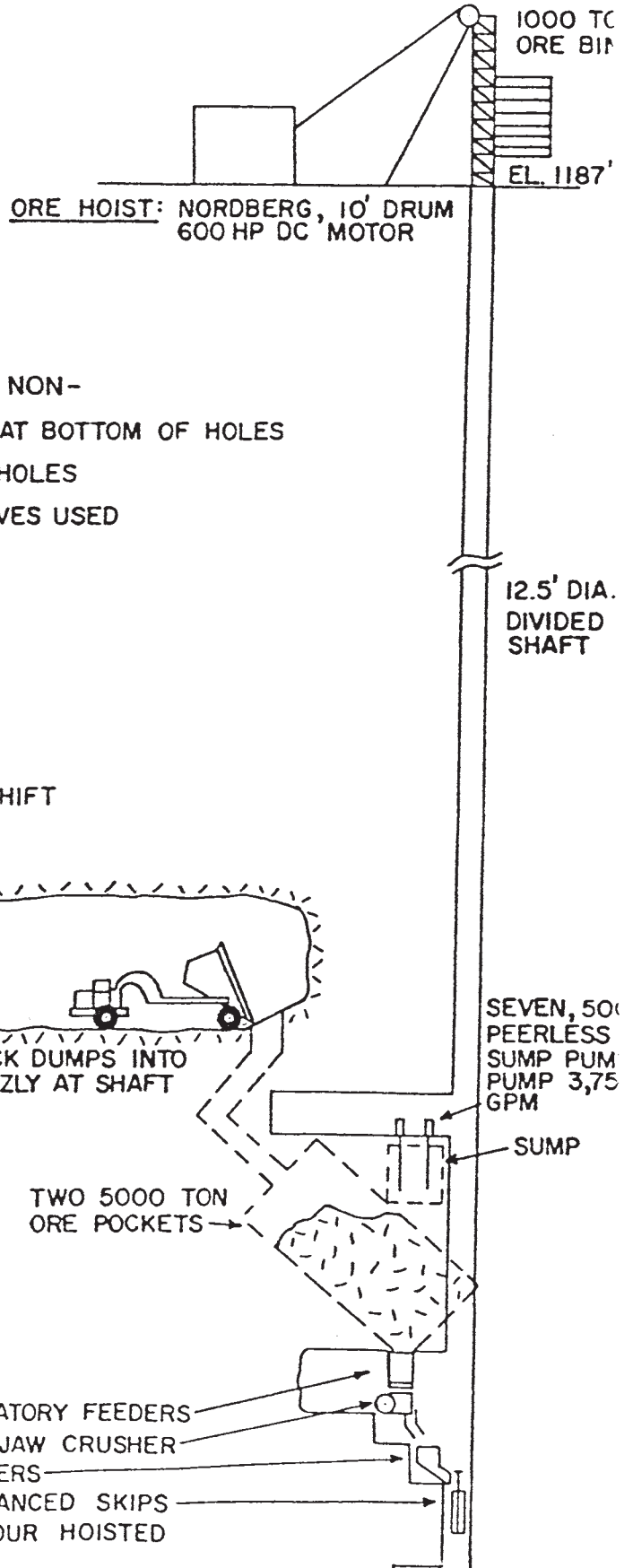
LOADING & HAULING:

CAT 988B LOADER (7.5 YD. BUCKET)
CAT 631D TRUCK (40 TON)
TWO LOADING CREWS PER SHIFT;
ONE LOADER WITH TWO TRUCKS
AND ONE LOADER WITH ONE TRUCK

TRUCK DUMPS INTO GRIZZLY AT SHAFT

TWO 5000 TON ORE POCKETS

TWO, ALLIS CHALMERS VIBRATORY FEEDERS
ALLIS CHALMERS 32" X 42" JAW CRUSHER
TWO, 8.5 TON WEIGH HOPPERS
TWO, 8.5 TON COUNTERBALANCED SKIPS
30 SKIPS PER HOUR HOISTED



MILLING

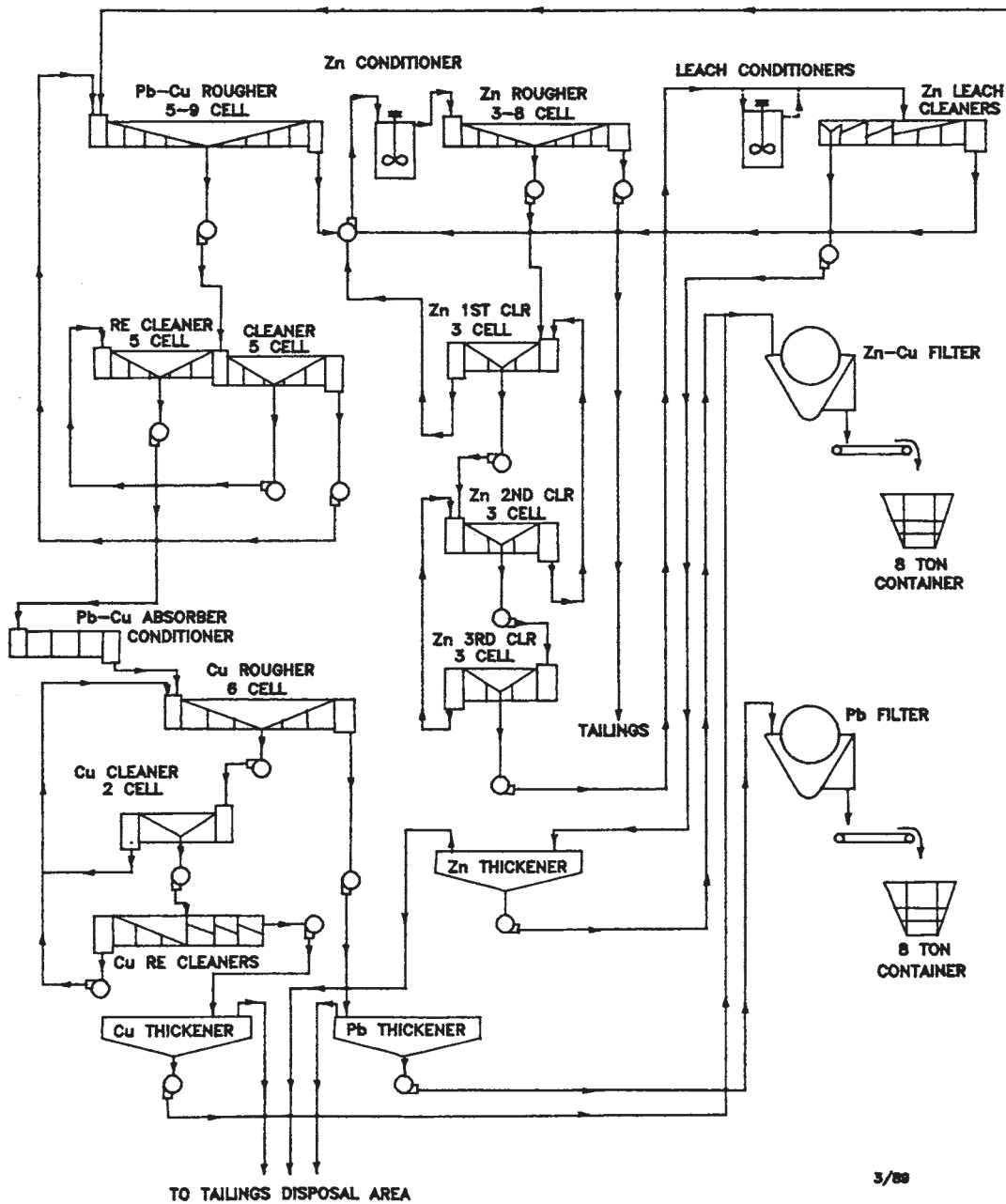
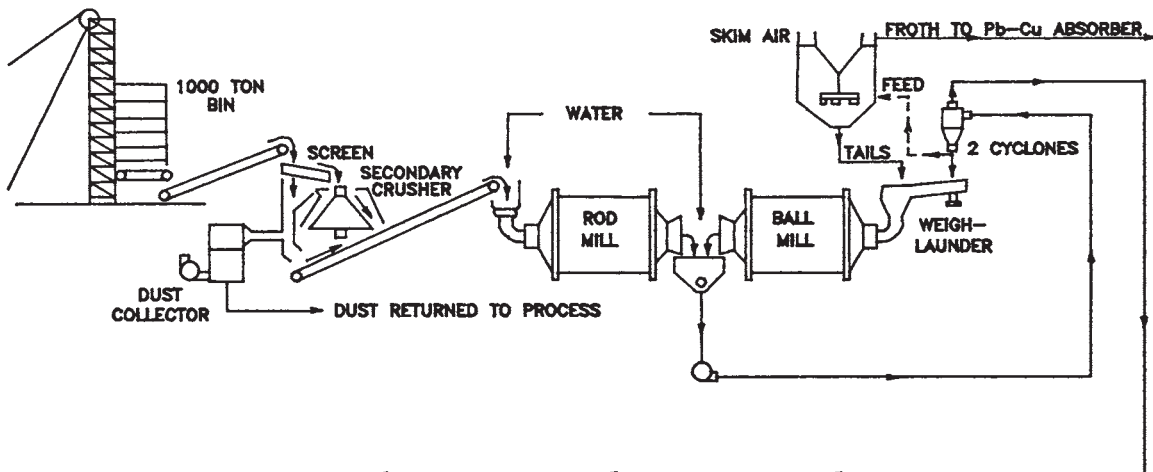
Milling is a highly automated and efficient process of extracting the mineral from the host rock, consisting of three basic steps: 1) crushing and grinding, 2) flotation and, 3) filtering.

The product of the crushing and grinding circuits is a 50% water slurry containing all the lead, zinc and copper minerals liberated from the gangue plus the lead and copper collecting agents. The slurry flows to a flotation machine where a small quantity of frothing reagent is added. The impellers in each of the cells provide agitation to maintain the particles in suspension and dispense finely divided air bubbles throughout the slurry. The chemically activated lead and copper minerals attach to air bubbles and rise to the surface forming a mineral-laden froth that overflows the lip of the machine. Zinc is not activated and flows through the machine with the gangue to the zinc circuit. Froth from the machine is further concentrated in two additional stages of flotation, then pumped to a lead-copper separation circuit where the lead is depressed and the copper recovered by flotation. The zinc and gangue from the lead-copper circuit are pumped to the zinc circuit and conditioned with copper sulphate to activate the sphalerite. Frothing and collecting reagents are added and the zinc is recovered, after which, it is cleaned by three additional stages of flotation. The gangue (tailing) is pumped into a settling basin.

The slurry is pumped to thickener storage tanks where the concentrated mineral solids settle. All water is recycled for mill usage. Lead, zinc and copper concentrates are dewatered by vacuum filter.

After milling, the concentrate is shipped to the various smelters for conversion into primary metals.

FLETCHER MILL FLOW SHEET



3/88

FLETCHER AREA
GENERAL INFORMATION

1. The Fletcher Operation comprises 1,500 acres of surface area plus 9,102 acres of Mineral Rights, either owned or leased. The plant site contains approximately 867,750 square feet (20 acres) under fence.
2. The service building contains 29,250 square feet of floor space and houses the offices, first-aid room, lunch room, boiler room, hoist control room, etc. Also, in this building are the change room with locker space for 158 men, the surface supply house with an inventory of approximately \$860,000, and the underground supply house with an inventory of approximately \$312,000.
3. The mill building, exclusive of reagent building, is 174 feet long and 160 feet wide. The ground floor contains 27,840 square feet; the second floor contains 19,000 square feet; and the upper floor contains 3,050 square feet. It is heated by three 240,000 BTU units, four 200,000 BTU units and two 80,000 BTU units. The console room, relay room, X-ray room and foremen's office are cooled by one combination unit with a capacity of 100,000 - 200,000 BTU heating and 88,000 BTU cooling units.
4. The water reservoir has a capacity of 2,000,000 gallons.
5. Current payroll consists of 49 payroll and 11 salaried people.
6. One liquid propane gas tank of 30,000 gallons will furnish heat for the building and one 30,000 gallon tank is used for gasoline storage.
7. Mill concentrates are currently hauled by truck to various smelters.
8. As of November 1, 1987, there were 182 acres of virgin ground mined out and 88 acres of re-worked ground, for a total of 270 acres.
9. The mill tailings, waste area, totals 11,800,000 square feet, or 271 acres.
10. A mine water clarification dam was constructed in 1977 to replace a similar dam which is now being used for mill tailings. This structure cost \$329,000 to build. It impounds over 111 million gallons of water pumped from the mine. Its purpose is to allow fine rock particles to settle out from the otherwise good water before the water is added to Bee Fork Creek. This lake covers 22.5 acres.

FLETCHER HISTORY

September, 1958 - First pay hole drilled in Fletcher area.

June, 1963 - St. Joe authorized development of the 14-million dollar
Fletcher facility.

July, 1964 - Shaft sinking started.

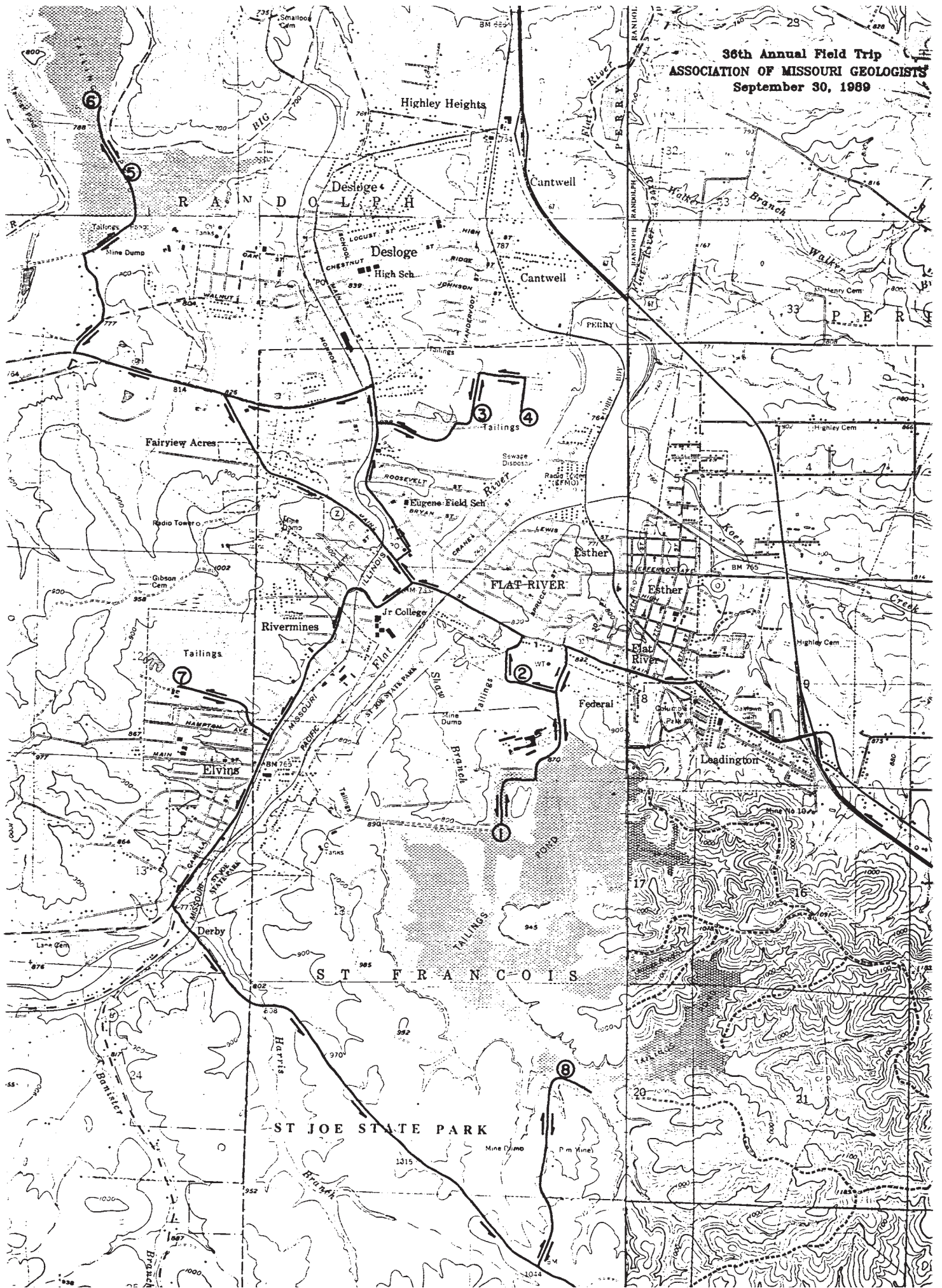
November, 1965 - The 1,344 foot, 12 1/2 foot diameter, shaft was bottomed.

February, 1967 - The mill began operation.

SATURDAY FIELD TRIP

SEPTEMBER 30, 1989

36th Annual Field Trip
ASSOCIATION OF MISSOURI GEOLOGISTS
September 30, 1969



Road Log of Saturday Field Trip
September 30, 1989

The field trip starts at Farmington and visits five sites where tailings are being used and returns to Farmington. Board buses at parking lot of the Tradition Inn at 8:00 a.m.

Distance Cumulative

0.0	0.0	Depart parking Tradition Inn and TURN RIGHT on Highway W.
0.1	0.1	TURN RIGHT (north) on Route 67.
1.6	1.7	Junction of Route 32 on right. The highway is on Bonneterre Formation between Farmington and the Flat River Exit. There are scattered outcrops in roadcuts.
3.7	5.4	The sheet-iron building on the left is changeroom for Number 11 Shaft. The eastern edge of the mine workings extend out under the intersection.
0.3	5.7	Exit on Route 32 west.
0.2	5.9	Stop light. Continue on Route 32.
0.6	6.5	Stop light. Follow Route 32 to the left.
0.7	7.2	TURN LEFT on Federal Mill Road. Missouri Mines' State Historical Site sign on the right directing you left.
0.1	7.3	Note the building on the right occupied by the Crabtree Funeral Home was formally the changeroom and offices for St. Joe's Mine #5 using Federal #1 shaft which is 100 feet or so south of the building.
0.2	7.5	Construction of Route 32 by-pass.
0.3	7.8	Locked gate on left into St. Joe State Park. Go through gate and follow road around the reservoir.
0.6	8.4	Stop #1. East end of dam. This was the main tailings storage area for the Federal Mill. The Federal Mines were originally developed by the Federal Lead Company in 1902. They operated a number of shafts and at least two mills until 1923 when they were acquired by St. Joseph Lead

Company. Federal Lead Company mined almost 21 million tons of ore containing approximately 880,000 tons of lead. The present mill facility was built by Federal in 1903. Number 17 shaft was sunk and underground rock haulage was consolidated to make this the main mill in the area by St. Joe in 1925. The tailings from these early mills were course jig tails with much in the +1/4 inch size. Most of these were stored in huge piles north of the mill. At some point the mill was changed to flotation recovery and the tails were much finer. At this time the present dam was started across this valley. The Federal Division of St. Joe produced 119 million tons of ore containing just under three million tons of lead metal, a large portion processed through the Federal Mill. Most of the courser tails are now gone, having been used as ag lime. When the mines were closed in 1972, Federal Mill was rated at 12,000 tons/day, was 100% flotation and recovered both lead and copper.

From here you can get a good view of the overall area. All the area you can see from the east end of the dam is undermined. Just over the hill at the other end of the dam is Mine #12 and a course tailing pile, now mostly gone. No. 12 shaft was used to hoist development rock out of the mines and once had a large "poor rock" pile as well. The rock facing the dams in this area came from there.

Across the valley, the Mine #16 tailing pile is visible. Beyond the town of Flat River, the National tailings pile is visible. It and the Bonne Terre piles are the most intact of the six large piles of course tailings. The others have either been used or re-milled. The largest was the Federal site which covered the whole area behind the mill where the new 32 by-pass is under construction.

The Desloge pile is just to the left of the National pile and was once visible from here. We will see all three of these closer during the trip.

Behind the dam some of the restoration efforts are visible. These plantings were done before the area became a state park.

Re-board the buses and retrace entry to Flat River Sports Complex.

I call your attention to the Federal Mill complex which is now the Missouri Mines State Historical Site. The museum has good displays of mining equipment and minerals and most of the mill is open for viewing. I recommend you pay a visit either this afternoon or at your earliest convenience.

Distance Cumulative

0.9	9.3	Construction of Route 32 by-pass.
0.2	9.5	TURN LEFT into Flat River Sports Complex.
0.2	9.7	Stop #2. Parking lot of Sports Complex. The Flat River Recreation Area is developed on an area of tailings that is part of a small pond developed behind the large tailings pile. The pile extended from just behind the mill to the road and down to near the creek. After much of the pile was removed, the area between the mill and the road was developed into bays where the coarse fraction of tails was dewatered between rail spurs and loaded into rail cars for agricultural lime. The 1963 aerial view of Fletcher Mill shows this facility. In season, over 100 cars a day would be shipped from here.
		Note that tailings are being used in construction of the by-pass.
		Continue out south drive of Sports Complex.
0.1	9.8	TURN RIGHT on Congress Street.
0.2	10.0	TURN LEFT on East Main (Route 32 west).
0.4	10.4	Railroad tracks.
0.1	10.5	Flat River Creek.
0.1	10.6	Three-Way Stop. STAY RIGHT on East Main (Business Route 67).
0.1	10.7	Four-Way Stop. TURN RIGHT and follow Business Route 67.
0.8	11.5	TURN RIGHT just beyond the old St. Louis Smelting and Refinery Company building.

Distance Cumulative

0.5 12.0 Follow the street around the end of the glass plant. Pull off on gravel parking area on right. Stop #3.
The Flat River Glass Co. plant is built on the site of the St. Louis Smelting and Refinery Co. mill, better known as the National Mill. St. Louis Smelting and Refinery Co. operated from 1897 until 1933 when the property was acquired by St. Joseph Lead Co. They produced just under 800,000 tons of lead metal. After the mill was discontinued an incline shaft was driven into the mine and the area became a supply yard. Material was loaded into underground rail cars and taken underground and directly to the ordering mine without further handling. The main St. Joe corerroom was also located here.

The course tailings are obvious. For some reason, this pile has never been used as raw materials and remains intact. The area to the north was used for fine tailings. The flat area covered by an industrial park is on the final surface. The pond we covered by vegetation in 1959 when I moved to the area. The badlands at our feet were caused when the retaining dam was breached and erosion was unchecked. My children and I used to explore these badlands for sedimentary structures. All sorts of cross bedding, slumps, etc. are visible at times. Most of the surface runoff has been diverted and the area is more or less stable at this time. This area demonstrates the main cause of environmental damage, i.e. erosion carrying tails into the streams. If you can keep the tailings in place, they do no harm but once they begin eroding by wind or water, it is very difficult to contain them.

Continue on the same street.

0.2 12.2 TURN RIGHT.

0.3 12.5 TURN RIGHT.

0.1 12.6 Stop #4. This cul-de-sac overlooks part of the washout.

RETURN to Business Route 67 the way we came in.

Distance Cumulative

1.2	13.8	TURN RIGHT on Business 67.
0.1	13.9	Railroad track.
0.1	14.0	TURN LEFT on Route 8.
0.8	14.8	Junction with Highway Z.
0.7	15.5	TURN RIGHT on Highway P.
0.2	15.7	TURN LEFT on entrance road to County Landfill marked by sign.
0.5	16.2	Stops #5 and #6. Gate to St. Francois County Landfill. We will visit at least three areas here based on availability on the field trip date.

The St. Francois County Landfill is operated by a board representing the various government bodies in the county. It is located entirely on the tailings area of the Desloge Mill. These mines and mill were operated by the Desloge Consolidated Lead Company from 1993 to 1928 when the property was acquired by St. Joseph Lead Company. St. Joe continued to operate the mill until 1958. The pile of course tailings is a remnant of the original pile which was at least 5-6 times as large. You can see that presently the course tailings are being used by the landfill as covering material and as raw material in a blacktop plant. A large volume of tails from the east side of the pile were re-milled while the mill was operating.

These tailings make a good base location for a landfill because the dolomite neutralizes any acid formed and acid is the main leaching agent for metals and other pollutants. It is also easy to move to make cells and for covering material. The town of Viburnum also has a landfill on a tailings area. There is some concern about the permeability of tails used for landfills, but fine tails and mixed course and fine tails have little permeability.

We plan to visit three different areas of the project. The active cell of the landfill which needs no description. The areas that we pass that are covered with soil and seeded

are cells that have been completed since the landfill opened in the early 1970's.

The second area (Stop #6) is where a major washout occurred in May, 1977. All the old tailings ponds used decant towers with drains through the dam to drain the tailings area. The decant tower and drain become clogged and a large body of water accumulated on the tails. When the dam was overtopped it washed out a large volume of tailings directly into Big River. The beach was repaired using tailings from the Desloge pile.

Note the use of bushes and limbs as a wind break and as protection for vegetation. Also note that swallows are using the bank for nesting sites.

The last stop is part way up the chat pile where there is an overall view of the operation and of the areas where test plots of vegetation were planted in the past.

RETURN to Highway P (mileage inside landfill not added in.

<u>Distance</u>	<u>Cumulative</u>	
0.3	16.5	TURN RIGHT on Highway P.
0.2	16.7	TURN LEFT on Route 8.
0.8	17.5	TURN RIGHT on Highway Z.
1.1	18.6	Railroad and Four-Way Stop. Continue straight.
0.1	18.7	Four-Way Stop. Continue straight.
0.1	18.8	Three-Way Stop. Junction of Route 32 west. TURN RIGHT on Route 32 west.
0.8	19.6	Rivermines office and shaft complex on left.
0.4	20.0	TURN RIGHT on entry road to Lead Belt Materials marked by sign.
0.7	20.7	Office area. Stop #7.

Leadbelt Materials Company has a blacktop operation based on using tailings from a mill constructed by the Doe Run Lead Company about 1918 at Doe Run Number 16 Shaft. The mill

probably treated over 30 million tons of ore before 1934 when it was closed.

Leadbelt Materials produces a very high quality blacktop by mixing the various sizes of tailings to the customers' specifications. As you can see the coarse tails are one of the main ingredients. They also mix in fine tails that are available to the left. When the operation started they used development or "poor rock" to produce their crushed rock needs. After that supply was exhausted they opened the quarry in the Derby-Doe Run Formation behind us.

Leadbelt Materials' market is mostly in the adjoining counties but they sell their patching mix as far away as Springfield. They have completed several jobs that contain a lead compound to retard oxidation of the asphalt. Preliminary tests indicate that this product will double the life of a road.

RETURN to Route 32 west the way we came in.

<u>Distance</u>	<u>Cumulative</u>	
0.8	21.5	TURN RIGHT on Route 32 west.
0.9	22.4	TURN LEFT on Highway B, cross bridge over Flat River Creek and stay left on Pim Road toward St. Joe State Park.
0.8	23.2	Bike trail. Uses old railroad bed.
1.2	24.4	Camping area for ORV users.
0.6	25.0	TURN LEFT into entrance to St. Joe State Park.
1.2	26.2	Stop #8. Recreation Area.

St. Joe State Park was created in 1976 on land donated by St. Joe Minerals Corporation. It contains 8,561 acres of which 800+ are covered by mine tailings. Approximately 25% of the total area is underlain by mined areas. Even while the mines were operating, this was a major recreation area with hiking, hunting and fishing the main uses. A few foolhardy souls would try their 4-wheel pickup trucks on the tailings area. I have spent several nights camping on what is now called Apollo Lake with both scouts and a

church group. As a state park, the area has been developed into a first class recreation area with areas designated for many kinds of activities (see map of St. Joe State Park). The bike trail makes use of old railroad beds that connected the mines before they were cut together underground.

The part we are interested in is the tailings area. This is the upper end of the pond formed by the dam we saw at Stop #1. When the mill was shutting down, the tailings area was seeded in 1970 and 1971 using a mixture of grasses. The area was fertilized again in 1976. The park had planned to fertilize again this year. The trees and shrubs you see are volunteer. A number of different species were tried near the mill and at the Desloge site. The best variety of tree seems to be black locust. As you can see cedars seem to like the tails also after grass cover is established. Note the different levels where ORV's regularly use the area versus the areas protected by grasses.

This is one of the prime ORV sites in the state and on a weekend we may see a great deal of this type use. The area also has swimming beaches and fishing lakes. The main beach area is on Monsanto Lake which we will see. The lake got its name from the fact that Monsanto was using the lake to test explosives when the state acquired the land.

Speaking of names, Pim as in Pim Lake and Pim Day Use Area comes from the name of the mines. Pim North Mine and Pim South Mine both used the Pim Shaft (National. #7) located where the picnic area is now situated. The rock across the road is development rock hoisted at this shaft.

RETURN to entrance.

<u>Distance</u>	<u>Cumulative</u>	
1.2	27.4	TURN LEFT on Pim Road.
0.3	27.7	Bike trail crossing.
0.5	28.2	Horse trail crossing.

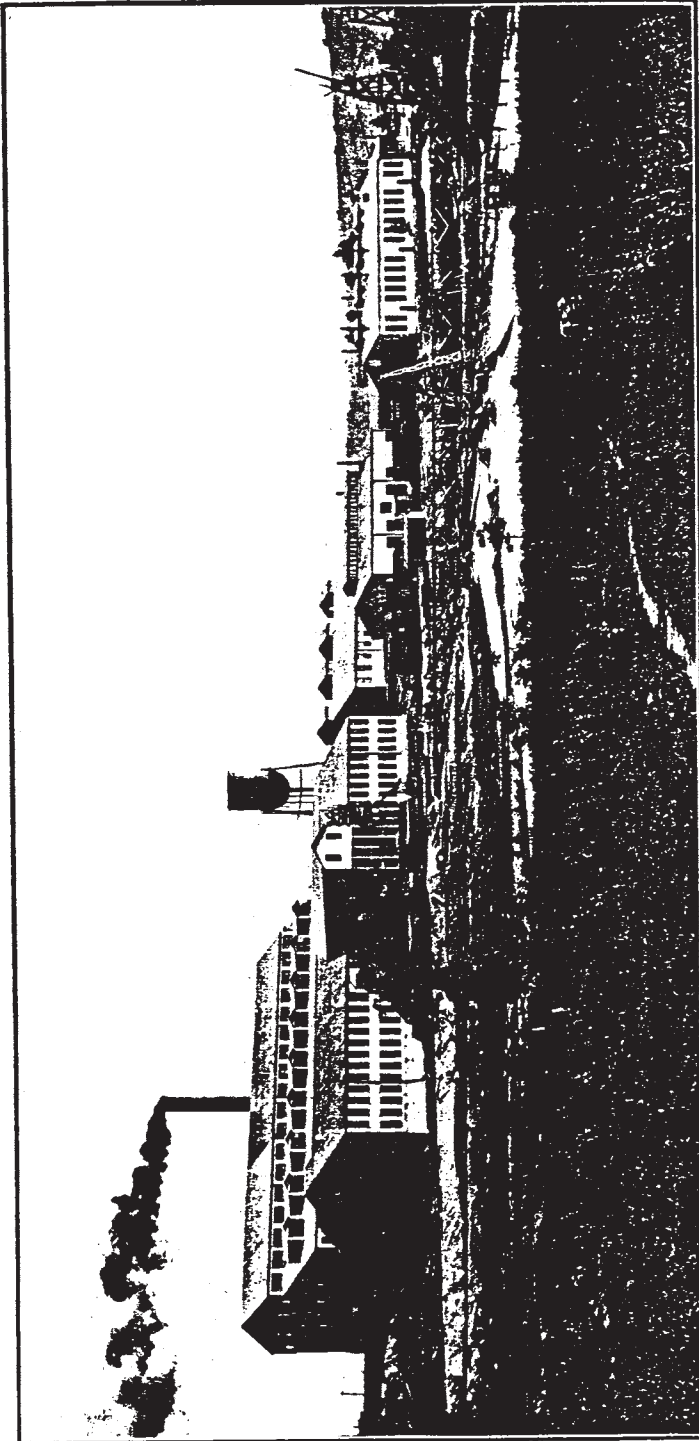
Distance Cumulative

1.4	29.6	"Y" Junction. STAY LEFT. Headframe for Shaft #25, "Doe Run Junction", on the right. The southern extent of mining is near here. This shaft was never used for production but much of the ore it intended to access was mined and taken to Federal Mill underground.
0.3	29.9	Equestrian campground and trail.
1.9	31.8	"T" Junction. STAY RIGHT.
0.3	32.1	TURN LEFT on Highway W.
0.7	32.8	Tradition Inn.

From Disseminated Lead Deposits
of St. Francois and Washington Counties
1907

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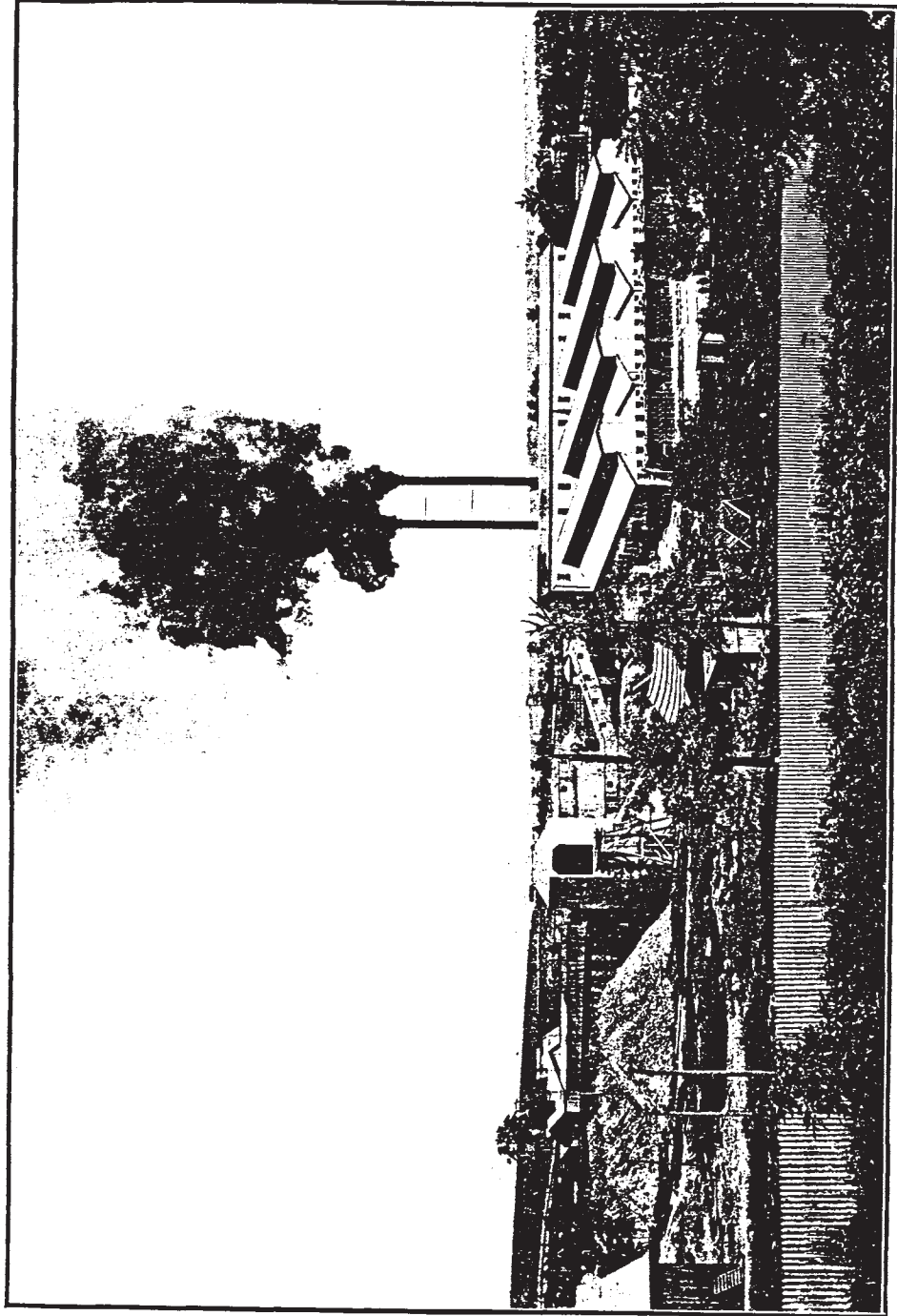


CONCENTRATING PLANT—FEDERAL LEAD CO.

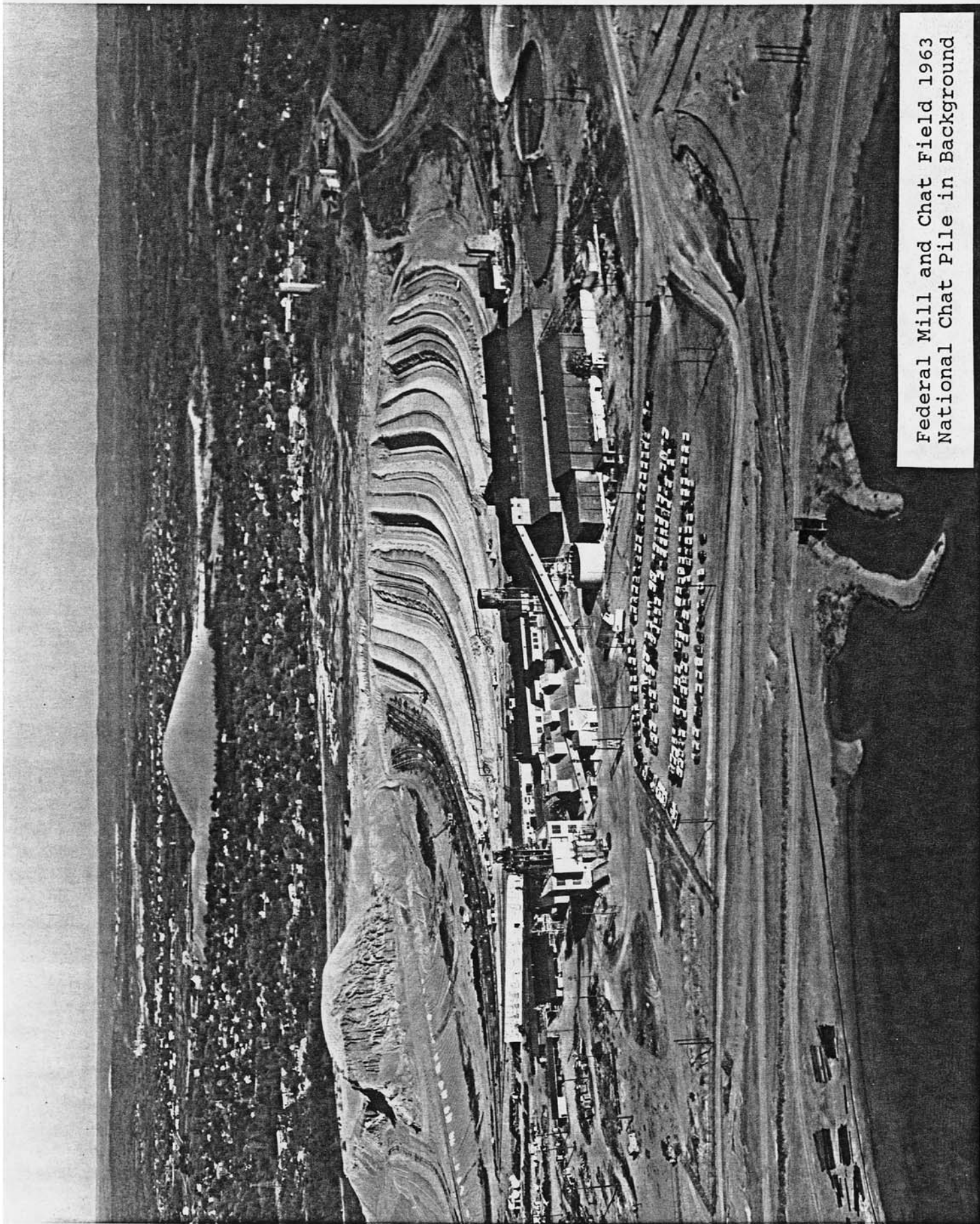
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ST. LOUIS SMELTING AND REFINING CO.
1600-ton concentrating plant.



Federal Mill and Chat Field 1963
National Chat Pile in Background

