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Mill Characterization:

MacMillan Bloedel Ltd. Harmac Division

March 1974

Manuscript Report 74 - 9
Pacific Region

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MILL CHARACTERIZATION:

MacMILLAN BLOEDEL LIMITED

HARMAC PULP DIVISION

March, 1974

by

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and

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Environment Canada
Environmental Protection Service
Pollution Abatement Branch
Pacific Region

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ABSTRACT

This report was prepared from technical data provided by MacMillan Bloedel Limited, Harmac Pulp Division. The report provides supplemental information for establishing a water pollution abatement program to meet the requirements of the Federal Pulp and Paper Effluent Regulations. The report will be used as a guide when determining the progress and changes made by the mill to achieve the requirements of the Federal Pulp and Paper Effluent Regulations.

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1. INTRODUCTION

The following assessment of MacMillan Bloedel Ltd.'s Harmac Mill was carried out in March 1974. This project was initiated with a number of purposes in mind. Firstly, an attempt was made to become familiar with individual mill processes in order to gain insight into sources of particular effluent streams. Also, an up-to-date inventory of sampling methods, testing techniques and abatement facilities was compiled. During this period a good working relationship was established with the mill personnel involved in water pollution abatement programs.

2. MILL DESCRIPTION

2.1 History

Harmac began operation in 1950 with an original production capacity of 350 T/D. In 1954 an expansion increased production to 750 T/D and in 1963 production was further expanded to the present 1300 T/D.

2.2 Location

Harmac is located on Northumberland Channel. The legal description is lots 22 and 23 on range 1 and lot 23 of range 2 - Cedar District.

2.3 Organizational Structure

Mill Manager; Mr. G.F. Woram

Technical Superintendent; Mr. A. Roy

A union pollution committee is presently being established.

Water Technician; David Kuhn

Air Technician; Peter Van Kerkoerle

2.4 Operation Information

2.4.1 Production. The production of bleached kraft pulp over 1973 averaged 1128 ADT/D. Approximately 70% was fully bleached while the remainder was semi-bleached.

2.4.2 Water Supply. Approximately 70% of the process water used at Harmac comes from the Nanaimo River, while the remaining 30% comes from six wells in the area. The river intake is protected by three link belt travelling water screens.

- One; 10 ft wide x 29 ft, 7 x 7 mesh
- Two; 7 ft wide x 29 ft, 7 x 7 mesh

Untreated river water is used in the process. The portion of the well water which goes to boiler feed makeup passes through ion exchange columns. The caustic rinse regeneration chemical is reused in the bleach plant. The acid rinse goes to the alkaline sewer.

Water usage over 1973 averaged 66.2×10^6 USGPD or 46,000 USGPM. This is equivalent to 59,000 USG per ADT of product.

2.4.3 Mill Processes. A complete description of mill processes is shown in Appendix I. The following is a brief characterization of major processes.

(a) Wood Mill:

(i) No. 1 Wood Mill; average 1973 production = 292 BDT/D.
- One, 60 inch Hansel hydraulic barker.
- Three, Tyrock bark dewatering screens.
- One, Effluent Clarifier 100 ft dia.

(ii) No. 2 Wood Mill; not operating (being dismantled).

(iii) No. 3 Wood Mill;
- One, 30 inch Nicholson Mechanical Barker.
- One, 54 inch Nicholson Mechanical Barker.

Over 1973 an average of 368 ODT of hog was produced per day. Total hog consumption, on the other hand, averaged 717 ODT per day (the difference being purchased).

(b) Pulping:

(i) Chip Supply; Approximately 27% of the chip supply is manufactured at the mill; the remainder is purchased. The wood species distributed to the digesters is shown in Table 1.

TABLE 1. WOOD SPECIES COOKED

	Batch Digesters	Kamyr
Fir	23%	38%
Hembal	54%	62%
Cedar	23%	---

(ii) Digesters;

- Batch, twelve at 4670 ft^3 capacity each,
  two at 5980 ft^3 capacity each.
- Continuous, one kamyr digester rated at 450 ADT/D (Hembal) or 360 ADT/D (Red Cedar).

The digesters are separated into three separate lines.

- No. 1 side, Digesters 1 to 6
- No. 2 side, Digesters 7 to 14
- No. 3 side, Kamyr.

(iii) Washers and Knotters;

- Thirteen, Ingersoll Rand Jonsson knotters
- Two, knot tanks No. 1, 2300 ft^3
  No. 2, 1800 ft^3
- No. 1 side washers, 3 stage Sherbrook
  8 ft dia x 14 ft washer drums
- No. 2 side washers, 3 stage
  11.5 ft dia x 20 ft washer drums
- No. 3 side washers, 11.5 ft dia x 20 ft washer drums

Note: No. 1 side Digesters to No. 1 side washers,
No. 2 side Digesters to No. 3 side washers,
No. 3 side (Kamyr) to No. 2 side washers
(Figure 1).

(c) Recovery:

- One, C.E. Black Liquor Recovery Boiler.
  Capacity 770,400 lbs Dry Solids/Day.
- One, C.E. Black Liquor Recovery Boiler.
  Capacity 1,020,000 lbs Dry Solids/Day.
- One, Band W Black Liquor Recovery Boiler.
  Capacity 2,400,000 lbs Dry Solids/Day.
- W.B.L. storage, No. 1 41,500 ft^3
  No. 3 32,600 ft^3
- S.B.L. storage, 4 tanks total 49,850 ft^3
- B.L. oxidation,
  - 1 B.C.R. oxidation system, capacity 1200 gpm
  - 1 Trobeck Ahlen oxidation system,
    capacity 95.3 lbs sulfide per minute.

(d) Power Boilers:

- C.E.V.V.X. Boilers, capacity 90,000 lb/hr on hog
- C.E.V.V.X Boiler, capacity 120,000 lb/hr on oil
- One, C.E. Power Boiler, capacity 250,000 lb/hr on
  hog, 450,000 lb/hr on oil.

(e) Recausticizing:

- Three, Traylor Rotary Lime Kilns:
  No. 1 60 T/D CaO
  No. 2 90 T/D CaO
  No. 3 160 T/D CaO
- One, Oliver Dregs Filter 6 ft dia x 10 ft
- One, G.L. Clarifier 33,700 ft^3
- Two, G.L. Storage
  No. 1 13,600 ft^3
  No. 2 42,200 ft^3

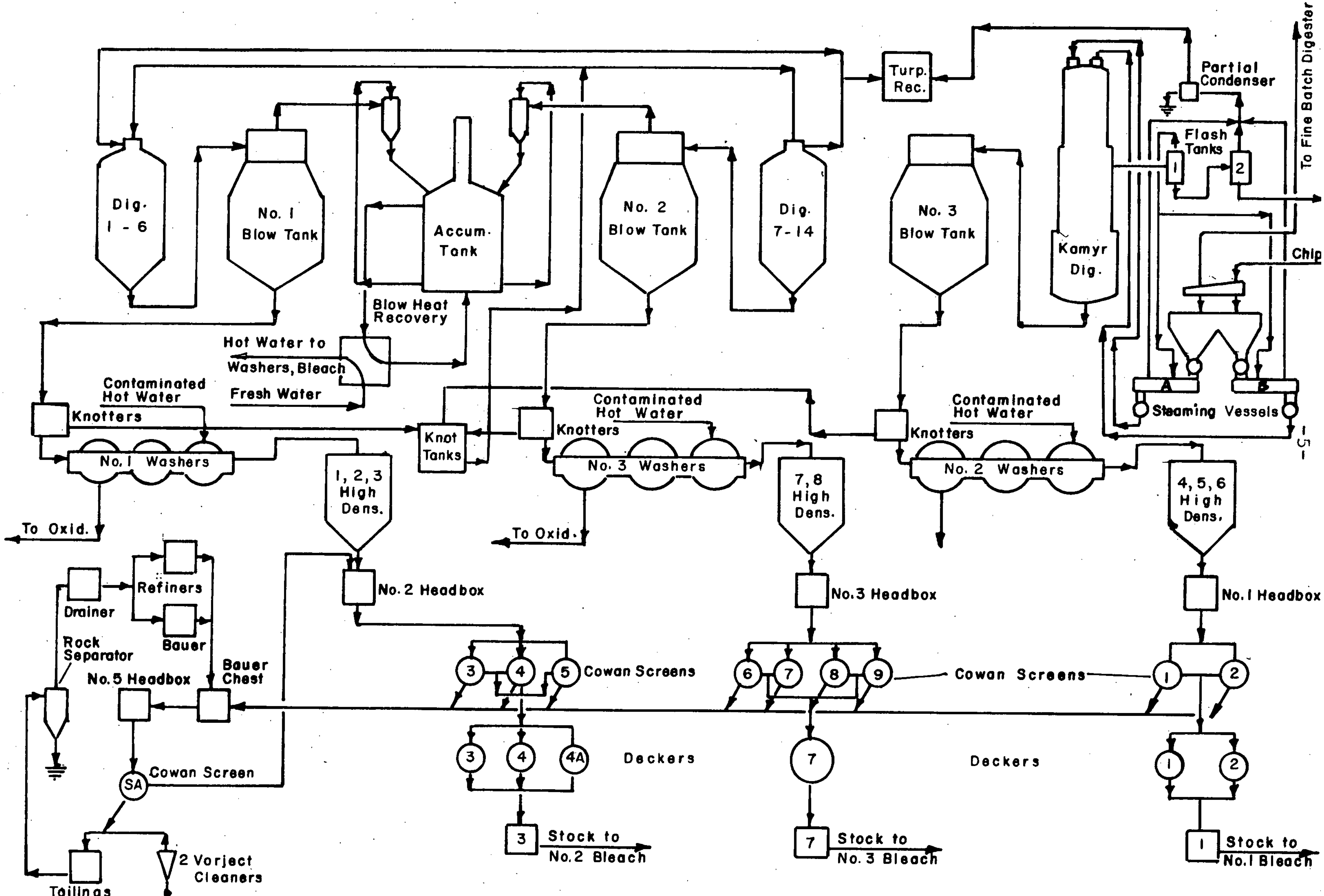

FIGURE I BROWN STOCK SYSTEM

- Two, W.L. Storage 20,200 ft^3 each
- Two, W.L. Storage 32,700 ft^3 each

(f) Bleach Plant:

- No. 1 Bleach Plant (Kamyr Stock);
  C.E.H.C.H.D.E.D. sequence
  capacity (approximately) 335 T/D
- No. 2 Bleach Plant (No. 1 Batch Stock);
  C.E.H.C.H.D.E.D. sequence
  capacity (approximately) 425 T/D
- No. 3 Bleach Plant (No. 2 Batch Stock);
  C.E.H.H.D. sequence
  capacity (approximately) 550 T/D
- Chemical Preparation;
  Four, Modified Holst ClO_2 reactors, Mathieson process.
  One, Rotary Sulfur Burner
  One, Spent Acid Tank 741 ft^3 (new one due)
  One, Continuous Ca or Na hypochlorite system
  (predominantly Ca)

(g) Sheet Formation:

- No. 1 Machine; 450 ADT/D
  One, John Inglis Fourdrinier with 180 ft wire width
  One, Flakt chain type pulp drier
- No. 2 Machine; 350 ADT/D
  One, Dominion Engineering Fourdrinier
  180 ft wire width
  One, Flakt chain type pulp drier
- No. 3 Machine; 600 ADT/D
  One, John Inglis Fourdrinier 200 ft wire width
  One, Flakt air borune dryer with pre dryer and
  sheet cooler.

2.4.4 Water Reuse.

(a) Evaporator condensate (1550 gpm) is reused on the Brown Stock Washers and to a limited extent in the Recausticizing department. Mainly fresh water is used for dregs and mud washing in the recaust area.

(b) Evaporator foul condensate is sewered.

(c) Evaporator surface condenser clean water (5000 gpm) is used for stock consistency control on brown and bleach screens.

(d) Kamyr and Batch Digester condensate is passed through a turpentine recovery system and then sewered.

(e) G-2 turbogenerator condenser and steam plant reclaim water (2700 gpm) is reused for stock dilution in bleach screening.

(f) Bleach screen room white water (9000 gpm) is reused for bleach plant stock dilution.

(g) Machine wire pit white water (10,300 gpm) is reused for stock dilution in the bleach stock screening process.

3. SEWER SYSTEM AND EFFLUENT CHARACTERISTICS

3.1 Sewer Layout

A layout of the sewer system is shown in Figure 2. The location of parshall flumes is also indicated. Briefly, effluent is discharged via four separate outfalls; the Alkaline, Acid, Machine Room and wood Room sewers.

3.2 Spill Detection

An elaborate spill detection system has been installed at Harmac (Figure 3). Twenty-six conductivity probes have been placed at strategic locations. When sewer conductivity goes above 5000 mmhos for 15 minutes, a light is displayed

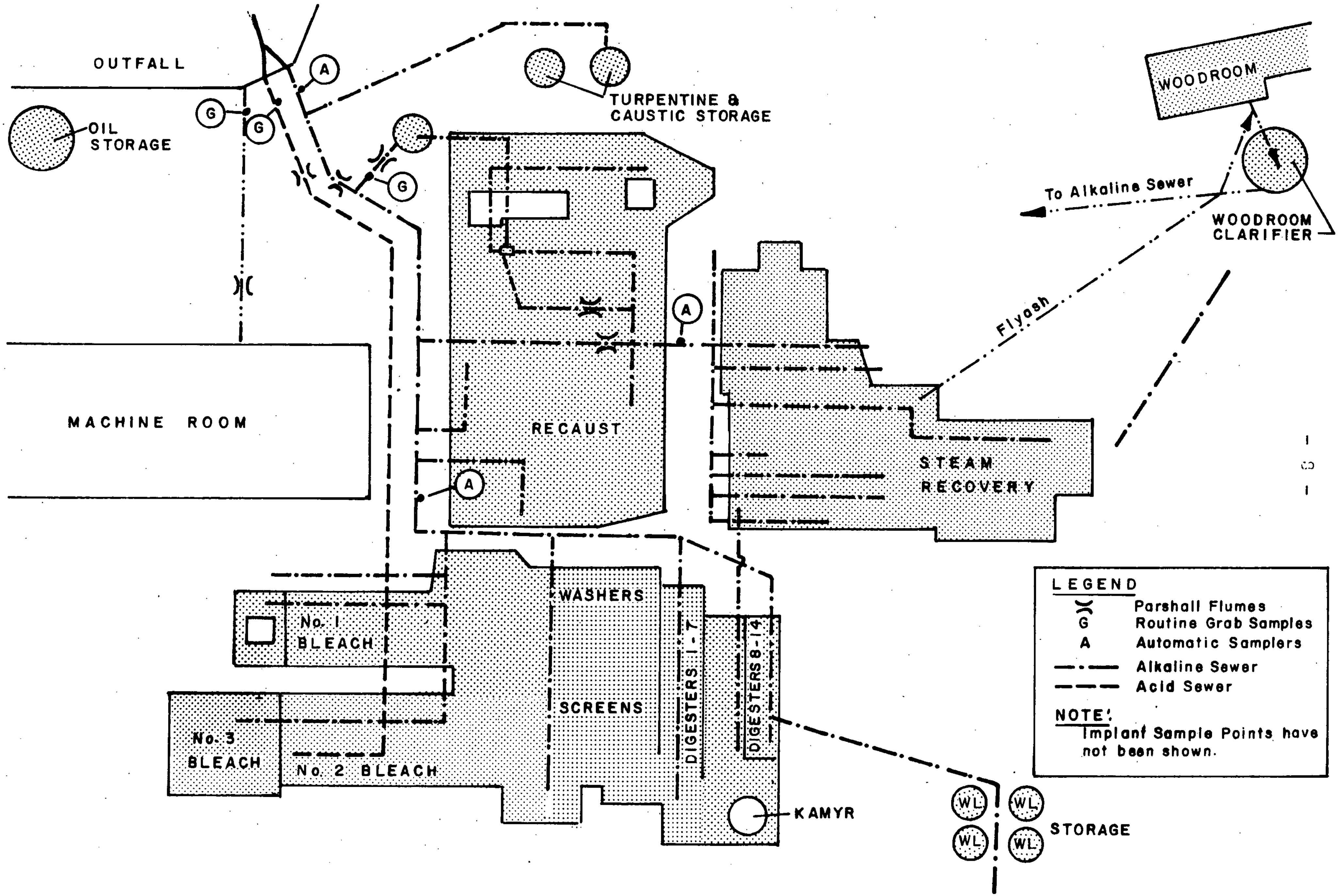

FIGURE 2 SEWER LAYOUT

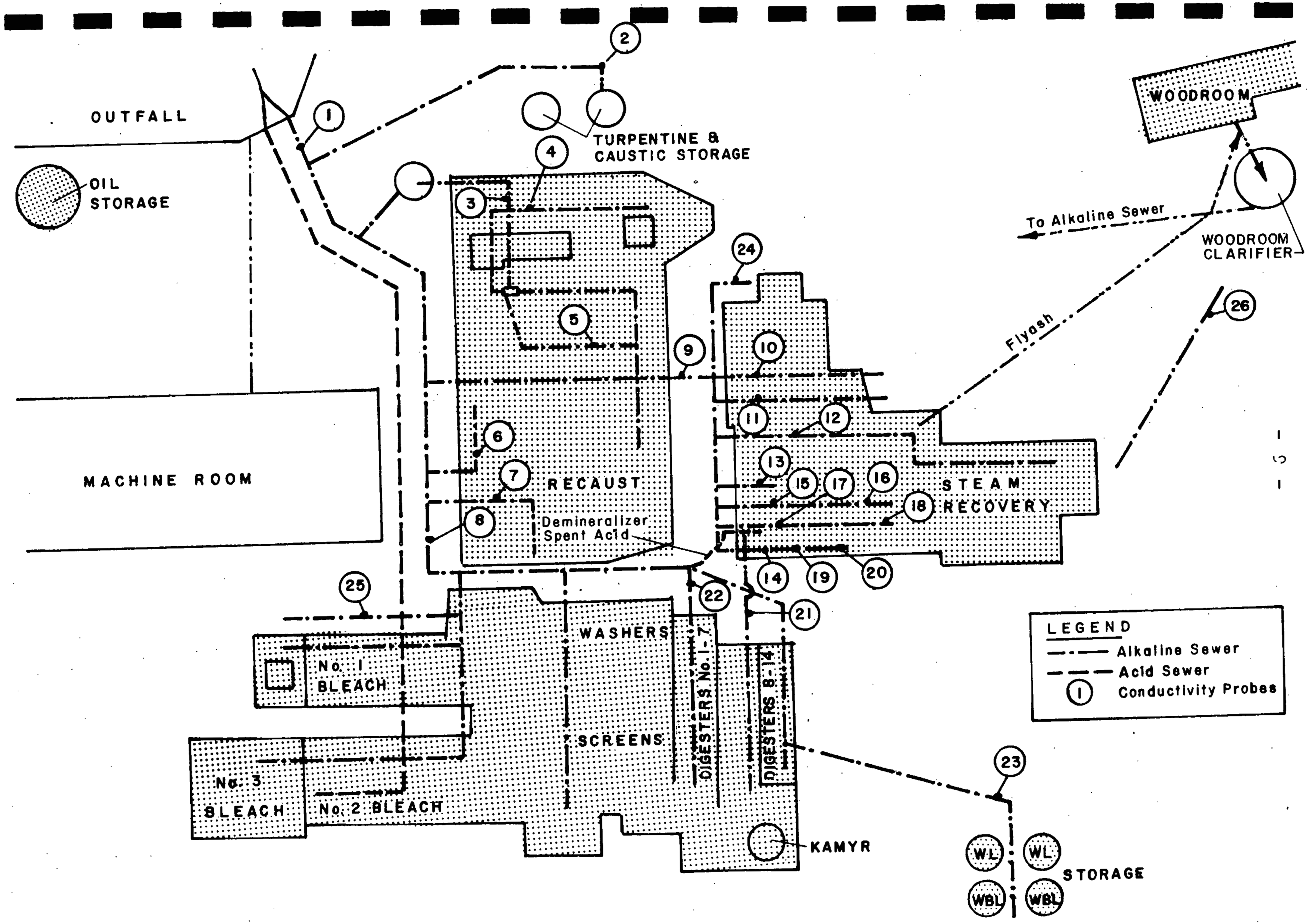

FIGURE 3 SPILL DETECTION

on a sewer map layout located in the steam plant operating room. This allows operators to track down the source of a spill. The locations of the twenty-six probes are shown in Figure 2. They are labelled as follows:

Conductivity Probe No.	Label
1	Main sewer outfall (alkaline)
2	50% caustic tank
3	No. 3 recaust
4	Filter building
5	Main recaust
6	No. 4 slaker
7	No. 3 slaker
8	Upstream alkaline
9	Main recovery
10	No. 6 recovery floor drains
11	No. 5 recovery N floor drains
12	No. 5 recovery S floor drains
13	No. 4 recovery floor drains
14	No. 3 evap. & demineralizer sewer
15	No. 1 evap. condensate
16	No. 1 evap. 1st effect
17	No. 2 evap. condensate
18	No. 2 evap. 1st effect
19	No. 3 evap. condensate
20	No. 3 evap. 1st effect
21	Kamyr flast tank condensate
22	Batch-Kamyr floor drains
23	Liquor storage
24	Oil pump house
25	Bleach plant floor drains
26	Surface drain

3.3 Sewer Sampling

3.3.1 Effluent Discharge Sampling. Samples are obtained daily from the Alkaline, Main Acid, Machine Room and Wood Room sewers. The Alkaline sewer is sampled continuously by a new Sirco Sampler, while the other sewers are sampled on a once per day grab basis. The samples are stored in the refrigerator. BOD_5 and solids analysis (S.S., V.S.S., etc.) are carried out once per week on the composite samples.

The parshall flumes on the Acid, Alkaline and Machine Room sewers are not operating so flow values are calculated from mill water usage data. The wood room and machine room effluents are assumed to be 1.22 million IGPD and 3.2 million IGPD respectively. The balance is equally split between the Acid and Alkaline sewers. In this way a pounds per day waste discharge is calculated. The sample sites are indicated on Figure 1.

3.3.2 Inplant Loss Measurements. These values are used for process control only. Daily fiber losses are measured at the following points:

(a) Main unbleached (Alkaline) upstream sewer. The sewer is sampled continuously by a pump sampler, air driven splitter combination.

(b) Acid bleach. Samples are grabbed daily.

(c) Machine Room. Samples are grabbed daily.

(d) Washer area centricleaners and centrisorters. Samples are grabbed daily.

Sodium losses are measured daily at the following points:

(a) Brown stock washers.

(b) Recausticizing clarifier overflow.

(c) Recovery sewer, composite sample.

(d) Main unbleached sewer.

Calcium losses are measured daily from the recaust area.

3.4 Final Effluent Discharge

3.4.1 Provincial and Federal Effluent Quality Requirements. Harmac Division applied for a Pollution Control Board effluent discharge permit (Level B) on October 26, 1973. The effluent characteristics stipulated are shown in Table 2. As an existing mill, the Federal Pulp and Paper Effluent Regulations stipulate that more stringent requirements be met for S.S. and toxicity. The federal requirements are shown in Table 3.

TABLE 2. PROVINCIAL OBJECTIVES

Kraft Pulping (Marine Discharge)

Characteristic	Value
pH Range	6.5-8.5
Temperature	95°F
Floatable Solids	Negligible
Total Suspended Solids	30 lb/ADT
Settlable Solids	2.5 ml/ℓ
BOD_5	60 lb/ADT
Toxicity (TLm_{96})	12.5%
Mercaptans	< 2.0 mg/ℓ
Sulphides	< 1.0 mg/ℓ
Residual Chlorine	< 0.1 mg/ℓ

Toxicity (TLm_{96}) - 50% survival at 12.5% effluent concentration over 96 hour exposure time.

TABLE 3. FEDERAL REQUIREMENTS

Process	Allowable S.S.	Allowable BOD_5
Hydraulic Debarking	5 lb/ODT of wood	---
Kraft Pulping	7 lb/ADT	64 lb/ADT
Kraft Bleaching	6 lb/ADT	27 lb/ADT
Kraft Sheet Formation	2 lb/ADT	

Toxicity - 80% survival at 65% V/V concentration over 96 hours

3.4.2 Current Harmac Final Effluent Discharge.

(a) BOD_5 and S.S.

(i) Kraft Mill and Machine Room.

Average daily S.S. and BOD_5 discharges over 1973 are shown in Table 4. These values are contrasted with the federal requirements and PCB Level B Objectives.

TABLE 4. FINAL EFFLUENT BOD_5 AND S.S. DISCHARGE

	Harmac Discharge	Fed. Allowable	PCB Level B
S.S.	83,000 lb/D	17,514 lb/D	33,800 lb/D
BOD_5	60,500 lb/D	102,000 lb/D	67,500 lb/D

Assume: Production = 1128 ADT/D
Water Usage = 66.2 MUSGPD, or 46,000 USGPM

(ii) Wood Mill.

The wood mill hydraulic debarker discharge over 1973 is shown in Table 5.

TABLE 5. WOODMILL DISCHARGE

	No. 1 Woodmill	Fed. Requirement	PCB Level B
S.S.	9100 lb/D	1460 lb/D	934 lb/D
BOD_5	933 lb/D	--	934 lb/D

Assume: 1973 production = 292 ODT/D

(b) Toxicity.

Recent total mill effluent toxicity data is shown below:

June 26, 1972	100% survival at 12.5% V/V.
Aug. 29, 1972	100% survival at 12.5% V/V.
Nov. 30, 1972	100% survival at 12.5% V/V.
Mar. 20, 1973	100% survival at 12.5% V/V.
June 20, 1973	80% survival at 12.5% V/V.
Dec. 10, 1973	100% survival at 12.5% V/V.

(c) Additional effluent characteristics.

The pH of the acid stream varies between 3 and 3.5 while the alkaline stream pH varies between 10.0 and 10.5 (average combined = 5.8). A colour balance has not been attempted.

3.4.3 Miscellaneous Discharges.

- No. 1 Boiler Flyash; about 5 T/D flyash from No. 1 power boiler is discharged into the main outfall area.
- Solid Wastes; about 300 yd^3/day solid waste is trucked to a site near the mill. This consists of general mill wastes such as green dregs, waste lime mud, hog wastes, slaker grits, etc. It is made up of approximately 42% combustible and 58% inert material. The dump drains north to a small creek. The creek, according to the local Fishery Officer, has long since ceased to support significant life.
- Chip Pile Leachate; runoff is ditched to a log pond beside No. 2 woodroom.

3.4.4 Process Losses. Inplant loss measurements have resulted in balances for the following parameters.

(a) Flow: The 1973 total mill effluent flow averaged 66,200,000 USGPD or 46,000 USGPM (based on water use records). The 1973 average wood mill effluent flow is 1020 USGPM. Assuming a flow of 2670 USGPM for the machine room, it can be calculated that the Acid and Alkaline sewers discharge at a rate of 42,310 USGPM. Assuming a 50:50 split, the average yearly flows are:

Acid ≈ 21,150 USGPM

Alkaline = 21,150 USGPM.

The contributions of the individual sewers to the alkaline stream have been estimated to be:

Recaust = 4%

Recovery = 13%

Boiler Ash No. 2 = 5%

No. 1 and 2 Unbleached Screens = 23%

No. 3 Unbleached Screens = 20%

Accumulator overflow = 1%

Bleach caustic extraction effluent = 32%

(b) Fiber: Average fiber losses over 1973 were as follows:

Upstream Alkaline Sewer = 17.3 BDT/day

Acid Sewer = 1.7 BDT/day

Machine Room = 0.5 BDT/day

Total = 19.6 BDT/day

= 39,200 lb/day

% of Production = $\frac{19.6}{1012}$ x 100% = 1.9%

Fiber loss contributions to the Alkaline sewer were as follows:

No. 1 and 2 Unbleached Screens = 8.9 BPT/day

No. 3 Unbleached Screens - 2.0 BPT/day

Floor Drains = 8.8 BPT/day

Total = 17.8 BPT/day

(c) Suspended Solids: Mill S.S. losses over 1973, as measured at the outfalls, averaged 83,000 lb/D (omitting wood mill). Assuming that No. 2 Boiler Ash is the main S.S. input into the Recovery Sewer, that lime lost in the Recaust area accurately reflects the S.S. output and that Fiber loss data reflects S.S. losses in the upstream Alkaline, Acid and Machine Room sewers; then the following distribution of S.S. losses exist:

1% Machine Room (1973 fiber loss) = 1000 lb/day
4% Acid (1973 fiber loss) = 3400 lb/day
47% Alkaline upstream (1973 fiber loss) - 39,200 lb/day
(screen rooms, etc.)
12% Recaust (1973 $CaCO_3$ losses) = 9400 lb/day
36% Recovery (Mainly No. 2 boiler ash) = 30,200 lb/day
Total S.S. Loss - 83,200 lb/day

(d) BOD_5: The BOD_5 output over 1973 from the Kraft Mill and Machine Rooms averaged 60,500 lb/day. Previous work suggests the following contributions to total BOD_5 output:

Acid Sewer 29%
Alkaline Sewer 70%
Machine Room 1%

The Alkaline sewer represents a BOD_5 discharge of 42,300 lb/day and is made up of the following streams:

Recaust 1%
Recovery 11%
Upstream Alkaline 88%

(e) Sodium and Calcium Losses: Average 1973 sodium losses are shown below for various streams. Values are reported in pounds of Na as Na_2SO_4 per day and as pounds of Na per day.

	lb Na_2SO_4/day	lb Na/day
Recaust	4,950	1,600
Recovery	43,800	14,200
Alkaline Upstream	110,000	35,600

Brown Stock Washer Soda Losses over 1973 are shown below:

	lb Na_2SO_4/BDTUB
No. 1 Side	35.3
No. 2 Side	16.4
No. 3 Side	22.6

Lower losses on No. 2 side reflect the internal washing of the Kamyr continuous digester. High losses on No. 1 side are due to the fact that the washers are overloaded. The washers are designed for 350 T/D; however, they are actually operated at 450 T/D.

$CaCO_3$ losses from Recaust averaged 4.7 Tons/day (10.3 lb/BDTUB).

3.5 Effluent Testing Procedures

3.5.1 Suspended Solids. A Whatman 40 15 cm filter disk is used; sample volume size has been set at 500 ml. All weighings are carried out on a 5 place Mettler Analytical Balance.

3.5.2 Fiber Loss. This test is carried out daily for inplant control purposes. It is exactly the same as a S.S. determination except that a 1000 ml sample size is used.

3.5.3 BOD_5.

(a) All D.O.'s are measured on an E.I.L. dissolved oxygen meter (same as Alberni Pulp and Paper lab).

(b) Distilled water is prepared from a metal tin-lined electric still. D.O. depletion trials on distilled water blanks showed that 1 to 2 mg/l oxygen was being consumed over 5 days. Because of these results it was decided to use only Alberni distilled water for BOD_5 testing purposes. Although the distilled water quality has improved, depletions are still high. Over the last 6 months distilled water depletions have averaged about 1.2 mg/l. However, Alberni results show zero depletion on the same distilled water. This anomaly should be pursued by the BOD_5 technician. A Milli-Q distilled water system is on order and should help solve this problem.

(c) Dilution water is prepared by adding the usual chemicals plus 25 ml seed per liter to distilled water. Since using Alberni distilled water, the dilution water has not been aerated before use. A seed control sample is prepared by adding 25 ml of seed to a 300 ml winkler bottle. The bottle is topped up with dilution water and incubated. The depletion over 5 days "D" multiplied by an appropriate factor "f" gives the contribution of the seed to the total depletion "B" of the seeded sample. BOD_5 is calculated as follows:

$$BOD_5 = \frac{B - fD}{A}$$

where B = total depletion of seeded sample,
D = depletion of seed control
f = factor
A = dilution ration of sample

In the case of a 5 ml sample (295 ml dilution water containing 7.4 ml seed) the factor "f" is equal to

$$\frac{7.4}{25 + 275 \times \frac{25}{100}} = 0.232.$$

(d) Sample Pretreatment: All samples are neutralized before the IDOD (immediate dissolved oxygen demand) of the sample is met by aerating the sample for 2 hours. At this point the sample is mixed with seeded dilution water in various ratios and incubated at $20^{o}C$ for 5 days.

(e) Seed Handling Procedures: Two years ago domestic sewage seed was slowly introduced to neutralized effluent. Three separate seeds were acclimated to bleach chlorination, bleach caustic extraction and whole mill wastes. Seeds are stored in the refrigerator. One day before use the seed is moved to the $20^{o}C$ incubator and fed. For the whole mill seed this consists of 200 ml Alkaline, 200 ml Acid and 50 ml Machine Room effluent. If the previous week's seed control sample was under 40% activity, 2 drops of canned milk are added along with the effluent mixture. The fed seed, open to the air, is incubated at $20^{o}C$ until used. The required seed is then pipetted carefully from the top of the bottle.

(f) A BOD_5 check is carried out weekly on a glucose glutamic acid standard. The standard is prepared monthly and refrigerated. The last 19 glucose determinations averaged 185 mg/l, standard deviation ± 41 mg/l.
1. Standard Glucose = 210 mg/l ± 10 mg/l.

(g) All BOD_5 bottles are cleaned with H_2SO_4 and rinsed 6 or 7 times with water.

3.5.4 Colour. The sample is adjusted to pH 7.6 using HCl or NaOH. The adjusted sample is filtered through a 0.45 mμ Millipore filter. The absorbance is measured at 425 mμ on an E.E.L. colorimeter.

3.5.5 Na and Ca. Sodium and calcium are measured using a Flame Photometer, Parkin Elmer 103.

3.5.6 Flow. Flow measurements are carried out by means of parshall flumes (Figure 2). The parshall flumes on the main outfalls, however, are inoperative. Flows are calculated from plant water usage data. Tracer studies have been carried out to show flow distributions.

4. POLLUTION ABATEMENT FACILITIES

4.1 Inplant Modifications

4.1.1 Brown Stock Washer Spill Control. The washer area is surrounded by raised curbs. Normal operating floor spills are collected and are gravity fed to a spill control tank (9,450 ft^3). Spills that exceed the dyke capacity go to the basement and then to sewer. Collected spills are pumped to the blow tank.

4.1.2 Knot Tank Overflow. Spills from the knot tanks go to a secondary knotter system. Knots are trucked to landfill and liquor goes to the brown stock spill tank.

4.1.3 Screen Room Spill Collection. Spills from the screen room area and bleach plant washer area (including stock tank overflows) are collected in a large basement sump and pumped (1200 gpm) to the tailings chest. From the tailings chest spills are fed back into the brown reject system.

4.1.4 Turpentine Recovery System. During the cook, digester relief gas from both the batch and continuous digesters is fed into the turpentine recovery system (Figure 4).

Turpentine production is about 200 gal/day. The kamyr digester contributes about 40 gal/day while the batch contributes 160 gal/day. The turpentine is stored in a 12 ft dia x 20 ft tank. There is no air space in the tank as the turpentine is stored above a water pad.

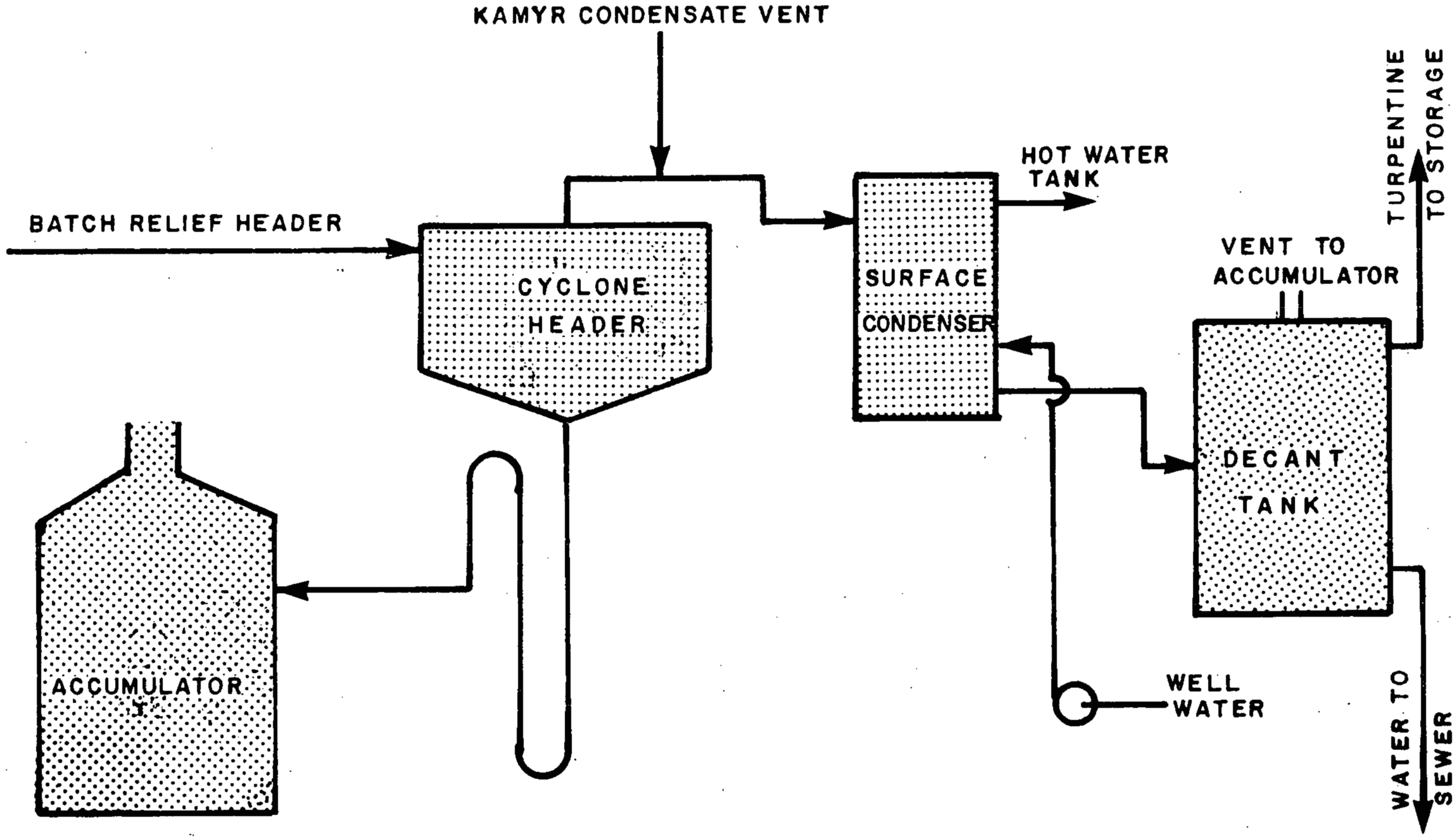

FIGURE 4 TURPENTINE RECOVERY SYSTEM

Before this system was installed, the turpentine would have gone directly to sewer, along with the digester condensate. The effects of this system on the mill toxicity and BOD_5 output have not been assessed.

4.2 External Treatment

4.2.1 Dregs Filter. Oliver 6 ft dia x 10 ft dregs filter. About 10 T/D green liguor dregs (GT/D - 25 T/D) are recovered and trucked to landfill. Dregs are recovered at about 25% consistency.

4.2.2 Recaust Clarifier. A 50 ft dia clarifier collects all settlable solids from the recaust sewer. Approximately 4 T/D of hypo sludge and recaust sewer material is collected and fed either to mud storage or to the dregs filter (if the material is contaminated). An emergency concrete mud storage basin (100 T capacity) collects excess mud during emergencies or during shutdowns. This material is returned to the mud storage via the recaust clarifier. The recaust sewer layout is shown in Figure 5. Plans are underway to reduce the hydraulic loading to the recaust clarifier by diverting the flow of clean kiln trunion cooling water to the Alkaline sewer.

4.2.3 Wood Room Clarifier. A 100 ft dia·clarifier has been constructed to treat woodroom hydraulic debarker wastes, flyash and centricleaner rejects. However, because of labout problems this system is inoperative. Eventually the clarifier will accept:

(a) 5 T/D wood room material,

(b) 24 T/D flyash from No. 1 and No. 2 boilers,

(c) 5 T/D unbleached and bleached centricleaner rejects.

An 80% suspended solids removal is expected.

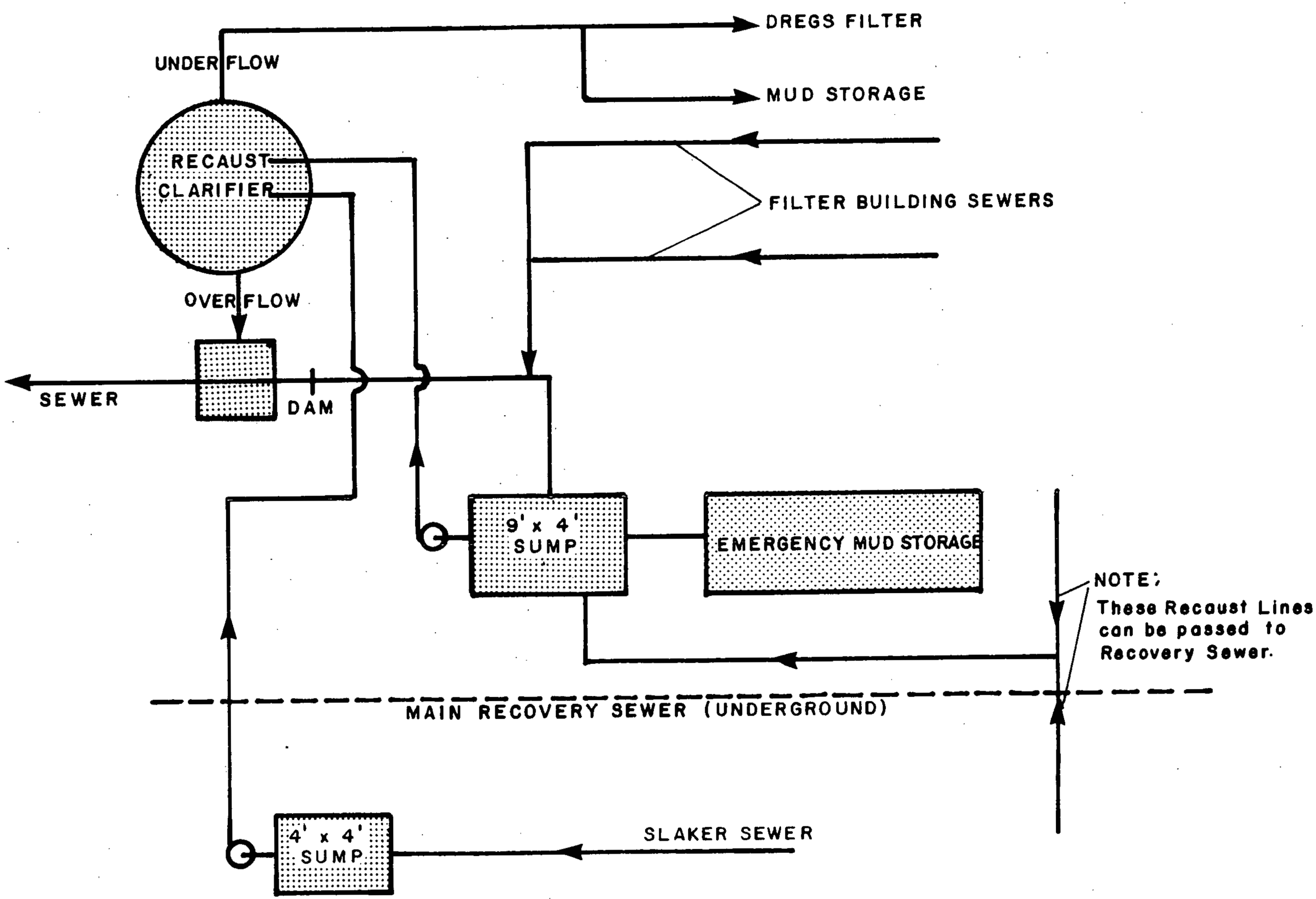

FIGURE 5 RECAUST SEWER SYSTEM

4.2.4 pH Neutralization. The pH of the kamyr digester spent acid cleaning solution is neutralized before being discharged to sewer.

4.2.5 Oil Storage. Bunker C oil storage tanks:

No. 2 247,000 ft^3
No. 3 14,400 ft^3

These tanks are surrounded by a concrete spill collection basin.

4.2.6 Colour Reduction. Experimental work carried out at Harmac has important implications concerning effluent colour reduction. Bleach sequences have been varied in an attempt to reduce the colour of the caustic extraction stage effluent. Basically two new sequences were developed:

(a) D/C PHDED

where D/C = combination ClO_2, Cl_2 stage
P = hydrogen peroxide stage

This sequence resulted in an approximate colour reduction of 66% over the conventional CEHCHDED sequence.

(b) DICHCHDED

This new sequence resulted in a colour reduction of approximately 90%.

4.2.7 NaCl Removal System. The NaCl input to the liquor system due to the handling of logs in salt water is about 20 lb NaCl/Ton. This leads to an equilibrium salt concentration in the white liquor system of about 35 mg/l (about 10 to 15% of the total solids in black liquor). As the mill reduces emissions, salt losses are also reduced, and the equilibrium salt concentration will rise. In a recovery limited mill such as Harmac an increase of 7.0 gm/l salt in the white liquor is equivalent to a production loss of about 14 unbleached BPT/day. Also corrosion problems and boiler tube problems increase. With this in mind a salt removal system was developed (Appendix II).

The system was designed to keep white liquor salt concentrations at about 35 gm/l assuming that mill emissions are to be reduced and that the salt input is going to remain at the present level. Recycling caustic extraction effluent, as a colour reducing practice, would lead to a 50-60 lb/Ton increase in the salt input. The present system was not designed with such massive chloride inputs in mind. Although this system has been installed, it is not operational because of labour problems.

4.2.8 Sewage. Domestic sewage is presently mixed in with mill effluent. Plans are underway to separate and treat this stream.

APPENDIX I

A mill equipment list and process flow diagrams can be found in the Pulp and Paper file. This work was prepared in 1968 by D.A. Kelly.

APPENDIX II

A report describing the salt removal system at Harmac can be found in the Pulp and Paper file.