RYAN Greensaire II®
The total greens care machine.

- *Relieves compaction*
- *Leaves turf ready for immediate play*
- *Uniform penetrations on 2" centers*
- *Easy to operate*
- *Ryan dependability*

Golf course greens are subjected to more abuse than any other turf area of a course. Every time golfers, caddies or maintenance crews walk across a green, they inhibit the root system's ability to absorb water and fertilizer by compacting the soil.

To combat this common, yet serious problem, Ryan Turf-Care has engineered a self-propelled aerator especially for greens care.

The Greensaire II is versatile, offering four sizes of tines ranging from ¼ to ⅝-inch in diameter. This allows proper aeration any time of the year and under varying soil conditions.

The tines of the Greensaire II penetrate the turf up to three inches deep on two-inch centers, removing up to 36 cores per square foot. And the Greensaire II is a time-saver on the job. It's capable of aerating up to 8,000 square feet per hour, covering a 24-inch swath. An optional windrow attachment makes core cleanup quick and easy.

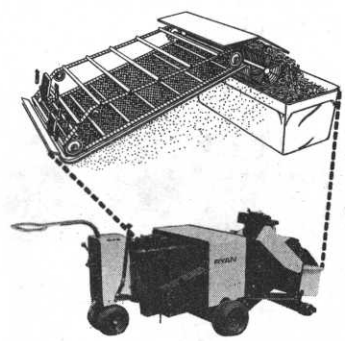
Aeration with the Ryan Greensaire II should be done once in the fall and once in the spring. However, greens that are frequently used or easily compacted may require aeration up to six times a year.

CORE PROCESSOR

To speed up the job of core removal from the turf, and to provide an easy method of top dressing, the Ryan Core Processor is the answer.

The Core Processor attaches exclusively to the Greensaire II. As the cores are ejected, the Core Processor catches them and separates the soil from the thatch and plant material. The good soil is sifted back onto the green, providing top dressing, while the leftover material is deposited in a big, 2.3 cubic foot debris catcher.

Using the Core Processor with the Greensaire II lets you aerate, top dress and collect thatch, all in one pass.



RYAN® TURF-CARE EQUIPMENT

Gould's are your "Seeing is Believing" Turf Equipment Suppliers
Let us demonstrate any equipment you need

LAWN GARDEN AND TURF
GOULD'S
SUPPLIES AND EQUIPMENT

3711 Lexington Avenue North
St. Paul, Minnesota 55112

FOR DEMONSTRATION CALL
612-484-8411

RESEARCH PROGRAM

Chairman George Ostler sends along a great big hearty thanks to the following clubs, individuals, associations and suppliers for their generous donations to the Research Fund: Minnetonka Country Club, Edina Country Club, Madden Brothers, Minnehaha Country Club, Mrs. Feser, Westward Ho Country Club, Somerset Country Club, Olympic Hills Golf Club, Mendakota Country Club, City of Anoka, Voyager Village, Indian Hills Country Club, Minikahda Club, Rochester Country Club, Cushman Motors, Ox Bow Country Club, Minnesota Valley Country Club, Mesaba Country Club, Majestic Oaks Country Club, Northland Country Club, St. Cloud Country Club, Chisago Lakes Golf Estates, City of New Hope, Southview Country Club, Forest Hills Country Club, Cottonwood Country Club, Jerry Heckler, North Oaks Country Club, Hazeltine National Golf Club, Keller Men's Golf Club, New Richmond Country Club, Hillcrest Country Club, Mora Country Club, White Bear Yacht Club, Daytona Golf Club, Minneapolis Golf Club, University of Minnesota Golf Club, Hudson Country Club, Minnesota Golf Association, Austin Country Club and Root River Country Club.

George would like to remind the superintendents whose club does not appear in the above list that now is the time to approach the club for a donation. With both a summer and a winter research program going, the need for financial support is greater than ever. Next month a report from Dr. Ward Steinstra on the progress of the program.

MGCSA ANNUAL GOLF TOURNAMENT

SPECIAL
HOLE-IN-ONE PRIZE
CLUB CAR BY JERRY COMMERS

It is time again to be looking ahead to the Annual Minnesota Golf Course Superintendents' Tournament. A time to enjoy golf, fellowship and entertain club officials, managers and professionals from your club. The event this year will be held on September 18, 1978 at Majestic Oaks Country Club. Don Lindblad is the host superintendent.

As this tournament grows in size each year, it becomes more necessary for reservations to be made early. Two shotguns will be held, the first at 8:00 a.m. and the second at 1:30 p.m. Each shotgun will be limited to 32 foursomes. Tee times for the 1:30 p.m. shotgun will be given on a first reservation returned basis and given to Class A and Class B superintendents first, unless they indicate the morning shotgun. Others will be placed in the 8:00 a.m. shotgun.

The cost of the event will be $19.00 per person which includes prizes and dinner. Carts will be available at a cost of $7.50 each.

For the early arrivals at Majestic Oaks coffee and rolls will be available. A buffet lunch will be available for golfers coming off the course from the 8:00 a.m. shotgun and available to persons playing in the 1:30 p.m. shotgun. These luncheons are difficult to plan for so please use the facility. The lunch will cost $3.00. As usual beer and pop will be available on the course for the players.

M.G.C.S.A. TOURNAMENT SEPTEMBER 18, 1978
MAJESTIC OAKS COUNTRY CLUB

Please reserve for _____ for the
(name of sponsoring supt.)
8:00 a.m. - 1:30 p.m. shotgun a spot for the following foursome:
(circle one)

Names of Players

1. _____ @ $19.00 _____

2. _____ @ $19.00 _____

3. _____ @$19.00 _____

4. _____ @$19.00 _____

Please reserve ____ carts at $ 7.50 ea. _____

Please reserve _____ extra dinners @$15.00 _____

Total $_____

Payment must accompany reservation. Make checks to M.G.C.S.A. Singles making reservations will be paired to make foursomes. Cancellations made prior to Sept. 11, 1978 will receive a full refund. Cancellations after Sept. 11, 1978 will receive no refund. No reservations (except for dinner) will be taken after Sept. 11, 1978. Send reservations to: JOHN NYLUND, C/O BRAEMAR GOLF CLUB, 6364 DEWEY HILL ROAD, EDINA, MINN. 55435.

USS Vertagreen Fall Fairway Fertilizer... We'll help winterize your fairways!

Hit the fairways this fall with an application of this great new USS Vertagreen fertilizer and you're on your way to fewer turf problems next spring. This quality product is ideal for fall fairway fertilization because it has a high potash analysis ... and that means less winter kill.

A soil test in the late summer or early fall will determine if your fairways lack this vital nutrient. If they do, USS Vertagreen Fall Fairway Fertilizer is the answer because it's formulated with primary nutrients specifically for your area. See your USS Vertagreen distributor and he'll show you how to winterize your fairways this fall. Next spring you'll be glad you did.

Distributed By
MINNESOTA TORO, INC.

USS TRADEMARK

Agri-Chemicals
Division of United States Steel
P.O. Box 1685, Atlanta, Ga. 30301

SUMMER TURF PROGRAM

Steve Leiser, my summer turf assistant, began working June 14. We first went to Rochester and applied several types of fertilizer to the nursery Kurt Erdmann maintains. Since it went so well that same day, we repeated our performance at the campus turf research area. Before Steve started working, Andy Lindquist and I seeded 7 Kentucky Bluegrasses, 4 Perennial Ryegrasses and 2 Fescues on a golf fairway at the Anoka Landscape Career Center. The Rye and Fescue established well, but the Bluegrasses did very poorly. The warm June did not help in establishing that turf plot area.

Steve's second week found him and me at Duluth where we fertilized the nursery of Eino Maki at the Northland Country Club and we also appeared at the Hazeltine National G.C. and at Oak Ridge C.C. Later that week Steve and Keith Scott applied fertilizers to a fairway test plot at Oak Ridge. The week of June 26 I traveled to Roseau for a grass seed field day and stopped at two golf courses in northern Minnesota. In mid July several turf problems surfaced and now it appears that nematodes may be involved in the short root, poor vigor symptom several of you have complained about. Fertilizer was again applied at Rochester, Campus and the Duluth locations on July 17-18 and a nematicide at the Minnesota Valley C.C. on July 19.

The last week of July will mark the beginning of the dollar spot test at the campus plot. Presently no other dollar spot sites are active. Fungicides, 4 experimental and 2 standard dollar spot materials are superimposed on the fertilizer trial at Campus. Weekly data and bi-weekly treatments are programmed through September.

The activities at Rochester, Campus and Duluth require 2 days of time to apply the materials and drive the 448 miles. Presently this seems like a large amount of travel time and little data has been collected. However, I am optimistic that the individual superintendents who take time to stop and observe will benefit from this study. Fungicide spraying, nematode testing and weekly observations will keep me very busy this summer.


```
**************************************
*        MARK YOUR CALENDAR          *
*   1978 G.C.S.A.A. FALL SEMINAR     *
*      SUBJECT-MANAGEMENT II         *
*  MINNEAPOLIS, MINN., OCT. 25-26    *
*        COST  $80.00 MEMBER         *
*        $115.00 Non-member          *
**************************************
```

RESEARCH NOTE

SYSTEMIC FUNGICIDES FOR CONTROL OF DUTCH ELM DISEASE

BY MARK STENNES AND D. W. FRENCH

The primary control measure for Dutch elm disease is sanitation which includes early detection, elimination of dead and dying elms and disruption of common root systems (Agricultural Extension Service Bulletin #211). Systemic fungicides, if properly applied, can provide additional protection against Dutch elm disease for elms of high value.

Although the fungitoxic properties of the two commercially available systemic fungicides ("Arbotect" 20-S = TBZ and "Correx" Lignasan BLP = MBC-P) have been know for some time, some unanswered questions remain. The objective of the study reported here was to demonstrate a technique of application and an amount of properly diluted chemical (dosage rate) which together will have the following attributes: (1) Maximum distribution of the chemical to all susceptible parts of the tree; (2) Optimal migration of the chemical into new apical and radial wood; (3) Effectiveness as a cure for mature American elms which are in an early state of infection by the Dutch elm disease fungus, Ceratocystis ulmi.

The overall objective is to provide the users of these systemic fungicides with dependable information on how to best use them.

EXPERIMENTATION. Three injection techniques, trunk, ground level and exposed root flare, and a range of dosage rates were tested in various combinations on groups of healthy, mature, even-aged American elms. Label rates as well as rates exceeding those suggested on the label were evaluated. Most of the trees injected are located on the Minnesota State Fairgrounds and have an average DBH (diameter at 4.5 feet above the ground) of 22.3 inches.

To assess the distribution and relative strength of the treatments being tested, a sampling and bioassay technique was used to detect and determine the percent distribution of the chemical in the crowns of the treated trees. There were five trees in each group and 16 samples from each tree for a total of 80 samples for each treatment.

The bioassay technique consisted of placing small sections of the branch samples on agar plates which had been covered with spores of Ceratocystis ulmi (Smalley, 1973). The development of the fungus on the branch sections was a relative measure of the amount of chemical present in that part of the tree.

Between June and September, 1976, 11 naturally infected American elms were treated with TBZ at the triple therapy rate. Percent foliar symptoms of Dutch elm disease in the crowns of these trees at the time of injection varied between 5 and 15%. Six of the trees were injected at ground level and five were injected through exposed root flares. In most cases, the branches with symptoms of the disease were removed about two weeks after injection, but no effort was made to remove all of the infected branches if they were not wilting.

RESULTS. The bioassays indicated that three high dose, exposed root flare injection treatments, one MBC-P treatment and two TBZ treatments, provided detectable quantities of the fungicide to practically all parts of the treated trees (Table I).

Some data not reported here, as well as work by others, indicate that MBC-P does not remain in the tree very long, regardless of the dosage used. It will not protect the tree the year following treatment. Bioassays in 1978 of trees injected in 1977 will undoubtedly confirm this conclusion.

TABLE I

% DISTRIBUTION AND RELATIVE AMOUNT OF MBC-P AND TBZ IN TREATED ELMS

CHEMICAL	DOSAGE	CONC. (PPM)	RATE (QTS/INCH)	ELAPSED TIME (DAYS)	DISTRIBUTION (%)	AMOUNT
MBC-P[1]	Th.[4]	438	2	14	0	
MBC-P	3 x Th.	438	6	22	72.4	low
MBC-P	6 x Th.	875	6	23	100.0	medium
TBZ[2]	Pr.[5]	5000	0.5	29	14.5	
TBZ	Th.	1000	5.0	27	55.8	low
TBZ	2 x Th.	2000	5.0	27	95.4	medium
				53 weeks	63.7%	low-med
TBZ	3 x Th.	3000	5.0	26	97.4	high
TBZ[3]	3 x Th.	5000	3.0	41-50 weeks	27-100	med-high

[1] MBC-P = "Correx" Lignasan BLP
[2] TBZ = "Arbotect" 20-S
[3] Diseased trees treated therapeutically in 1976
[4] Th. = Maximum therapy label rate
[5] Pr. = Maximum preventive label rate

The two highest TBZ dosages rates (2 x Th. and 3 x Th.) can provide detectable fungicide activity to the most recent annual ring at least into a second growing season. The double therapy rate (2 x Th.) will result in detectable amounts of chemical more than a year after treatment, but the fungicide will not be as well distributed or at levels as high as with the triple therapy rate. Repeated bioassays during the 1977 growing season indicated that the general quality of the triple therapy rate (3 x Th.), measured in terms of % distribution and relative levels of activity, will remain relatively high throughout the second growing season. If the apparent trend continues, appreciable chemical activity may extend into a third growing season after injection. Bioassays in 1978 will determine whether or not these trends are confirmed.

During the 1977 growing season, 2 of 11 diseased elms treated therapeutically with TBZ in 1976 died, and one developed symptoms in one additional branch. Symptoms of Dutch elm disease did not reappear in any of the other eight trees. The only trees which wilted completely or developed new symptoms of Dutch elm disease had been injected at ground level and all five of the trees that were injected through exposed root flares survived through the 1977 growing season without retreatment or recurrence of symptoms. On the basis of bioassay and cultural examinations of the trees that died, incomplete and uneven chemical distribution was the most probable reason for the failure of the fungicide to save them. Even these elms may have survived if the exposed root flare injection technique had been used.

SUMMARY: Most effective injection technique: EXPOSED ROOT FLARE. Most promising chemical: "Arbotect" 20-S. Most promising dosage rate: 3 x MAXIMUM THERAPY LABEL RATE. Chemical concentration: 3000 PPM (1.92 fluid oz. Arbotect/gallon of solution). Rate of application: 1.25 gallons of solution/inch DBH.

Although our research results are incomplete and some important questions remain unanswered, we can draw some preliminary conclusions on the basis of what we do know. The data from those treatments evaluated all seem to indicate that exposed root flare injection of "Arbotect" 20-S at the triple therapy rate will provide the most fungicide for the longest time and will probably yield the most satisfactory results. Interpretation of the data is tentative because the exact relationship between bioassay results and actual resistance to infection in the tree has not been established. Specific conclusions about the significance of bioassay results will be possible only after artificial inoculation-bioassay experiments have been completed.

To consistently effect a cure for established Dutch elm disease infections in mature elms, all parts of the diseased tree must receive enough chemical to both suppress and inactivate the fungus and subsequently provide the tree with the opportunity it needs to compartmentalize the infection and leave it buried harmlessly in new wood. Exposed root flare injection appears to be the only practical method of attaining satisfactory chemical distribution. There is also some evidence to indicate that the resulting injury to the tree will be less severe and the wounds will close more quickly than wounds in the main stem.

Our research results are corroborating some reports from the University of Wisconsin which indicate that TBZ, the active ingredient in "Arbotect" 20-S, has some physical and chemical properties that are highly desirable in a systemic fungicide. The chemical will move into the crown of the tree where it is needed to combat the Dutch elm disease fungus but it will not move into the leaves in appreciable quantities (Nishijima, 1977). In addition, the chemical is quite stable and will move into new radial wood, provided the concentrations present initially are high enough. The research results indicate that the ability of this fungicide to move into new wood as the trees grow is a function of the total dose initially injected. The more fungicide injected initially, the longer the chemical activity will continue to exist in the newest formed wood. Of the dosage rates tested so far, the triple therapy rate appears to maximize this attribute of TBZ.

The most important advantages of a long-lasting treatment relate to cost and the need to minimize the injury to trees from wounds made in the injection process. Shigo has clearly established that the multiple injuries which result from tree injection are serious wounds from which the tree can never completely recover and that yearly injections to prevent Dutch elm disease are unacceptable to the well-being of the tree (Shigo, 1977). Accordingly, although the initial expense of the triple therapy rate will be the most costly (two 27" elms can be treated with 1 gallon of "Arbotect" 20-S), both the cost of and the additional injury caused by subsequent injections will be avoided.

In contrast to the above research results it is necessary to indicate to all concerned that the label is the law and that the data presented here do not change the law. They do indicate, however, that the label rates which have been approved may not provide adequate levels of fungicide to the treated tree.

References: Nishijima, W.T. 1977. Systemic fungicides for Dutch elm disease control. Ph.D Thesis. University of Wisconsin. Shigo, A.L. and Richard Campana. 1977. Discolored and decayed wood associated with injection wounds in American elm. J. Arbor. 3: 230-235. Smalley, E.B., C.J. Meyers, R.N. Johnson, B.C. Fluke and R. Vieau. 1973. Benomyl for practical control of Dutch elm disease. Phytopathology 63:1239-1252.

Local Distributors of "Arbotect" 20-S and "Correx" Lignasan BLP:

Brayton Chemical Company
P.O. Box 437
West Burlington, Iowa 52655

C & R Supply
P.O. Box 1837
Sioux Falls, South Dakota 57101

Castle Chemical
301 Master Avenue
Savage, Minnesota 55378

Cole Chemical
2020 Broadway St. N.E.
Minneapolis, Minnesota 55413

Hopkins Agricultural Chemical
P.O. Box 7532
Madison, Wisconsin 53707

Turf Supplies
2970 Dodd Road
Eagan, Minnesota 55121

Dosage Schedule for

"Arbotect" 20-S *

Chemical concentration: 3000 PPM = 1.92 fluid oz Arbotect/gallon

Rate of Application: 1.25 gallons (5 qts)/inch DBH

Circumference (Inches)	DBH (Inches)	Gallons of solution	Fluid ounces "Arbotect" 20-S
31.4	10	12.5	24.0
34.6	11	13.75	26.4
37.7	12	15.0	28.8
40.8	13	16.25	31.2
44.0	14	17.5	33.6
47.1	15	18.75	36.0
50.3	16	20.0	38.4
53.4	17	21.25	40.8
56.6	18	22.5	43.2
59.7	19	23.75	45.6
62.8	20	25.0	48.0
66.0	21	26.25	50.4
69.1	22	27.5	52.8
72.3	23	28.75	55.2
75.4	24	30.0	57.6
78.5	25	31.25	60.0
81.7	26	32.5	62.4
84.8	27	33.75	64.8
88.0	28	35.0	67.2
91.1	29	36.25	69.6
94.3	30	37.5	72.0
97.4	31	38.75	74.4
100.5	32	40.0	76.8
103.7	33	41.25	79.2
106.8	34	42.5	81.6
110.0	35	43.75	84.0
113.1	36	45.0	86.4
116.2	37	46.25	88.8
119.4	38	47.5	91.2
122.5	39	48.75	93.6
125.7	40	50.0	96.0
128.8	41	51.25	98.4
132.0	42	52.5	100.8

* Equivalent to three times the maximum therapy label rate

Your Northrup King man is also your Adelphi man.

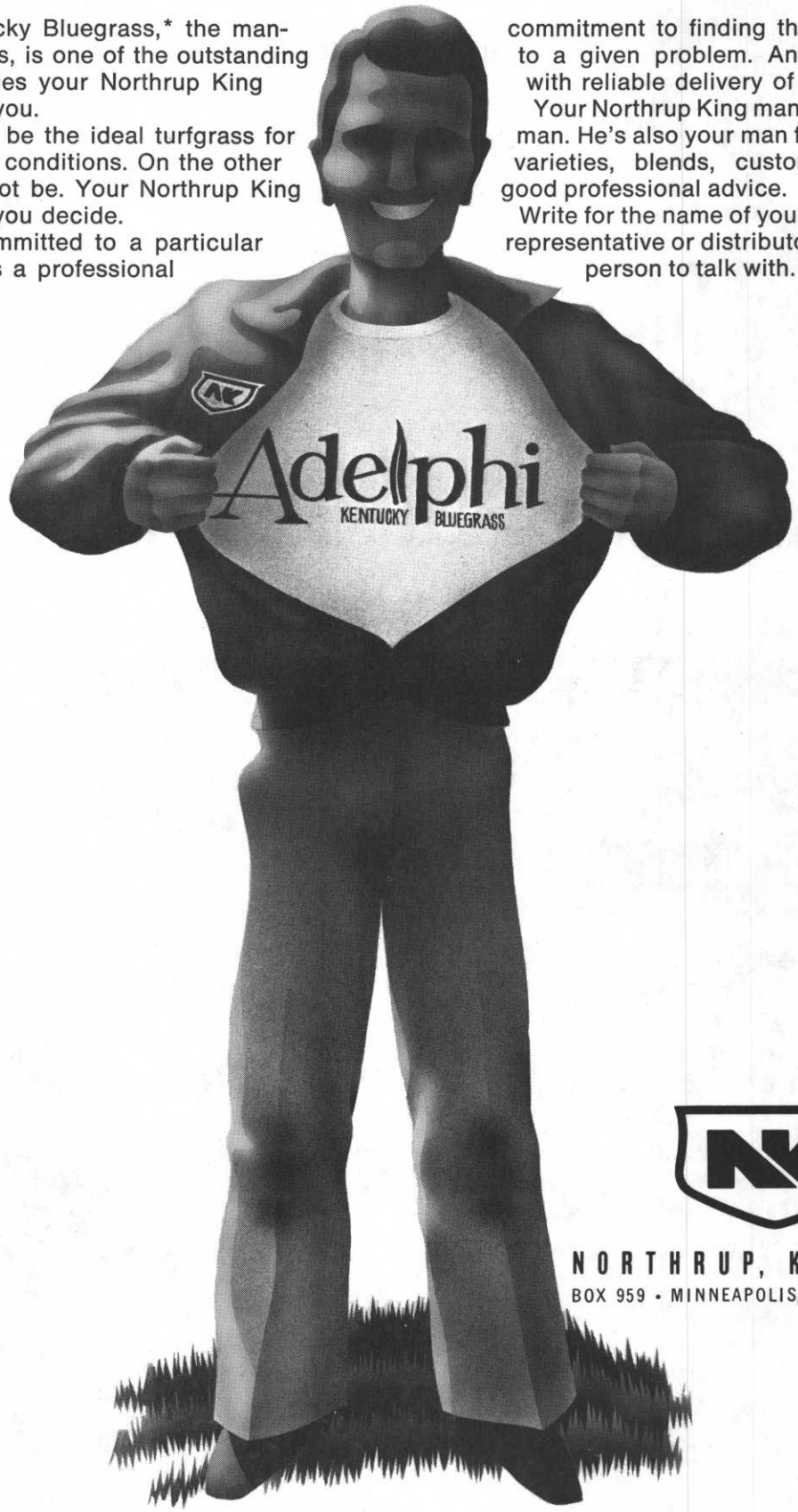
Adelphi Kentucky Bluegrass,* the man-made bluegrass, is one of the outstanding turfseed varieties your Northrup King man can offer you.

Adelphi may be the ideal turfgrass for your particular conditions. On the other hand, it may not be. Your Northrup King man can help you decide.

He's not committed to a particular variety. He has a professional commitment to finding the best solution to a given problem. And following up with reliable delivery of quality seed.

Your Northrup King man is your Adelphi man. He's also your man for a lot of other varieties, blends, custom blends and good professional advice.

Write for the name of your Northrup King representative or distributor. He's a super person to talk with.



NORTHRUP, KING & CO.
BOX 959 • MINNEAPOLIS, MINNESOTA 55440

*P.P. 3150