PASSF
1.8
7/1987

PASCO SANITARY LANDFILL

APPENDIX 1

DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR EXPANSION OF THE PASCO SANITARY LANDFILL SITE

July, 1987

Prepared For:

FRANKLIN COUNTY

PLANNING DEPARTMENT

USEPA SF
1426451

franklin county planning

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Pasco, Washington 99301
Telephone (509) 545-3521

ROBERT H. BOOTHE

Planning Director

APPENDIX 1

TECHNICAL CONSIDERATION

FOR

SLUDGE DISPOSAL

AT

THE PASCO SANITARY LANDFILL

SEP 18 1987

Superfund Branch

CITY OF PASCO
PUBLIC WORKS DEPARTMENT
P.O. BOX 293, 412 WEST CLARK, PASCO, WASHINGTON 99301
Water Distribution / 545-3463 Street Maintenance / 545-3464
Sewage Treatment / 545-3468 Water Filtration Plant / 545-3469

April 23, 1987

TO: Larry Kamberg, R.S., Supervisor

FROM: Harold Posthuma, Pasco Wastewater Superintendent

SUBJECT: Pasco Sludge Utilization Project

Ref:
- A. Posthuma 3-11-87 Sludge Utilization Application to Kamberg
- B. Kamberg 3-18-87 memo to Posthuma
- C. WDOE 82-11
- D. WDOI 82-12
- E. Airport well drilling logs and reports
- F. Airport aerial photo with soil types
- G. Fertilizer guides
- H. Soil type descriptions
- I. Sludge analysis
- J. Soil analysis
- K. Map of proposed utilization areas
- L. Map of utilization project signs
- M. Map of soil sample locations
- N. Map of well locations
- O. Statement of soil compatability with sludge utilization
- P. City-Airport contractual language
- Q. Map of Circle Numbers
- R. Old Airport aerial photo

In addition to the information in Ref. A, the following is submitted in response to Ref. B.

The City of Pasco Wastewater Treatment Plant generates approximately 1.3 million gallons of anerobically digested sludge per year. The City's proposal is to surface apply this sludge to the Airport described in Ref. A., Part I, Item C and pictured in Ref. K. The area ($A=\pi R^2/43560$ ft.^{2} per acre) of this circles in acres is as follows:

#1	1280 ft.^{2}	x 3.1416	divided by 43560 ft^2/acre	=	118	acres
#2	.75x1020 ft.^{2}	x 3.1416	divided by 43560 ft^2/acre	=	56	acres
#3	1240 ft.^{2}	x 3.1416	divided by 43560 ft^2/acre	=	111	acres
#4	960 ft.^{2}	x 3.1416	divided by 43560 ft^2/acre	=	66	acres
#5	950 ft.^{2}	x 3.1416	divided by 43560 ft^2/acre	=	65	acres
					416	acres

Circle #1 is planted in alfalfa and therefore does not need the nitrogen available in the sludge. The remaining 298 irrigated acres are planted in timothy and are suitable for sludge application. There are an additional 175 non-agricultural acres that could be used for sludge application. Sludge that is applied to non-agricultural land would be used to support natural vegetation and for experimental purposes such as testing various cover crops and for soil stabilization and conservation. This would include using sludge as a mulch for hydroseeding. The majority of the sludge would go on the circles starting with Circle #5 which has accessability, but is the most isolated from the general public. When the sludge could not be applied to the circle because of the crop situation we would start well documented experimental plots in the areas designated on Ref. K.

Because the crops on the circles are forage crops (timothy) with an expected three and hopefully four cuttings per growing season the sludge will be surface applied. Surface application does not disturb the crop and promotes soil stabilization. Discing disturbs the soil surface and is detrimental from a soil conservation point of view.

The digesters will be used as the primary back-up to surface application at the airport with the drying beds at the treatment plant being the secondary back-up. In addition as provided by RCW 70.95.255 sludge could go to landfill on a temporary emergency basis.

At the landfill we are currently applying a truck load (900 gallons) of sludge to an area 9 feet by 500 feet. This 900 gallons per 4500 square feet is on the conservative side. The application rate can be modified by driving faster while dispersing the sludge and/or modifying the splash plate to develop a wider pattern.

Sulfur (S)

Fast-growing, heavily-watered lawns have a high demand for S. Although many domestic sources of water contain S, frequently additional S is required to obtain the deep green foliage essential for attractive lawns. A S-containing fertilizer material should be used at the time of fertilizer application. S needs are .5 to 1 lb. S/1000 sq. ft./yr.

Phosphorus (P)

If WSU soil test reads:		Apply this amount–lbs. of P_2O_5 per 1000 sq. ft.	
Acetate Method	Bicarbonate Method	Establishment	Existing Turf
ppm	*ppm*		
0-4	0- 5	5	3
4-6	5- 7	3	2
6-8	7-10	2	1
More than 8	More than 10	0	0

These P rates will not cause burning. P will not leach out of the soil. Therefore, the entire P requirement may be applied at one time.

Potassium (K)

If WSU soil test reads: (Acetate and Bicarbonate)	Apply this amount–lbs. of K_2O per 1000 sq. ft. Establishment	Existing Turf *Caution**
ppm		
0- 80	5.0	4.0
81-150	4.0	3.0
151-200	2.5	1.5
More than 200	0	0

As with N fertilizers, those containing K must be applied when the turf is dry and then watered in or leaf burn may result.

GUIDE FOR USE OF FORMULATED TURF FERTILIZERS

A complete fertilizer contains N, P, and K. The percent of each fertilizer nutrient will be shown on the bag. An example is 10-5-10 which contains 10% N, 5% P_2O_5, and 10% K_2O. Even though N is the element most commonly needed on turf, occasional applications of P and K are seldom harmful. Grass uses N-P-K for growth at about a 3-1-2 ratio. Thus, fertilizers with about this ratio are excellent for turf.

For good turf, these fertilizers should be applied 4 times per season to supply 1 to 1.5 lbs. of N per 1000 sq. ft. for a total of 4 to 6 lbs. of N per season.

**Caution:* Foliar and possible root damage can occur if potash applications exceed 1 lb. K_2O/1000 sq. ft./application. If more than 1 lb./1000 sq. ft. is needed, equally divide the total and make applications every 3-4 weeks apart followed by a normal irrigation. If both N and K are applied together, the maximum combined N + K should not exceed 1.5 lbs./1000 sq. ft.

REF G

To calculate the amount of complete fertilizer required to obtain the desired N rate use the following equation.

$$\begin{pmatrix}\text{Complete fertilizer, lbs.}\\ \text{needed/1000 sq. ft.}\end{pmatrix} = \frac{\text{N desired/1000 sq. ft. x 100}}{\text{N content of complete fertilizer}}$$

Example: N at 1.5 lbs./1000 sq. ft. is desired. The fertilizer to be used has a grade of 12-5-10 (N-P-K).

$$\text{Complete fertilizer needed (lbs.)} = \left(\frac{1.5}{12}\right) \times (100) = 12.5 \text{ lbs./1000 sq. ft.}$$

Retest your soil every 2 or 3 years to determine if the fertilizer needs have changed.

Liming Requirements For Central And Eastern Washington

The pH of soils in this region is usually high enough that liming is rarely essential. Turfgrass areas such as golf putting greens, sports fields constructed from sand and a few other isolated areas may require an occasional application of agricultural limestone or dolomitic limestone if magnesium is low.

Liming Before Establishing New Turf

Liming of soils with pH lower than 5.6 may be desirable especially if the calcium level is low. Soil for bluegrass turf should be limed to a pH of 6.0-6.5. To determine if your soil needs lime, check both the pH (pH is a measure of acidity) and the calcium (Ca) level on your soil test report. Use the table below in the following manner: in the left-hand column find the pH range corresponding to your soil. Across the top of the table find the calcium (Ca) range for your soil. Go down this column until it intersects the line covering the pH range into which your soil falls. The number at the point of intersection is the number of pounds of lime to apply for each 1,000 sq. ft.

For example, if your soil has a pH of 5.8 and a calcium value of 4 meq/100 g. of soil, the amount of lime to apply is 125 lbs./1,000 sq. ft.

	Lime For New Lawns If WSU or equivalent soil test for calcium (Ca) in terms of meq/100 g. soil is:			
pH Value	*Below 2.0*	*2.1-3.5*	*3.6-5.5*	*above 5.5*
	Lbs. of lime/1,000 sq. ft. to apply			
4.0-5.0	100	150	200	200*
5.1-5.5	100	125	150	200*
5.6-6.0	75	100	125	0
6.1-6.5	50	50	0	0
above 6.5	0	0	0	0

*Lime rates over 200 lbs./1,000 sq. ft. are not needed. The undesirable chemical condition is adequately corrected for grass by this rate, even if there isn't a major increase in pH.

It is important that lime be finely ground. Coarse lime dissolves so slowly that it is almost ineffective in neutralizing soil acidity. Lime that is ground fine enough that 90% passes through a U.S. Standard

REF G

No. 8 sieve and 20% through a U.S. Standard No. 100 mesh sieve is satisfactory. Apply the lime as far ahead of fertilizing and planting as possible. Work the lime thoroughly into the top 4 to 6 in. of soil. Several months are normally required for the lime to neutralize the soil acid. An alternative, but less satisfactory method, is to apply the lime just prior to fertilizing and planting.

Liming Established Lawns

Follow the same procedure for determining lime needs as given above. However, do not apply more than 50 lbs./1,000 sq. ft. in any one year on established lawns. The reason is that higher rates tend to "cake up" on the thatch. This results in a much reduced rate of solution of the lime and movement into the soil. Application is best made in late fall or early winter to take advantage of winter rain to dissolve and move the lime into the soil. Repeat the application annually until the amount indicated by the test has been applied.

If lime is applied to lawns having a thatch layer, the lime may persist for several years before it is completely dissolved. A good practice to help move the lime down into the soil is to use a standard hollow tined aerifier immediately before applying the lime. This allows some of the lime to get down into the root zone.

Prepared by Roy L. Goss, Professor of Agronomy, K. J. Morrison, Extension Agronomist, and A. R. Halvorson, Extension Soil Scientist, Washington State University, Pullman, Washington. Extension programs and employment are available to all without discrimination. Revised April 1982.

REF 9

FG-31 (Rev.), November 1974

WINTER WHEAT

(Irrigated)

for Central Washington

FRANKLIN COUNTY EXTENSION SERVICE
COURTHOUSE
PASCO, WASHINGTON 99301

25¢

These guidelines are based on relationships which have been established between WSU soil tests and yield responses. The suggested rates will be reasonably accurate for your field provided (1) the soil sample properly represents the area to be fertilized and (2) provided you filled in the information sheet which you sent with your sample.

Nitrogen (N)

This table gives N fertilizer rates for different crop residue situations. If the soil has not been tested for N, assume it has an N soil test index of 20, unless you have reason to believe, based on cropping and fertilizer history, that the residual N may be higher or lower.

Soil test N* (use the value nearest your test value)	New land, or after potatoes, sugar beets, corn for silage or wheat with straw removed**	After peas, beans, or alfalfa stubble	Alfalfa or other legume green manure plowed under
ppm N	*Rate of N to apply per acre*		
10	240	200	160
20	200	160	120
30	160	120	80
40	120	80	0
50	80	40	0
60	40	0	0

*For N, take samples to depth of rooting zone. See E.M. 3076.

**If stover from corn or straw from wheat is not incorporated before September 1, add 40 to 80 lbs. N to these rates, depending on amount of residue and time of incorporation. Larger amounts of residue and later incorporation require more N. For the most part, apply N for the crop in the spring, not for the residue in the fall. (It is suggested that wheat not follow wheat in the rotation because of possible disease problems.)

Date of seeding[1]	N to be shanked in or plowed under before seeding	N to be top-dressed[2] in January or February and not later than March 7
September (preirrigated)	no[3]	yes
October (preirrigated)	no	yes
November (preirrigated)	yes	no
February[4] (fall irrigated)	yes	no

[1]On soils testing above 30 ppm nitrate N, seed after October 15 to avoid excessive fall growth.

[2]Anhydrous or aqua ammonia should be shanked into the soil.

[3]If soil test is below 10, apply 40 lbs. N per acre during soil preparation. Subtract this amount from the total applied.

[4]Seed by February 15 to insure vernalization. After February 15, use spring wheat.

COOPERATIVE EXTENSION SERVICE • COLLEGE OF AGRICULTURE • WASHINGTON STATE UNIVERSITY • PULLMAN
In cooperation with the United States Department of Agriculture
Issued in furtherance of the Acts of May 8 and June 30, 1914, by the Washington State University
Cooperative Extension Service • O. Young, Director

REF G

Phosphorus (P) and Potassium (K)

If WSU soil test for P reads:	Apply this amount–lbs./acre	
ppm	*P**	*(P_2O_5)*
2	130	(295)
4	110	(250)
6	90	(204)
8	60	(136)
10	40	(68)
Above 10	0	(0)

If WSU soil test for K reads:	Apply this amount–lbs./acre	
ppm	*K**	*(K_2O)*
30	200	(240)
60	160	(192)
90	120	(144)
120	80	(96)
Above 120	0	(0)

Note: P and K test values are different from those used before July 1, 1969. P values are 50% and K values 60% of previous values.

*P and K are expressed here in the elemental form with the oxide form in parentheses. To convert P_2O_5 to P, multiply by .44. To convert K_2O to K, multiply by .83.

Zinc (Zn)

Zn deficiency may occur in rare instances. Where the soil test for Zn is below 0.8 or on new land where leveling has exposed limey subsoil, apply Zn fertilizer at a rate which will supply 10 lbs. of Zn per acre.

Sulfur (S)

There is no WSU soil test for S for irrigated areas. Areas irrigated with water from most of the major streams east of the Cascades will usually not require S because of the high S content in the water. Exceptions are the Roza district, areas above Yakima including the Kittitas Valley, and the Wenatchee Valley. Occasionally, on sandy soils and after heavy winter rainfall, S deficiency may appear even where S content of irrigation water is high.

If S is known to be deficient, apply S fertilizer at a rate which will supply 40 pounds of S per acre.

GENERAL COMMENTS

Nitrogen

On soils subject to leaching, N can be applied through sprinkler systems. Do not use aqua or anhydrous ammonia in sprinkler systems.

Phosphorus and Potassium

Follow a practice of resampling once in a crop rotation, or at least every 3 years.

REF G

Zinc

This can be applied as zinc sulfate or there are a number of other materials containing Zn which are equally effective. Use soil applications only.

Fall applications of P, K, and Zn are effective.

Other Elements

Other than N, P, K, S, and Zn, research has not shown a need for additional fertilizer materials for wheat in central Washington. Even when the soil test shows low B values, B fertilizers have not given yield responses. *The practice of applying mixes of various elements "for insurance" is not recommended.*

Prepared by A. I. Dow, Extension soil scientist, in cooperation with S. Roberts, associate soil scientist, and A. R. Halvorson, Extension soil scientist, all of Washington State University, Pullman, Washington.

REF G

FG-34 (Reprint), February 1975

DRY LAND WHEAT NITROGEN NEEDS

(With Moisture & Nitrate Tests)

for Eastern Washington

The procedure for determining nitrogen (N) fertilizer needs from a soil moisture and nitrate test is as follows:

- Obtain potential yield value from moisture supply data.
- Determine total N needs from potential yield value.
- Inventory the soil N supply.
- Calculate the N fertilizer rate to be applied.

A._____ bu.
Potential yield

Potential Yield: The first 4 inches of available water is used to grow the plant. Each additional inch of water with recommended soft white winter wheat varieties produces about 7 bu.; hard red winter and club wheat varieties produce about 6 bu./inch. Your potential yield is calculated by inserting the expected rainfall (see Note 1) and moisture data* from the moisture nitrate test into the following equation:

Yield = (7 bu.) X (rainfall expected + available soil water – 4)

_____ bu. = (7) X (_____ + _____ –4)
yield rainfall soil water

*When soils are supersaturated (water standing on surface) follow instructions in Note 2.

B._____ lb./acre
Crop needs

Total N Needed: Recommended varieties of soft white winter wheats require about 2.7 lbs. of N per bu. of grain; hard red wheats use about 3.0 lbs. N/bu. Compute total N needs by the following example for soft wheats:

_____ lb./acre = (_____ bu./acre) X (2.7 lbs./bu.)
N needed Item A

C._____ lb./acre
Soil supply

Soil N Inventory: The soil N available for grain production is the sum of expected N release from all sources minus anticipated N tie-up by straw decomposition. Use the procedure below to inventory your soil N supply.

1.	Soil test N (NO_3)	_____
2.	Expected release from organic matter, legumes, chemically bound NH_4; etc. (See Note 3.)	_____ *(add)*
	Total	_____
3.	Straw decomposition tie-up (See Note 4.)	_____ *(subtract)*
4.	Total available Soil N	_____

REF G

D. _____ *N to apply*

Calculated N Application Rate Needed: The difference between total N needed (item B) minus available soil inventory N (item C) is the fertilizer N to apply. Use the procedure below to compute your application rate.

1.	Total N needs (B)	_____
2.	Less available soil N (C)	_____ *(subtract)*
3.	N to apply	_____

Note 1. Average Rainfall Expected During Growing Season:

Rainfall Zone	Feb.	Mar. *inches/year*	Apr.	May	June
Less than 10 in.	1.0	.8	.7	.6	.7
10-13	1.3	1.0	.9	.7	.8
14-17	1.9	1.5	1.4	1.3	1.2
18-20	2.1	2.2	1.5	1.4	1.2
Above 20	2.4	2.3	1.7	1.6	1.4

Note 2. Saturated Soils:

Samples for moisture nitrate tests are frequently obtained in wet weather before excess water has drained from the profile. Using moisture data from excessively wet soils invalidates potential yield calculations (item A). In your calculations do not use moisture values above those listed below. *Larger Available Moisture Values Should Not Be Used For These Soils In Potential Yield Calculations.*

Soil	Available Water *inches/ft.*	Total Available Water in 6 Feet *inches*
Palouse Silt Loam	2.1	12.6
Athena Silt Loam	2.1	12.6
Walla Walla Silt Loam	1.6	9.6
Ritzville Silt Loam	1.5	9.0
Ritzville Loam	1.3	7.8
Ritzville Fine Sandy Loam	1.1	6.6

Note 3. Sources of Soil N

N not detectable by the soil nitrate test becomes available to the crop as the growing season progresses from the following sources. *The sum of all the N released from the following sources is used as item C-2.*

a) Soil organic matter release

(1) In areas with minimal erosion, or a history of high N fertilizer use, growing season N (lb./acre) release = (3.5) X (average annual rainfall).

(2) With moderate erosion (lb./acre) release = (3.0) X (average annual rainfall).

(3) Severely eroded areas (lb./acre) release = (2.0) X (average annual rainfall).

/REF G

b) Legumes as a preceding crop

(1) Peas, yielding over 2,000 lbs./acre . . . . . 20 lbs. N/acre

(2) Peas, yielding less than 2,000 lbs./acre . . . . . 15 lbs. N/acre

(3) Alfalfa hay . . . . . 15 lbs. N/acre

c) Ammonia nitrification. N fertilizers applied as anhydrous ammonia or ammonium compounds (aqua, solution 32, etc.) must undergo nitrification before they can be detected by soil nitrate tests. Applications after September 1 remain for the most part in the ammonium form. Applied fertilizer N not detected by soil tests should be added here as non-nitrified available N.

Note 4. Straw Decomposition N Tie-Up:

Bacteria require N for normal growth during straw decomposition activity. When grain yields are above average, straw yields and, subsequently, N tie-up during decomposition will be above average. Subtract 1 lb./acre available N for each bu./acre wheat yield produced in the previous crop above the following regional average yields:

Rainfall Area–inches	Yield–bu./acre
18-20	65
16-18	50
14-16	45
12-14	35

(subtract as item C-3)

Less than 12–additional straw is seldom produced.

Prepared by C. F. Engle, Extension Soil Scientist, F. E. Koehler, Agronomist, K. J. Morrison, Extension Agronomist, and A. R. Halvorson, Extension Soil Scientist, Washington State University, Pullman, Washington.

D. STANLEY & ASSOCIATES
CONSULTING ENGINEERS

CONSTRUCTION INSPECTION REPORT

PROJECT _____ DATE _____

INSPECTOR _____ REPORT NO. _____

DIVISION OF WORK _____

COPIES TO: ( ) OWNER ( ) CONTRACTOR _____

11/11 Begin pump #4 @ 11:30 AM. Pumping 3520 Gpm at 2:10 PM w/ 6" Drawdown. Well cont. 12 hr. test. #3 down 40' by mid. P.M.

11/13 Drilling #3 Water at 50'

11/14 Fin. #3 Down 81' water at 49.

11/19 Perf. 20' complete. 53' to 73'. Plussed. Ready for testing.

11/20 Lee K. & ADS relocated well #2 approx 600' east and 50' north of original location. Cont. moving in p.m.

11/22 Well #2 down 40'. Ran thro metal at 25'

11/26 Water at 58'. Black sand layer 10' thick. Water Strata 70'-76'. Will go on down.

12/2 Plussed. Surging. Perf 10' to align w/ gravel strata. Lee, Hurl, Jim Hayles inspect.

D. STANLEY & [illegible]

Well Drilling - Airport

10/10 Move in equipment on Well #4

10/21 Begin work. Haulin pipe, etc. Set-up.

10/23 Drilling. Down 32 feet. Mostly sandy loam.

10/25 Hit water at 63'. Static at 59'. Casing down 72' at quitting time. Strata looks good. Will proceed to approx 100' thru.

10/29 At 102'. Agreed to plug & develop. Strata looks good. Plan to test 11/5 & move to new hole.

10/31 Not at site. In office agreed that 25' perf needed.

11/4 Surging & developing. Test on Wed 11/6

11/5 Moved to Well #3. Ready to test #3

11/8 Test equipment broken down (2:30 P.M.) Plan to run approx 5-5 hrs. Welder on well #3 down. Not much progress.

. D. STANLEY & ASSOCIATES
CONSULTING ENGINEERS

CONSTRUCTION INSPECTION REPORT

PROJECT _____ DATE _____

INSPECTOR _____ REPORT NO. _____

DIVISION OF WORK _____

COPIES TO: ( ) OWNER ( ) CONTRACTOR ( )

11/5 Fin. Well #2. Move to #1 18' [illegible] Looks O.K. Test #2 11/6

11/6 Test well #2. 2610 gpm at peak. Ret at 2200. Cleared up fast. Good Test.

11/9 Drilled to 63'. Ready for Perf. Aggreed to 36' to 56' (10' addn.)

11/11 Developing & surging

11/16 Pump Test at 1105 gpm max. Got water Sample.

Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Permit No. G3-[illegible]

(1) OWNER: Name City of Pasco #1 Address

(2) LOCATION OF WELL: County Franklin NW NW Sec. 14 T. 1 N. R. 35 W.M.
Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☒ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)
New well ☒ Deepened ☐ Reconditioned ☐
Method: Dug ☐ Bored ☐ Cable ☒ Driven ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 16 inches.
Drilled 104-5 ft. Depth of completed well 104-5 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 16" Diam. from +1 ft. to 78 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type Stainless Model No.
Diam. 16 Slot size .250 from 80 ft. to 101 ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 55 ft. below top of well Date 5-18-78
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
SAND - BLACK, 3" minus gravel	0	32
SAND - BLACK - 2-3" gravel COARSE	32	40
SAND - BLACK - 8" minus gravel 4 1/2°	40	71
SAND - FINE TAN, Ringold, 2-6" gravel	71	81
SAND - FINE TAN, 2-6" gravel some cemented chunks 4 1/2° slow	81	106
SAND - FINE TAN, 2-3" gravel CLAY TRACES, 4 1/2° SHUTOFF	106	110
CLAY - Brown, OCC. 2" gravel	110	112
Screen measurements		
K packer 4' blank		
20' 7" screen		
3' pump sump		

Work started 5-1 1978 Completed 5-18 1978

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Nelson Well Drilling Inc. (Person, firm, or corporation) (Type or print)
Address 10036 W. ARGENT PASCO WA
[Signed] Bruce L. Williams (Well Driller)
License No. 0659 Date 5-22 1978

(USE ADDITIONAL SHEETS IF NECESSARY)

F. No. 7356—OS—(Rev. 4-71)
CY-070-28

The Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. .....
Permit No. .....

(1) OWNER: Name City of Pasco #2 Address .....

(2) LOCATION OF WELL: County ..... — ..... ¼ ..... ¼ Sec. ..... T. ..... N., R. ..... W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☒ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) .....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 16 inches.
Drilled 121-6 ft. Depth of completed well 121-6 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 16" Diam. from +1 ft. to 103 ft.
Threaded ☐ ..." Diam. from ..... ft. to ..... ft.
Welded ☐ ..." Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☒
Type of perforator used .....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type Pipe Model No. .....
Diam. 14 Slot size 250 from 104 ft. to 119 ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal Cement
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ..... Depth of strata .....
Method of sealing strata off .....

(7) PUMP: Manufacturer's Name .....
Type: ..... H.P. .....

(8) WATER LEVELS: Land-surface elevation above mean sea level ..... ft.
Static level 77 ft. below top of well Date 7-15-80
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? .....
Yield: ..... gal./min. with ..... ft. drawdown after ..... hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test .....
Bailer test ..... gal./min. with ..... ft. drawdown after ..... hrs.
Artesian flow ..... g.p.m. Date .....
Temperature of water ..... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
SAND, SILTY TAN	0	28
SAND, BLACK COARSE SOME 2" GRAVEL	28	63
GRAVEL 6" MINUS - BLACK SAND COARSE	63	78
GRAVEL 4" MINUS, FINE TAN SAND - ROUNDED	78	81
GRAVEL 6 MINUS FINE SAND SILTY	81	96
GRAVEL 6 MINUS FINE TAN SAND SILT SANDS	96	98
GRAVEL 4-6 MINUS FINE SAND	98	120
Screen 16" Bank to Bottom 15.8 240 Screen 3' Bottom		

Work started 7-7 19 80 Completed 7-21 19 80

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Nelson Well Drilling Inc (Person, firm, or corporation) (Type or print)

Address 10036 W. Argent Pasco

[Signed] Bruce L. Williams (Well Driller)

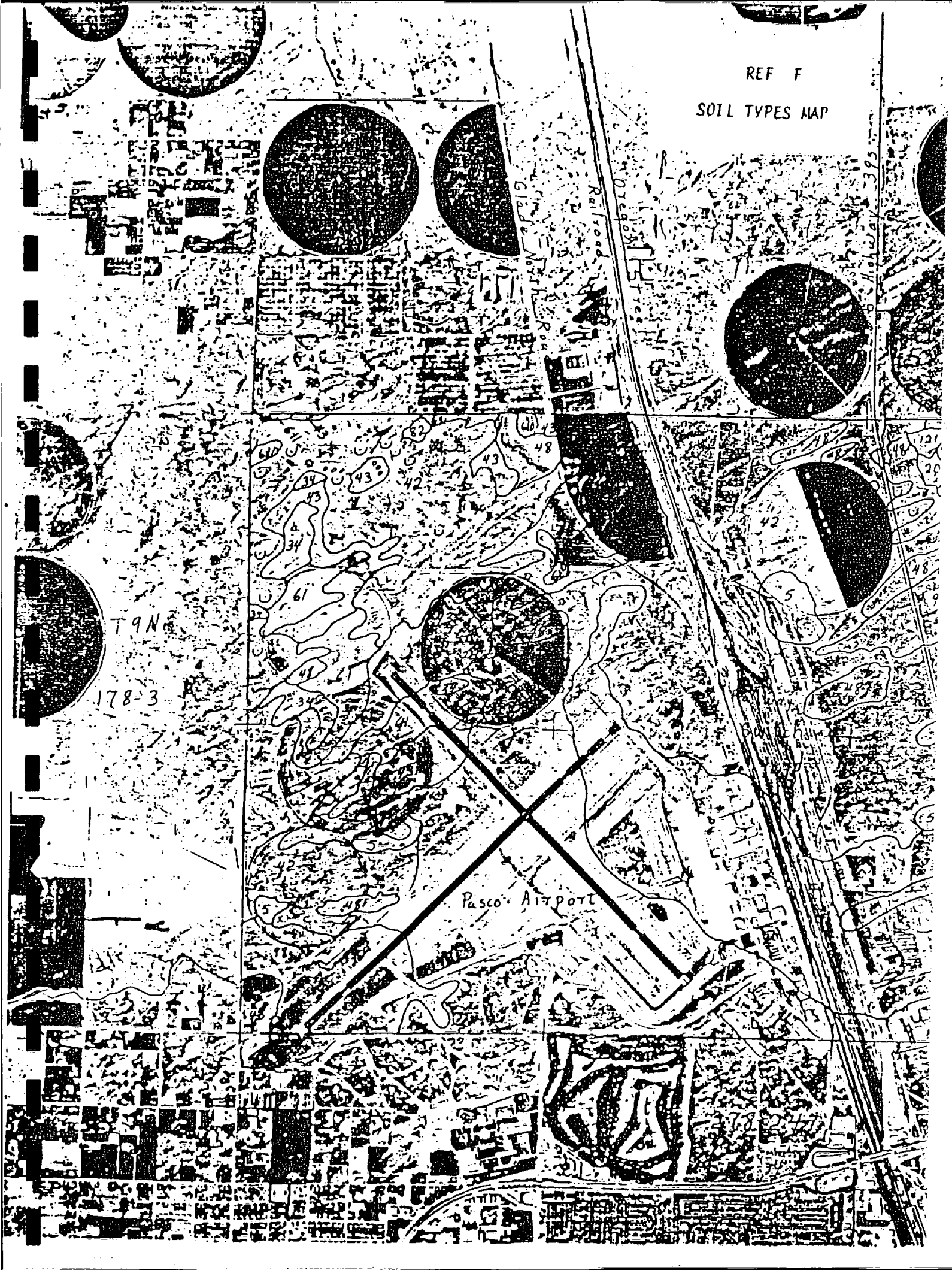
License No. CX659 Date 7-15, 1980

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7356—OS—(Rev. 4-71)
ECY-070-28

REF F

SOIL TYPES MAP



FG-0004 Revised August 1979

IRRIGATED PASTURE

for Central Washington

Irrigated Pasture for Central Washington

These guidelines are based on extensive research from which relationships have been established between WSU soil tests[1] and yield responses. The suggested rates will be reasonably accurate for your field provided (1) the soil samples properly represent the area to be fertilized and (2) you filled in the information sheet which you sent with your sample.

Nitrogen (N)

N requirement for irrigated pastures varies a great deal. In legume or grass-legume pastures, little or no N is needed except where the amount of grass is more than 50%. In pure-grass pastures, N requirement depends greatly on potential production of forage which, in turn, depends upon:

1. Age, density, and purity of stand.

2. Species. Orchardgrass and tall fescue (Fawn fescue) are the two most productive grasses. Use only recommended varieties for your area.

3. Location or length of growing season. The frost-free seasons of areas within the Yakima, Okanogan, and Walla Walla Valleys, and the Columbia Basin and Horse Heaven areas range from 130 to 200 days. Other areas such as the Kittitas Valley, parts of Klickitat County, and the deep-well areas of eastern Adams and adjacent Lincoln County are generally less than 130 days and may contain areas with less than 100 days.

4. Management factors such as irrigation, pest control, grazing management, inoculation of legumes, etc. (not included in the table).

Established Stands:

Species	Condition of Stand	Length of Season	N lbs/acre
Alfalfa	poor	any	0
Alfalfa	good, pure stand	any	0
Alfalfa-grass	<50% grass	any	0
Alfalfa-grass	>50% grass	any	60-120
Grass, low yielding	poor	short	20-60
Grass, high yielding	poor	short	40-80
Grass, low yielding	good	short	60-100
Grass, high yielding	good	short	140-200
Grass, low yielding	poor	long	40-80
Grass, high yielding	poor	long	80-120
Grass, low yielding	good	long	100-180
Grass, high yielding	good	long	240-300

[1]Some private labs are using WSU testing procedures. For information regarding private labs, consult with your local Extension office.

Surface-apply the N in three equal amounts—early spring, about June 1, and about August 15.

Efficiency of N utilization is closely related to irrigation management. Under sprinkler irrigation, much of the N can be applied through the sprinkler system throughout the season.

Avoid excessive irrigation. No more than 10% of the water applied should move beyond the root zone, except in saline soils.

New Stands: Apply 40 lbs N/acre at the time of seedbed preparation.

Phosphorus (P) and Potassium (K)

If WSU soil test reads (use the value nearest your test value): *ppm of Phosphorus (P)*	Apply this amount—lbs/acre (adjust rate up or down depending on your actual test value): *P**	*(P_2O_5)*
2	130	(295)
4	90	(204)
6	70	(159)
8	50	(114)
10	30	(68)
More than 10	0	(0)
ppm of Potassium (K)	*K**	*(K_2O)*
30	200	(240)
60	160	(192)
90	120	(144)
120	80	(96)
More than 120	0	(0)

*Phosphorus and potassium are expressed here in the elemental form with the oxide form in parentheses. To convert P_2O_5 to P, multiply by .44. To convert K_2O to K, multiply by .83.

If possible, apply several years' supply of P and K at the time of establishment of the pasture. Broadcast the fertilizers and plow under before seeding. However, these materials can be applied on the surface in the established stands.

Fall applications of P and K are effective.

Sulfur (S)

Soil test S is not a reliable indicator of fertilizer S requirement in irrigated soils. Areas irrigated with water from most of the major streams east of the Cascades will not require S because of the high S content in the water. Exceptions are the Roza District, areas above Yakima including the Kittitas Valley, and the Wenatchee Valley. S content of well water may or may not be sufficient to supply crop needs. Water from any new source should be tested for S and other constituents. S deficiency can be determined by tissue analysis. Even where water is high in S, deficiencies can occur on sandy soils, especially in the spring after a winter of above normal rainfall.

If S is known to be deficient, apply S fertilizer at a rate which will supply 40 lbs S/acre.

Zinc (Zn)

Zn deficiency may occur in rare instances. Where the soil test for Zn is below 0.8, on new land, or where leveling has exposed limey subsoil, apply Zn fertilizer at a rate which will supply 10 lbs Zn/acre.

Boron (B)

If the soil test index for B is less than 0.5, apply a B fertilizer at a rate which will supply 3 lbs B/acre. B is toxic to plants in excessive amounts. Do not apply more than 3 lbs/acre. The B requirement is much higher for alfalfa and clover than for grasses.

Salinity (expressed as mmhos/cm)

Soil salinity (total soluble salts) is determined on all irrigated central Washington soil samples sent to WSU. A salt reading of 3 or 4 may indicate a salinity problem and further tests should be made. Alfalfa, clover, and orchardgrass will tolerate salinity levels up to 3 or 4. Alta (tall) fescue will tolerate levels to 6 or 8. If a problem exists, refer to EM 2435, *Managing Saline Soils in the Columbia Basin*, or consult with your county Extension agent.

GENERAL COMMENTS

Other elements: Other than N, P, K, S, Zn, and B, research has not shown a need for additional fertilizer materials for pasture in central Washington. The practice of applying mixes of various elements "for insurance" is not recommended. Also, overuse of fertilizers can cause buildup of salts or nitrates. Use the soil test to determine whether or not these are accumulating.

Important: Fertilizers are of little value where other factors are limiting. For high yields follow good management practices regarding irrigation, pest control, grazing, etc.

Prepared by A. I. Dow, R. Parker, W. W. Heinemann, D. W. Evans, and A. R. Halvorson; all of Washington State University

FERTILIZER GUIDE FG-36, April 1970

IRRIGATED SUDAN GRASS PASTURE OR SILAGE

for Central Washington

These guidelines are based on relationships which have been established between WSU soil tests and yield responses. The suggested rates will be reasonably accurate for your field provided (1) the soil sample properly represents the area to be fertilized and (2) provided you filled in the information sheet which you sent with your sample.

Nitrogen (N)

Seeding Date	Apply N per acre (lbs.)
1st week in May	160
1st week in June	100
1st week in July	60
1st week in August	40

Plow under or shank in all fertilizer before seeding

Phosphorus (P) and Potassium (K)

If WSU soil test reads (use the value nearest your test value):	Apply this amount– lbs./acre (adjust rate up or down depending on your actual test value)	
ppm of Phosphorus (P)	*P**	*(P_2O_5)*
2	130	(295)
4	90	(204)
6	70	(159)
8	50	(114)
10	30	(68)
More than 10	0	(0)
ppm of Potassium (K)	*K**	*(K_2O)*
30	200	(240)
60	160	(192)
90	120	(144)
120	80	(96)
More than 120	0	(0)

Note: P and K test values are different from those used before July 1, 1969. P values are 50% and K values 60% of previous values.

*Phosphorus and potassium are expressed here in the elemental form with the oxide form in parentheses. To convert P_2O_5 to P, multiply by .44. To convert K_2O to K, multiply by .83.

COOPERATIVE EXTENSION SERVICE • COLLEGE OF AGRICULTURE • WASHINGTON STATE UNIVERSITY • PULLMAN
In cooperation with the United States Department of Agriculture
Issued in furtherance of the Acts of May 8 and June 30, 1914, by the Washington State University
Cooperative Extension Service, John P. Miller, Director

REF G

Using the current application rate and applying those numbers to the predominant soil, type 42, which the soil conservation service has combined with 43, Ref.H, we arrive at the following:

$$\frac{900 \text{ gal} \times 12 \text{ in./ft.}}{9 \text{ ft.} \times 500 \text{ ft} \times 7.48 \text{ gal/ft.}^3} = .321 \text{ in.}$$

Therefore, the current application is equivalent to 0.321 inches of liquid sludge on the area covered. Applying this to quincy loamy fine sand (soil type 43), Ref. H., the predominant airport soil type as indicated in Ref. F, we arrive at the following:

Soil type 43, Ref. H., has a minimum water holding capacity of 0.11 inches per inch for the 0 to 4 inches depth and 0.06 inches per inch for the 4 to 60 inch depth range. Therefore, the maximum depth the sludge liquid would penetrate the soil excluding evaporation would be:

$$\frac{0.321 \text{ in}}{0.11 \text{ in/in}} = 2.92 \text{ inches}$$

Stated another way, a 1/3 inch application of sludge would be held in the top 3 inches of soil in the worst possible case. The lowest available water capacity of any soil at the airport is 0.05 in./in. The 0.05 in./in. capacity soil is located at the 15-60 inch depth of soil type #98 and the 21-60 inch depth in soil type #34. From the previous calculations it is shown the liquid would not reach the 0.05 in./in. capacity soil with the current 1/3 inch application rate.

The minimum soil permeability from Ref. H., is 6 inches per hour. Excluding evaporation and the water retention of the sludge solids the .321 inch sludge application will be totally absorbed below the surface in a maximum of:

$$\frac{.321 \text{ in.} \times 60 \text{ min/hr.}}{6 \text{ in./hr.} \times .06 \text{ in./in.}} = 53.5 \text{ minutes}$$

Ref. H., also points out several other soil parameters that are of concern when considering a sluge utilization site. The shrink-swell potential for all airport soils is low as would be expected in the case of sand. This means that when soil is wetted it will not swell, sealing itself to further water penetration. The per cent clay and organic matter is very low. This is substantiated by the permeability which is high. The pH is also high, which in turn ties up the metals so that they become less critical with respect to food chain crops.

at a 240 pounds of available nitrogen per acre application rate.

By applying the sludge to circle #5 and assuming it is available for sludge application 75% of the time because of the crop situation we would be applying,

$$\frac{49.74}{65} \times .75 \times 240 \text{ or } 138 \text{ pounds}$$

of available nitrogen per acre per year, or, 58% (138/240) of the minimum required nitrogen to circle #5.

As stated in Refs. C and D, the controlling factor is the nitrogen application rate vs the removal rate (plant uptake rate). Considering the fact that the application rate is less the 60% of the minimum removal rate the project would fall well within paragraph 4.11 of Ref. D, precluding most site monitoring. Utilization sites do not require the level of concern for environmental pollution that disposal sites do.

During the 25% of the time that sludge could not be put on the #5 circle we would have the option of going to another circle, experimenting with non-agricultural areas of the airport, or utilizing one of the proposed project back-ups. The experimental plots will be well documented so that successful test plots could be duplicated in conserving and stabilizing the airport surface soil. These experiments would ultimately lead to improving the asthetics of the airport. The goal of these experiments, from conservation and argricultural points of view is to create a demand for sludge. This has been accomplished in other localities and is ultimately reflected in the system user fees.

Using the previously determined 138 pounds of available nitrogen application per acre per year we can relate this back to the metals application which are a concern. The 138 pounds of nitrogen per acre per year was determined by applying 75% of the sludge to 65 acres. Using Ref. I and the above evaluations the cadium application is as follows:

$$\frac{1,300,000 \text{ gal/x } .75}{65 \text{ acres}} \times 8.34 \text{ lb/gal} \times .0000004 = .050 \text{ lb/acre/yr.}$$

From Table II Ref. D the total cadium loading limit in soil with 5-15 meq/100/g application exchange capacity and a pH greater than 6.5, which are substantiated by Ref. J, is 8.9 pounds per acres. Or 8.9 lbs/acre divided by .050 lbs/acre/yr. = 178 years before the cadium loading limit would be reached.

Utilizing the same procedure for zinc:

$$\frac{1,300,000 \text{ gal/yr. x } .75}{65 \text{ acres}} \times 8.34 \text{ lb/gal} \times .00007373 =$$

9.224 lbs/acre/yr.

$$\frac{445 \text{ lbs/acre}}{9.224 \text{ lbs/acre/yr.}} = 48 \text{ years}$$

Considering the Central Washington soils are deficient in zinc to the point where zinc is added to fertilizer for some crops, the 48 year zinc loading limit could be considered conservative.

The previous analysis of the soil physical characteristics versus the liquid application shows that the sludge soil penetration stays well above any ground water and probably stays well within the root zone of the vegetation, particularly the native vegetation.

Ref. E is copies of and a summary of the well drilling reports for well numbers 2, 3, 4, and 5 at the airport and well numbers 1 and 2 at the golf course. The well locations are shown on Ref. N. Circle #5 is supplied by well #1. Ref. E shows that first water was encountered at 50 feet or more. Ref. H states that high water table is at a depth of greater than 6 feet. The ground water flow is in a south southwesterly direction through the airport area.

A majority of the airport area is fenced and it is posted in addition to security patrols and observation from the control tower providing more than sufficient access control to the sludge application areas. Ref. K depicts the areas to which sludge will be applied. The location of sludge utilization signs is shown in Ref. L.

The City will handle complaints and problems with respect to the sludge utilization project at the airport.

Paragraph 1.11 of Ref. C states that the jurisdictional health department should not allow variances with the local solid waste management plan when permitting sludge utilization projects. This being the case, there is no reason for the City of Pasco to go to the Benton-Franklin Governmental Conference for compliance with their Solid Waste Management Plan, unless there are variances to the Plan requested by the City.

./

REF A

APPLICATION FOR SLUDGE UTILIZATION PROJECT(S)

PART I - GENERAL INFORMATION

A. APPLICANT FOR SITE

Name: CITY OF PASCO

Address: P.O BOX 293, PASCO, WA. 99301 Phone: (509) 545-3468

Owner of Site: PORT OF PASCO

Address: 3601 N 20TH, PASCO, WA, 99301 Phone: (509) 547-6352

B. GENERATOR OF SLUDGE

Name: CITY OF PASCO.

Address: P.O. BOX 293 PASCO, WA 99301

Contact Person: HAROLD POSTHUMA Phone: (509) 545-3468

C. SITE LOCATION(S)

Street, road, or location description: PASCO AIR PORT

3601 NORTH 20TH, PASCO, WA.

Legal description: Section 7, 12, 13, 18, 24 Township 9N Range 29E + 30E

A site map must be submitted with the completed application. Copy of a Metsker map or a hand-drawn map to scale is acceptable. Maps should show the size by acres, location of streams, and drainages, if any, and the actual area(s) that will receive sludge.

PART II - CHARACTERISTICS

A. SLUDGE CHARACTERISTICS

Describe the type of sludge to be applied (i.e., lagoon, clarifier). Include a description of the basic process involved in the origin of the sludge and a description of pre-treatment and/or the sludge stabilization process. Include all chemicals, if any, utilized in the treatment process.

ANAEROBICLY DIGESTED SLUDGE, APPROXIMATELY 60 DAY RETENTION TIME AT 98°F AND MECHANICALLY MIXED. SLUDGE IS SUBSEQUENTLY HELD FOR APPROXIMATELY 60 DAYS IN SECONDARY DIGESTER. NO CHEMICALS ARE ADDED TO THE SLUDGE.

Attach a copy of the most recent (within the past 12 months) chemical analysis of a sludge sample that suitably represents the sludge proposed for land application. The analysis should include the following parameters:

pH, % Solids, Total Nitrogen - N, Ammonia Nitrogen - NH4-N, Nitrate Nitrogen - NO3-N, Inorganic N, Total Phosphorus, Total Potassium, Cadmium, Copper, Lead, Nickel, Zinc.

B. SITE CHARACTERISTICS

Briefly describe the past and present use of the utilization site in terms of silviculture, crops, pasture, etc. Also, the intended future use of the site.

A PORTION OF THE SITE IS CURRENTLY UTILIZED FOR HAY PRODUCTION. BALANCE OF SITE NOT COMMERICALLY FARMED. THIS PORTION WOULD BE USED FOR SLUDGE APPLICATION FOR SOIL STABILIZATION TO EVENTUALLY SUPPORT A GRASS TYPE CROP FOR STABILIZATION AND AESTHETIC PURPOSES.

Attach a copy of a soil analysis or information that suitably represents the utilization site. The analysis or information should include the following parameters:

pH, Total Nitrogen, Total Phosphorus, Cadmium, Zinc, and Cation Exchange Capacity.

Part II (Continued)

Existing known soil information may be used or assistance may be obtained from the local soil conservation service or county extension agent. Soil analysis may not be necessary for sites receiving light or one-time application of sludge far below the crop fertilization requirements.

Briefly describe the type of agricultural activity planned, crops to be grown, method and frequency of sludge application, method of harvest, and use of the crops. Crops grown for human consumption may need more protection from disease vectors and heavy metals contained in the sludge.

OUTSIDE OF THE EXISTING HAY PRODUCTION THE BALANCE OF THE SITE WOULD BE A GRASS FOR SOIL STABILIZATION AND ASTHETIC PURPOSES. SLUDGE WOULD BE SURFACE APPLIED AT LESS THAN THE AGRONOMIC RATE

PART III - OPERATION AND ADMINISTRATION

APPLICATION RATE

Calculate the total annual volume in tons, yards, or gallons per year to be applied at the utilization site, including the application rate based on sludge analysis, crop fertilization needs, and soil deficiencies. The Washington State Department of Ecology has published Guidelines (WDOE 82-11) and Best Management Practices (WDOE 82-12) to assist in developing environmentally sound utilization practices.

1,440,000 GALLONS PER YEAR OF THE ATTACHED ANALYSIS SLUDGE TO BE APPLIED PER YEAR TO THE SITE

PUBLIC ACCESS

Describe how the general public will be protected from this activity.

AREA IS FENCED AND POSTED

MONITORING

Describe how the application rates will be followed and the site will be managed consistent with the issued permit.

TRUCK APPLICATION SPEED TO BE DETERMINED TO ATTAIN A A PERCENT OF AGRONOMIC RATE THAT WILL EQUALLY DISTRIBUTE SLUDGE OVER THE AREA ON AN ANNUAL BASIS

D. RECORDS

List records, if any, that will be maintained.

AMOUNT OF SLUDGE REMOVED FROM PLANT ON A DAILY BASIS RECORDED ON PLANT MONITORING REPORT

E. TRANSPORTATION

Describe how the sludge will be transported (type of truck, haul routes, storage, etc.).

TANK TRUCK FROM PLANT TO AIRPORT, MOST ECONOMICAL ROUTE CONSISTANT WITH TRUCK TRAFFIC

F. OTHER REQUIREMENTS

As deemed necessary by each jurisdictional health department, additional requirements or concerns may be added to this application form.

G. H G Posthuma

Person preparing this form sign here

Date

Property owner sign here

Date

3-18-87

REF B

Harold Posthuma
Waste Water Superintendent
City of Pasco
P.O. Box 293
Pasco, WA 99301

Dear Harold:

Pursuant to you March 11, 1987, application for a sludge utilization project, this department has reviewed the documentation submitted. Washington Department of Ecology (WDOE) publication 82-11 is the primary guidance document in such projects and in referring to it we find many unanswered or inadequate answers to the following questions/concerns:

1. Provide a clarified site map. Indicate on the map in contrasting colors or shading exactly what areas are to receive sludge applications, and when, i.e. lay out of application pattern on map by month, quarter, etc.

2. What is the depth to ground water at the site in the first aquifer? To determine this, either existing wells or well logs can be used. Provide at least two values, on upstream and one downstream in the ground water plume. Irrigation wells are deeply drilled and generally not the first aquifer, hence not acceptable as indicative of that ground water aquifer.

3. Designate the ground water flow direction on the site map.

4. Indicate where signs will be placed noting the area is a "sewage sludge utilization project."

5. Describe how access is to be controlled. If sludge truck can access area, so can the public.

6. How many acres are available to receive sludge, and what crop is being grown on them? Will it be disced in? If not, explain why.

7. Provide a soil analysis of the acreage in item 6 above noting the following parameters:

pH =
Total Nitrogen =
Total Phosphorus =
Cadmium =
Zinc =
Cation Exchange Capacity =

With the above information (and the sludge analysis provided), you can then calculate the application rate per acre for the crop involved. Show all calculations.

8. Read and address item 4.12 on page 11 in WDOE 82-11. Have your city attorney develop a contrast between the landowners (Port of Pasco) and the generator/hauler/applicator (City of Pasco).

9. What provision is there for severe winter weather when access is not possible, i.e., on-site storage, drying beds., etc.?

10. Who will handle/mitigate complaints/problems from the public that may result from this project? Will the public be informed that the city plans this project?

11. Since this is not a one time project but a long term solution, the local Solid Waste Management Plan should address the subject. Gary Karnofski at the Benton-Franklin Governmental Conference is the point of contact. It would be advisable to submit an environmental checklist along with the responses to the above questions. Your city planner should be able to assist with this.

The soil information is to general to be useful. We would suggest you contact the local Soil Conservation Service (SCS) office in Pasco and have a qualified soil scientist inspect the actual site of application. They can provide you with more detailed information on limitations of the site and can identify areas of soils that differ from those delineated on a standard soils map such as that which you included.

The above questions/concerns when developed will constitute a site "design and operation plan." The above points stand out as needing answers but all the points in WDOE 82-11 should be addressed.

L. D. Kamberg, R.S.

REF. E

Summary of the attached well drilling reports is as follows:

AIRPORT

Well #2	Hit Water At	58'
Well #3	Hit Water At	50'
Well #4	Hit Water At	63'
Well #5	Hit Water At	85'

GOLF COURSE

Well #1	Hit Water At	81'
Well #2	Static Level	77'

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. .....
Permit No. G-[illegible]

(1) OWNER: Name Port of Pasco Address P.O. Box 709 Pasco WA 99301

(2) LOCATION OF WELL: County Benton — NW ¼ SE ¼ Sec. 24 T. 9 N., R. 29 W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) 5
New well ☐ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well [illegible] inches.
Drilled [illegible] ft. Depth of completed well [illegible] ft.

(6) CONSTRUCTION DETAILS:

Casing installed: [illegible]" Diam. from +1 ft. to 60 ft.
Threaded ☐ 10" Diam. from 60 ft. to 70 ft.
Welded ☐ ..... " Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☐
Type of perforator used .....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes ☐ No ☐
Manufacturer's Name Johnson
Type stainless Model No. 304
Diam. 10 Slot size 80 from 70 ft. to 100 ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes ☐ No ☐ Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes ☐ No ☐ To what depth? 44 ft.
Material used in seal bentonite
Did any strata contain unusable water? Yes ☐ No ☐
Type of water? ..... Depth of strata .....
Method of sealing strata off .....

(7) PUMP: Manufacturer's Name Berkeley
Type: submersible turbine H.P. 50

(8) WATER LEVELS: Land-surface elevation above mean sea level .... ft.
Static level 62 ft. below top of well Date 2/4/86
Artesian pressure ..... lbs. per square inch Date .....
Artesian water is controlled by ..... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom? [illegible]
Yield: [illegible] gal./min. with [illegible] ft. drawdown after [illegible] hrs.
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test .....
Bailer test ..... gal./min. with ..... ft. drawdown after ..... hrs.
Artesian flow ..... g.p.m. Date .....
Temperature of water ..... Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Sand black coarse	6	[illegible]
Sand black, coarse w gravel	[illegible]	44
Sandstone, tan hard (Ringold formation)	44	57
Basalt boulder	57	63
Sandstone coarse very hard (ringold formation)	63	74
Basalt boulder	74	76
Sandstone hard (Ringold)	76	85
Sandstone w gravel seams w water	85	90
Sandstone soft	90	113
Sand w water	113	116
Clay brown soft	116	117
12" drive shoe utilized		

Work started 11/26, 1985 Completed 12/24, 1985

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME [illegible] DRILLING & DEVELOPMENT INC (Person, firm, or corporation) (Type or print)

Address [illegible] 6010 Broadway Spokane WA 99212

[Signed] [signature] (Well Driller)
W. Joseph Close Jr.

License No. 1040 Date 12/24, 1985

(USE ADDITIONAL SHEETS IF NECESSARY)

CV 050-1-20

NORTHWEST
Agricultural Consultants
2545 West Falls · Kennewick, Washington 99336
(509) 783-7450

Date Received and/or Sampled: April 2, 1987

Report No: 2722-1-Addendum 7k

Grower:

Sampler:

Last Year's Crop: 19 ____

Fertilizer: 19 ____

Harold G. Posthuma
City of Pasco
P.O. Box 293
Pasco, WA 99301

Field No. ____ Field Name ____ Crop To Be Grown 19 ____ Yield Goal ____

SOIL CHEMICAL ANALYSES

DEPTH FOOT	SOIL MOISTURE % of Field Capacity	SOIL MOISTURE Available Inches	NO3 PPM	NITROGEN NO3 lbs per Acre	NITROGEN NH4 lbs per Acre	Sulfur S PPM	pH	Organic Matter Percent	Phosphorus P (Lbs)	Potassium K (Lbs)	Calcium Ca (meq per 100 grams)	Magnesium Mg (meq per 100 grams)	Total Bases (meq per 100 grams)	Soluble Salts mmhos/cm	Effervescence with acid
1															
2															
3															
4															
5															
6															
Total															

MINOR ELEMENT ANALYSES

Depth Foot	Boron B	Zinc Zn	Manganese Mn	Copper Cu	Iron Fe	Cation Exchange Capacity (meq per 100 grams)	Sodium Na	Percent Base Saturation
	(Parts per million PPM)							
1								
2								

Estimated Nitrogen Release from Organic Matter

Estimated Total Nitrogen Available to Crop

Soil Series and Type ____ Average Annual Rainfall ____

Previous Crop ____ Irrigated ____ Sprinkler ____ Pull ____ Other ____

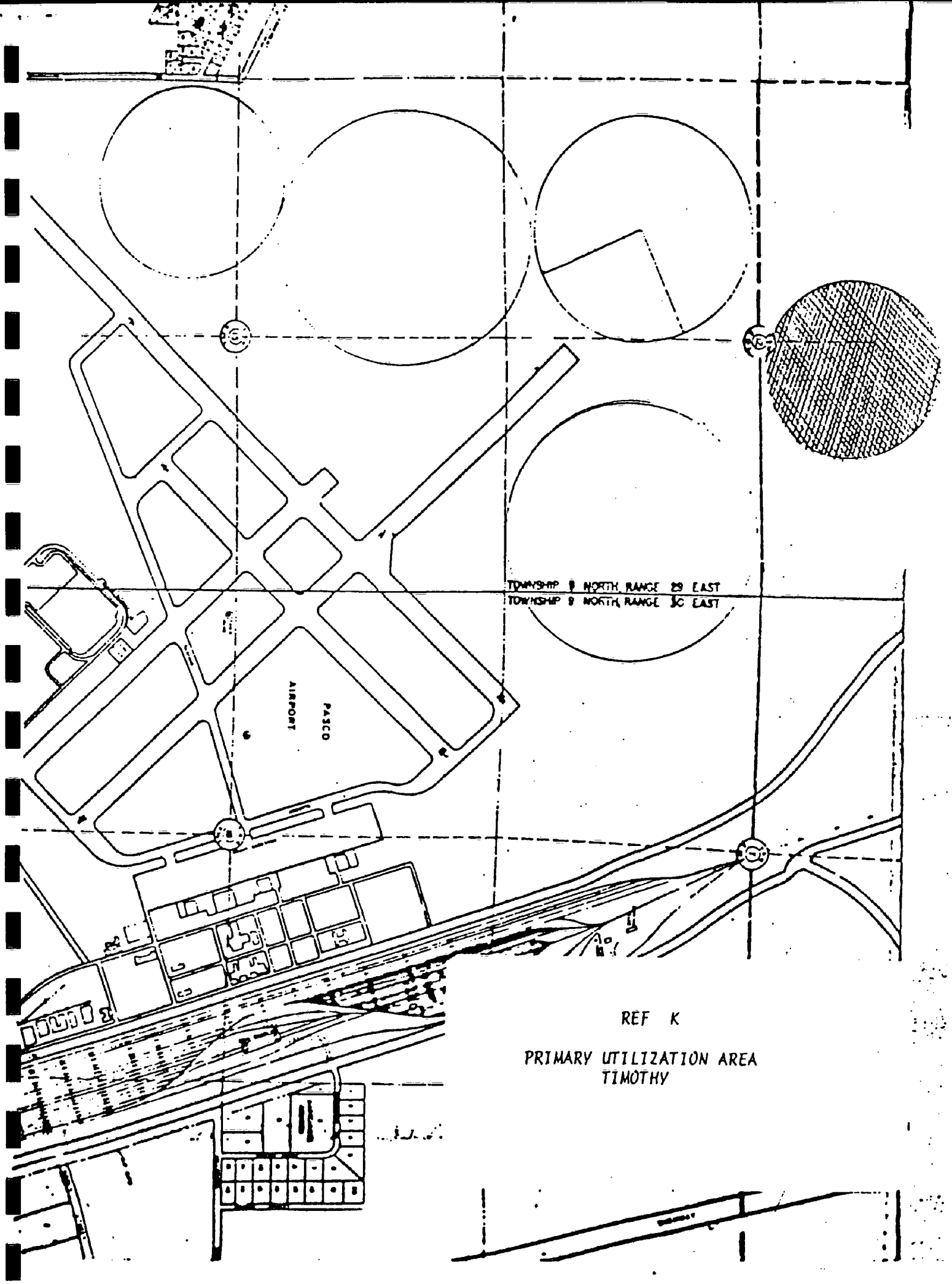
Comments and Recommendations:

Following are the results for Cadmium analyses on the soil samples you submitted to us:

SAMPLE ID.	ANALYSIS	LEVEL FOUND	DET. LIMIT	METHOD
1	Cadmium	Less than 0.50 mg/kg *	0.50 mg/kg	Flame AA
2	"	Less than 0.50 mg/kg	0.50 mg/kg	"
3	"	Less than 0.50 mg/kg	0.50 mg/kg	"
4	"	Less than 0.50 mg/kg	0.50 mg/kg	"
5	"	Less than 0.50 mg/kg	0.50 mg/kg	"
6	"	Less than 0.50 mg/kg	0.50 mg/kg	"
7	"	Less than 0.50 mg/kg	0.50 mg/kg	"

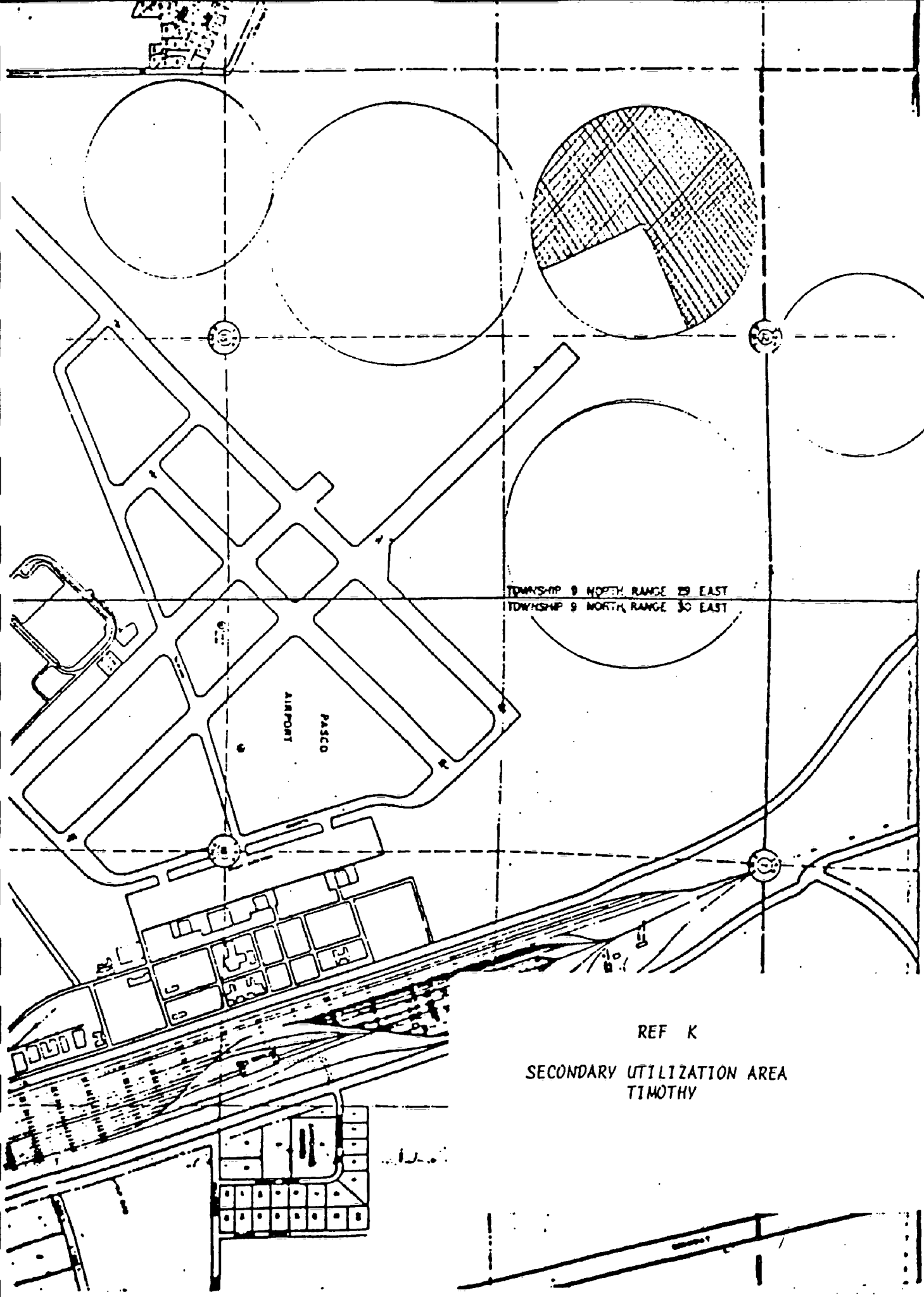
* .5 parts per million

Mark Wahlenmaier
Agricultural Consultant



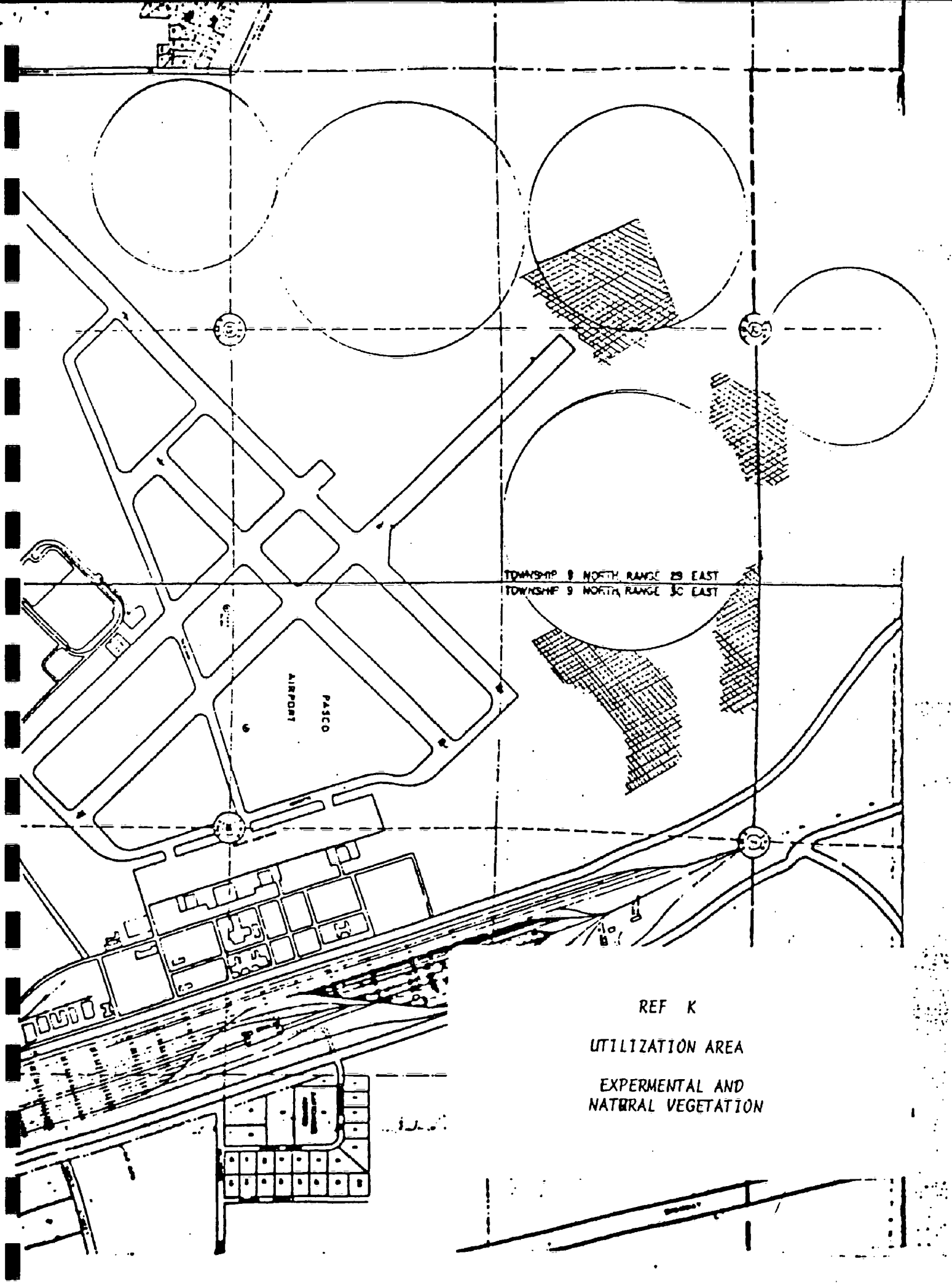
REF K

PRIMARY UTILIZATION AREA
TIMOTHY



REF K

SECONDARY UTILIZATION AREA
TIMOTHY



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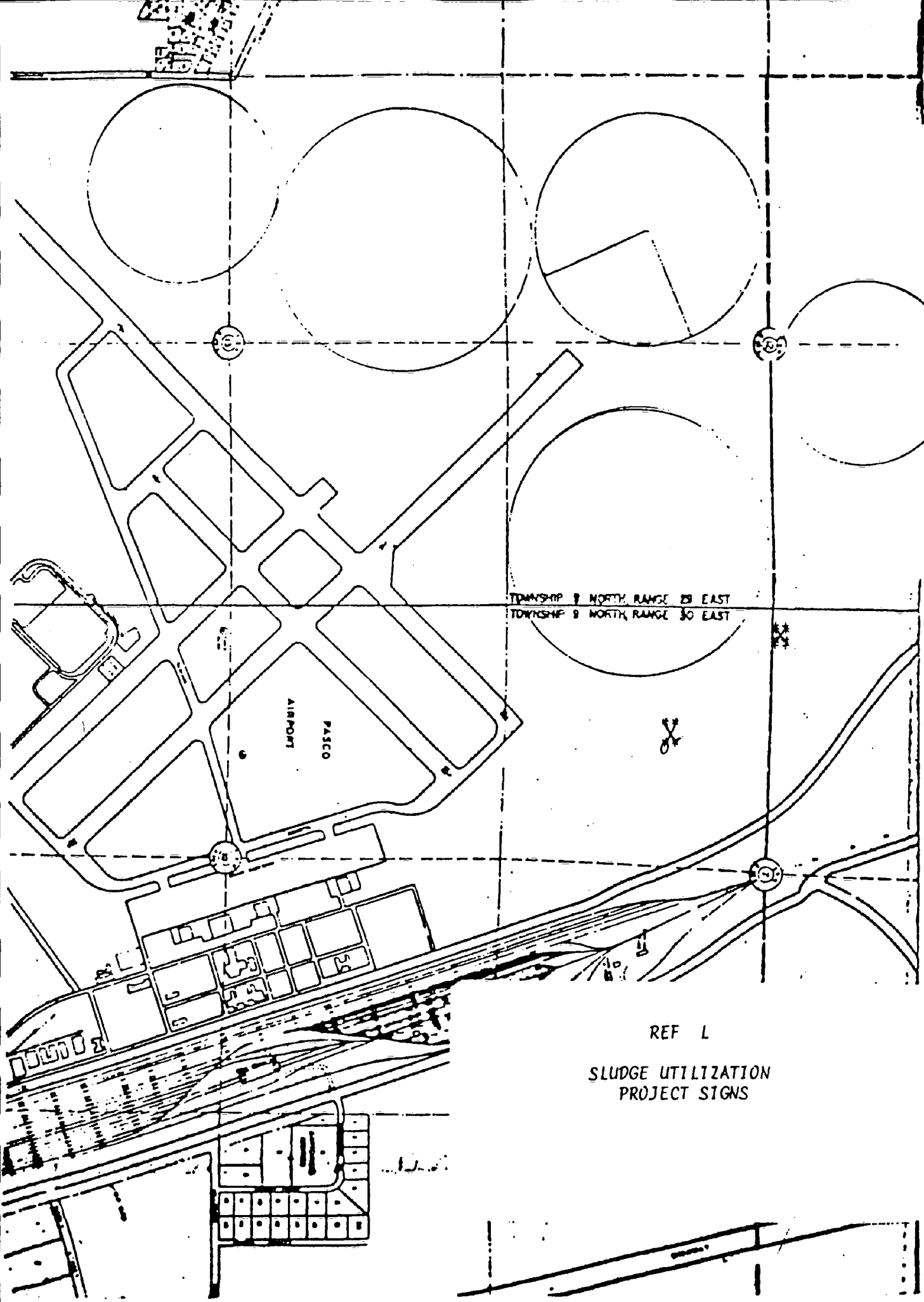
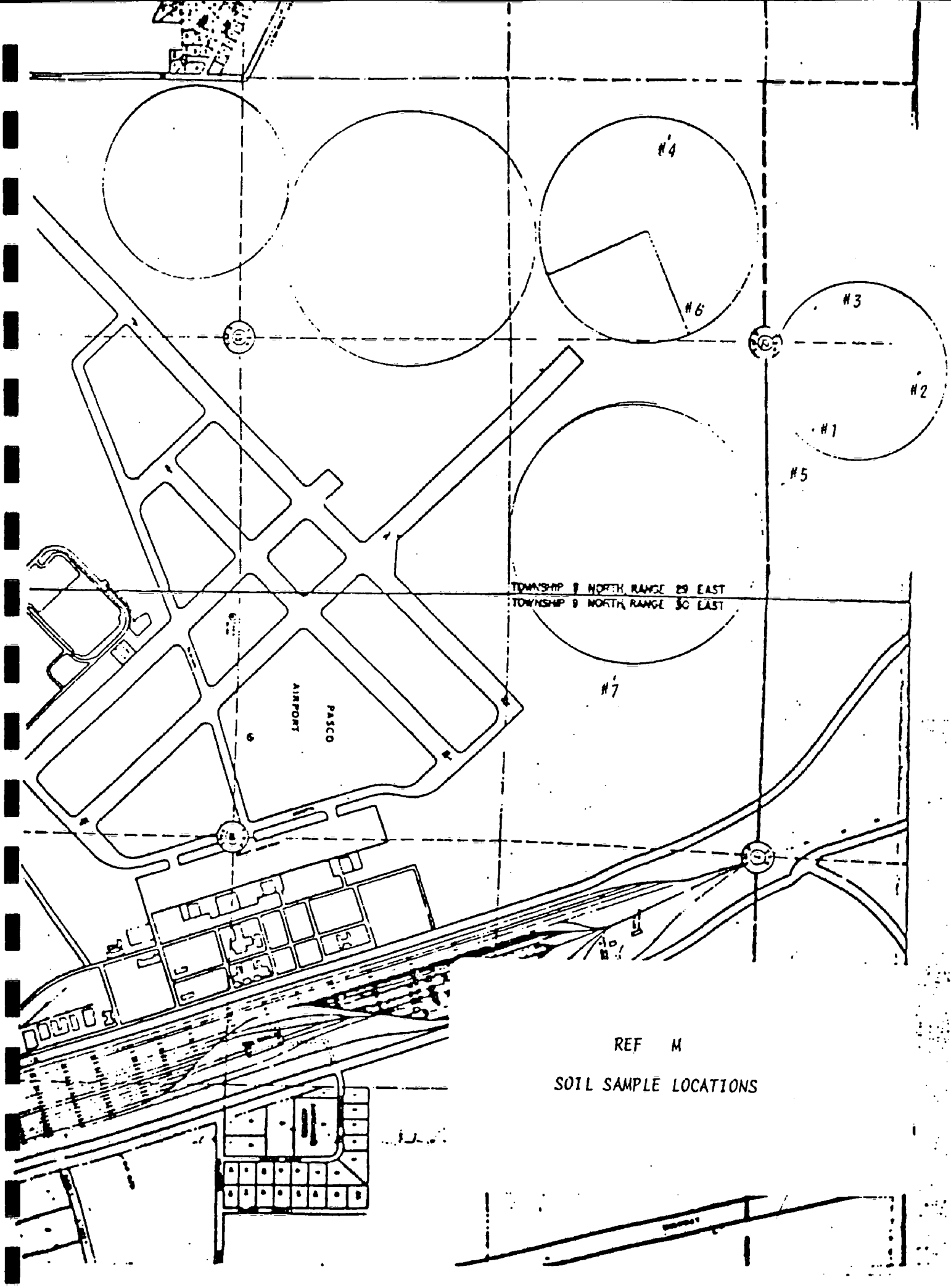
UTILIZATION AREA

EXPERMENTAL AND
NATURAL VEGETATION



REF L

SLUDGE UTILIZATION
PROJECT SIGNS



REF M

SOIL SAMPLE LOCATIONS

SOIL INTERPRETATIONS RECORD

34 NOVARK SILT LOAM, 2 TO 5 PERCENT SLOPES IeA

THE NOVARK SERIES CONSISTS OF DEEP WELL DRAINED SOILS FORMED IN WIND MODIFIED ALLUVIUM AND GLACIAL-FLUVIAL SEDIMENTS ON TERRACES. THE VEGETATION IS MAINLY GRASSES AND SHRUBS. MAP IS 6 TO 9 INCHES, MAAT IS ABOUT 52F AND THE FFS IS 150 TO 210 DAYS. TYPICALLY, THE SURFACE LAYER IS LIGHT BROWNISH GRAY SILT LOAM 5 INCHES THICK. THE SUBSOIL IS PALE BROWN VERY FINE SANDY LOAM 12 INCHES THICK. THE SUBSTRATUM IS LIGHT GRAY AND WHITE SILT LOAM 4 INCHES THICK OVER FINE SAND TO A DEPTH OF 60 INCHES OR MORE.

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT 3 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	LIQUID LIMIT	PLASTICITY INDEX
0-5	SIL	ML	A-4	0-5	95-100	95-100	90-100	70-85	-	NP
5-17	SIL, VFSL	ML	A-4	0-5	95-100	95-100	90-100	75-85	-	NP
17-21	SIL, VFSL	ML	A-4	0-5	95-100	90-100	85-95	75-85	-	NP
21-60	FS, S, COS	SM, SP-SM	A-3, A-2	0-5	95-100	90-100	50-70	5-15	-	NP

DEPTH (IN.)	CLAY (PCT)	MOIST BULK DENSITY (G/CM3)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	T	WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY STEEL	CONCRETE
0-5	5-10	1.15-1.35	0.6-2.0	0.16-0.20	7.4-8.4	-	LOW	.43	5	5	1-3	HIGH	LOW
5-17	5-10	1.30-1.50	0.6-2.0	0.16-0.20	7.4-8.4	-	LOW	.49					
17-21	5-10	1.30-1.50	0.6-2.0	0.16-0.20	7.9-8.4	<2	LOW	.49					
21-60	0-5	1.45-1.65	>20	0.05-0.07	7.9-8.4	<2	LOW	.10					

FLOODING FREQUENCY	DURATION (MONTHS)	HIGH WATER TABLE DEPTH (FT)	KIND	MONTHS	CEMENTED PAN DEPTH (IN)	HARDNESS	BEDROCK DEPTH (IN)	HARDNESS	SUBSIDENCE INIT. (IN)	TOTAL (IN)	HYD GRP	POTENTIAL FROST ACTION
NONE		>6.0			-		>60		-		B	HIGH

SANITARY FACILITIES

SEPTIC TANK ABSORPTION FIELDS	SEVERE-POOR FILTER
SEWAGE LAGOON AREAS	SEVERE-SEEPAGE
SANITARY LANDFILL (TRENCH)	SEVERE-TOO SANDY
SANITARY LANDFILL (AREA)	SLIGHT
DAILY COVER FOR LANDFILL	POOR-SEEPAGE,TOO SANDY

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	SEVERE-CUTBANKS CAVE
DWELLINGS WITHOUT BASEMENTS	SLIGHT
DWELLINGS WITH BASEMENTS	SLIGHT
SMALL COMMERCIAL BUILDINGS	SLIGHT
LOCAL ROADS AND STREETS	SEVERE-FROST ACTION
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	SLIGHT

CONSTRUCTION MATERIAL

ROADFILL	GOOD
SAND	PROBABLE
GRAVEL	IMPROBABLE-TOO SANDY
TOPSOIL	FAIR-SMALL STONES,THIN LAYER

WATER MANAGEMENT

POND RESERVOIR AREA	SEVERE-SEEPAGE
EMBANKMENTS DIKES AND LEVEES	SEVERE-SEEPAGE,PIPING
EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DRAINAGE	DEEP TO WATER
IRRIGATION	SLOPE,ERODES EASILY
TERRACES AND DIVERSIONS	ERODES EASILY,TOO SANDY
GRASSED WATERWAYS	TOO ARID,ERODES EASILY

REF H

RECREATIONAL DEVELOPMENT

CAMP AREAS	MODERATE-DUSTY	PLAYGROUNDS	MODERATE-SLOPE,DUSTY
PICNIC AREAS	MODERATE-DUSTY	PATHS AND TRAILS	SEVERE-ERODES EASILY

CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)

CAPABILITY		ALFALFA HAY (TONS)		BEANS, OTHER DRY (BU)		PASTURE (AUM)		PEAS, DRY (LBS)		POTATOES, IRISH (CWT)		SUGAR BEETS (TONS)		WHEAT, WINTER (BU)	
NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.	NIRR	IRR.
6E	2E		8		40		14		2800		540		28		110

WOODLAND SUITABILITY

ORD SYM	MANAGEMENT PROBLEMS: EROS'N HAZARD	EQUIP. LIMIT	SEEDL. MORT'Y	WINDTH HAZARD	PLANT COMPET	POTENTIAL PRODUCTIVITY: COMMON TREES	SITE INDX	PROD CLAS	TREES TO PLANT
						NONE			

WINDBREAKS

SPECIES	HT	SPECIES	HT	SPECIES	HT	SPECIES	HT
AUSTRIAN PINE	40	GREEN ASH	50	LILAC	15	RUSSIAN-OLIVE	30
PEKING COTONEASTER	5	HONEYSUCKLE	10	ROCKY MT. JUNIPER	20	SIBERIAN PEASHRUB	15
BLUE SPRUCE	20	LOMBARDY POPLAR	65	NORTHERN WHITE-CEDAR	28	GOLDEN WILLOW	35

WILDLIFE HABITAT SUITABILITY

POTENTIAL FOR HABITAT ELEMENTS: GRAIN & SEED	GRASS & LEGUME	WILD HERB.	HARDWD TREES	CONIFER PLANTS	SHRUBS	WETLAND PLANTS	SHALLOW WATER	POTENTIAL AS HABITAT FOR: OPENLD WILDLF	WOODLD WILDLF	WETLAND WILDLF	RANGELD WILDLF
GOOD	GOOD	GOOD	GOOD	GOOD	GOOD	POOR	V. POOR	GOOD	-	V. POOR	-

POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST UNDERSTORY VEGETATION)

COMMON PLANT NAME	PLANT SYMBOL (NLSPN)	PERCENTAGE COMPOSITION (DRY WEIGHT)				
BLUEBUNCH WHEATGRASS	AGSP					
SANDBERG BLUEGRASS	POSE					
BIG SAGEBRUSH	ARTR2					
OTHER PERENNIAL FORBS	PPFF					
OTHER PERENNIAL GRASSES	PPGG					
OTHER SHRUBS	SSSS					
OTHER ANNUAL GRASSES	AAGG					
GE OLEANDTHREAD	STCO4					
BALSAMROOT	BALSA					
HAWKSBEARD	CREPI					
BISCUITROOT	LOMAT					
RABBITBRUSH	CHRYS9					

POTENTIAL PRODUCTION (LBS./AC. DRY WT):					
FAVORABLE YEARS					
NORMAL YEARS					
UNFAVORABLE YEARS					

FOOTNOTES

1 EXCESSIVE PERMEABILITY RATE MAY CAUSE POLLUTION OF GROUND WATER.

REF H

SOIL INTERPRETATIONS RECORD

43 QUINCY LOAMY FINE SAND, 0 TO 15 PERCENT SLOPES IRR.

THE QUINCY SERIES CONSISTS OF VERY DEEP, EXCESSIVELY DRAINED SOILS FORMED IN EOLIAN SAND. THE PARENT MATERIALS ARE GRANITIC, QUARTZITIC, AND BASALTIC SAND. THESE NEARLY LEVEL TO STEEP SOILS HAVE RIDGED, HUMMOCKY, DUNELIKE RELIEF. VEGETATION IS GRASS. MAAT IS 52F. MAP IS 6 TO 12 INCHES. FFS IS 100 TO 190 DAYS. TYPICALLY, THE PROFILE IS A GRAYISH-BROWN LOAMY FINE SAND THAT EXTENDS TO 60 INCHES OR MORE.

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT >3 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	LIQUID LIMIT	PLASTICITY INDEX
0-4	LFS	SM	A-2	0	100	100	65-100	15-30	-	NP
4-60	LFS, FS, S	SM	A-2	0	100	100	65-80	10-30	-	NP

DEPTH (IN.)	CLAY (PCT)	MOIST BULK DENSITY (G/CM3)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	T	WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY STEEL	CONCRETE
0-4	1-6	1.20-1.45	6.0-20	0.11-0.15	6.1-8.4	-	LOW	.17	5	2	.5-1	HIGH	LOW
4-60	1-7	1.45-1.60	6.0-20	0.06-0.09	6.6-8.4	<2	LOW	.17					

FLOODING FREQUENCY	DURATION	MONTHS	HIGH WATER TABLE DEPTH (FT)	KIND	MONTHS	CEMENTED PAN DEPTH (IN)	HARDNESS	BEDROCK DEPTH (IN)	HARDNESS	SUBSIDENCE INIT. (IN)	TOTAL (IN)	HYD GRP	POTENTIAL FROST ACTION
NONE			>6.0			-		>60		-		A	LOW

SANITARY FACILITIES

SEPTIC TANK ABSORPTION FIELDS	SEVERE-POOR FILTER
SEWAGE LAGOON AREAS	SEVERE-SEEPAGE,SLOPE
SANITARY LANDFILL (TRENCH)	SEVERE-TOO SANDY
SANITARY LANDFILL (AREA)	SLIGHT
DAILY COVER FOR LANDFILL	POOR-TOO SANDY

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	SEVERE-CUTBANKS CAVE
DWELLINGS WITHOUT BASEMENTS	SLIGHT
DWELLINGS WITH BASEMENTS	SLIGHT
SMALL COMMERCIAL BUILDINGS	MODERATE-SLOPE
LOCAL ROADS AND STREETS	SLIGHT
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	MODERATE-DROUGHTY

CONSTRUCTION MATERIAL

ROADFILL	GOOD
SAND	IMPROBABLE-EXCESS FINES
GRAVEL	IMPROBABLE-EXCESS FINES
TOPSOIL	POOR-TOO SANDY

WATER MANAGEMENT

POND RESERVOIR AREA	SEVERE-SEEPAGE
EMBANKMENTS DIKES AND LEVEES	SEVERE-SEEPAGE,PIPING
EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DRAINAGE	DEEP TO WATER
IRRIGATION	SLOPE,DROUGHTY,FAST INTAKE
TERRACES AND DIVERSIONS	TOO SANDY,SOIL BLOWING
GRASSED WATERWAYS	TOO ARID,DROUGHTY

REF H

RECREATIONAL DEVELOPMENT

CAMP AREAS	MODERATE-TOO SANDY	PLAYGROUNDS	SEVERE-SLOPE
PICNIC AREAS	MODERATE-TOO SANDY	PATHS AND TRAILS	MODERATE-TOO SANDY

CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)

	CAPABILITY		WHEAT, WINTER (BU)		ALFALFA HAY (TONS)		PASTURE (AUM)		POTATOES, IRISH (CWT)		ALFALFA SEED (LBS)		CORN (BU)		APPLES (BU)	
	IRR	IRR	IRR		IRR	IRR	IRR	IRR	IRR	IRR	IRR	IRR	IRR	IRR	IRR	IRR
	7E	4E		100		7.0		15		500				130		630

WOODLAND SUITABILITY

ORD SYM	EROS HAZARD	EQUIP. LIMIT	SEEDL. MORTY	WIND HAZARD	PLANT COMPET	POTENTIAL PRODUCTIVITY COMMON TREES	SITE INDX	PROD CLASS	TREES TO PLANT
						NONE			

WINDBREAKS

SPECIES	HT	SPECIES	HT	SPECIES	HT	SPECIES	HT
LOMBARDY POPLAR	65	AUSTRIAN PINE	40	PECKING COTONEASTER	15	SIBERIAN PEASHRUB	15
RUSSIAN-OLIVE	30	LILAC	20	GOLDEN WILLOW	35	HONEYSUCKLE	10
GREEN ASH	50	BLUE SPRUCE	20	NORTHERN WHITE-CEDAR	25	ROCKY MT. JUNIPER	20

WILDLIFE HABITAT SUITABILITY

POTENTIAL FOR HABITAT ELEMENTS								POTENTIAL AS HABITAT FOR:			
GRAIN & SEED	GRASS & LEGUME	WILD HERB.	HARDWD TREES	CONIFER PLANTS	SHRUBS	WETLAND PLANTS	SHALLOW WATER	OPEN LD WILDLF	WOODLD WILDLF	WETLAND WILDLF	RANGELD WILDLF
FAIR	FAIR	FAIR	FAIR	FAIR	FAIR	IV. POOR	IV. POOR	FAIR	-	IV. POOR	-

POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST UNDERSTORY VEGETATION)

COMMON PLANT NAME	PLANT SYMBOL (NLSPN)	PERCENTAGE COMPOSITION (DRY WEIGHT)				
INDIAN RICEGRASS	ORHY					
NEEDLEANDTHREAD	STCOR					
SANDBERG BLUEGRASS	POSE					
THICKSPIKE WHEATGRASS	AGDA					
SAND DROPSEED	SPCR					
OTHER PERENNIAL GRASSES	PPGG					
THURBER NEEDLEGRASS	STTH2					
PENSTEMON	PENST					
OTHER PERENNIAL FORBS	PPFF					
BIG SAGEBRUSH	ARTR2					
BASIN BIG SAGEBRUSH	ARTRT*					
ANTELOPE BITTERBRUSH	PUTR2					
GRAY RABBITBRUSH	CHNA2					
GRAY HORSEBRUSH	TECA2					
OTHER SHRUBS	SSSS					
POTENTIAL PRODUCTION (LBS./AC. DRY WT):						
FAVORABLE YEARS						
NORMAL YEARS						
UNFAVORABLE YEARS						

FOOTNOTES

REF H

SOIL INTERPRETATIONS RECORD

48 QUINCY LOAMY FINE SAND, LOAMY SUBSTRATUM, 0 TO 10 CENT SLOPES IRR

QUINCY LOAMY SUBSTATUM CONSISTS OF VERY DEEP SOMEWHAT EXCESSIVELY DRAINED SOILS FORMED IN GLACIOLACUSTRINE DEPOSITS ON TERRACES. VEGETATION IS GRASSES AND SHRUBS. MAAT IS 52 DEGREES F., MAP IS 6 TO 9 INCHES. FFS IS 170 TO 200 DAYS. TYPICALLY, THE SURFACE LAYER AND UNDERLYING MATERIAL IS GRAYISH BROWN LOAMY FINE SAND ABOUT 49 INCHES THICK. THE LOWER MATERIAL IS LIGHT GRAY STRATIFIED SILT LOAM AND LOAMY FINE SAND TO 60 INCHES OR MORE.

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT >3 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	LIQUID LIMIT	PLASTICITY INDEX
0-3	LFS	SM	A-2	0	95-100	95-100	80-95	10-30	-	NP
3-49	LFS	SM	A-2	0	95-100	95-100	80-95	20-30	-	NP
49-60	SR-SIL-LFS	ML, SM	A-4, A-2	0	95-100	95-100	85-100	25-60	20-30	NP-5

DEPTH (IN.)	CLAY (PCT)	MOIST BULK DENSITY (G/CM3)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	T	WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY STEEL	CONCRETE
0-3	0-7	1.25-1.45	6.0-20	0.09-0.11	6.6-8.4	-	LOW	.17	5	2	1-2	HIGH	LOW
3-49	1-7	1.30-1.50	6.0-20	0.08-0.11	6.6-8.4	-	LOW	.17					
49-60	5-10	1.50-1.70	0.6-2.0	0.16-0.18	7.9-9.0	<2	LOW	.43					

FLOODING FREQUENCY	DURATION (MONTHS)	HIGH WATER TABLE DEPTH (FT)	KIND	MONTHS	CEMENTED PAN DEPTH (IN)	HARDNESS	BEDROCK DEPTH (IN)	HARDNESS	SUBSIDENCE INIT. (IN)	TOTAL (IN)	HYD GRP	POTENTIAL FROST ACTION
NONE		>6.0			-		>60		-		A	LOW

SANITARY FACILITIES

SEPTIC TANK ABSORPTION FIELDS	SEVERE-POOR FILTER
SEWAGE LAGOON AREAS	SEVERE-SEEPAGE
SANITARY LANDFILL (TRENCH)	MODERATE-TOO SANDY
SANITARY LANDFILL (AREA)	SLIGHT
DAILY COVER FOR LANDFILL	FAIR-TOO SANDY

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	SEVERE-CUTBANKS CAVE
DWELLINGS WITHOUT BASEMENTS	SLIGHT
DWELLINGS WITH BASEMENTS	SLIGHT
SMALL COMMERCIAL BUILDINGS	MODERATE-SLOPE
LOCAL ROADS AND STREETS	SLIGHT
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	MODERATE-DROUGHTY

CONSTRUCTION MATERIAL

ROADFILL	GOOD
SAND	IMPROBABLE-EXCESS FINES
GRAVEL	IMPROBABLE-EXCESS FINES
TOPSOIL	FAIR-TOO SANDY

WATER MANAGEMENT

POND RESERVOIR AREA	SEVERE-SEEPAGE
EMBANKMENTS DIKES AND LEVEES	SEVERE-PIPING
EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DRAINAGE	DEEP TO WATER
IRRIGATION	SLOPE,DROUGHTY,FAST INTAKE
TERRACES AND DIVERSIONS	SOIL BLOWING
GRASSED WATERWAYS	TOO ARID,DROUGHTY

REF H

RECREATIONAL DEVELOPMENT

CAMP AREAS	MODERATE-TOO SANDY	PLAYGROUNDS	MODERATE-SLOPE,TOO SANDY
PICNIC AREAS	MODERATE-TOO SANDY	PATHS AND TRAILS	MODERATE-TOO SANDY

CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)

CAPABILITY IRR.	CAPABILITY IRR.	WHEAT, WINTER (BU) IRR	WHEAT, WINTER (BU) IRR.	ALFALFA HAY (TONS) IRR	ALFALFA HAY (TONS) IRR.	PASTURE (AUM) IRR	PASTURE (AUM) IRR.	POTATOES, IRISH (CWT) IRR	POTATOES, IRISH (CWT) IRR.	CORN (BU) IRR	CORN (BU) IRR.	IRR	IRR.	IRR	IRR.
7E	4E		100		8		15		520		130				

WOODLAND SUITABILITY

DRO SYM	EROS HAZARD	EQUIP. LIMIT	SEEDL. MORTY	WINDTH HAZARD	PLANT COMP	POTENTIAL PRODUCTIVITY COMMON TREES	SITE INDX	PROD CLAS	TREES TO PLANT
						NONE			

WINDBREAKS

SPECIES	HT	SPECIES	HT	SPECIES	HT	SPECIES	HT
PEKING COTONEASTER	5	SIBERIAN PEA SHRUB	5	LILAC	5	ROCKY MT. JUNIPER	20
BLUE SPRUCE	20	RUSSIAN-OLIVE	30	GOLDEN WILLOW	35	SCOTCH PINE	40
AUSTRIAN PINE	40	PONDEROSA PINE	40	BLACK LOCUST	50	LOMBARDY POPLAR	70

WILDLIFE HABITAT SUITABILITY

POTENTIAL FOR HABITAT ELEMENTS: GRAIN & SEED	GRASS & LEGUME	WILD HERB.	HARDWD TREES	CONIFER PLANTS	SHRUBS	WETLAND PLANTS	SHALLOW WATER	POTENTIAL AS HABITAT FOR: OPENLD WILDLF	WOODLD WILDLF	WETLAND WILDLF	RANGELD WILDLF
FAIR	FAIR	FAIR	FAIR	FAIR	FAIR	V. POOR	V. POOR	FAIR	-	V. POOR	-

POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST UNDERSTORY VEGETATION)

COMMON PLANT NAME	PLANT SYMBOL (NLSPN)	PERCENTAGE COMPOSITION (DRY WEIGHT)				
NEEDLEANDTHREAD	STCO4					
SANDBERG BLUEGRASS	POSE					
BIG SAGEBRUSH	ARTR2					
THICKSPIKE WHEATGRASS	AGDA					
OTHER PERENNIAL GRASSES	PPGG					
ANTELOPE BITTERBRUSH	PUTR2					
OTHER SHRUBS	SSSS					
INDIAN RICEGRASS	ORHY					
OTHER PERENNIAL FORBS	PPFF					
POTENTIAL PRODUCTION (LBS./AC. DRY WT):						
FAVORABLE YEARS						
NORMAL YEARS						
UNFAVORABLE YEARS						

FOOTNOTES

REF H

SOIL INTERPRETATIONS RECORD

61 ROYAL LOAMY FINE SAND, 0 TO 10 PERCENT SLOPES JRR

ROYAL SERIES CONSISTS OF DEEP WELL DRAINED SOILS FORMED IN WIND MODIFIED GLACIO-FLUVIAL SEDIMENTS ON NEARLY LEVEL TO GENTLY SLOPING FOOTSLOPES AND TERRACES. VEGETATION IS MAINLY GRASSES AND SHRUBS. MAP IS 6 TO 9 INCHES. MAAT IS 50F AND THE FFS IS 150 TO 210 DAYS. ROYAL SOILS HAVE A SURFACE LAYER OF LIGHT BROWNISH GRAY LOAMY FINE SAND 5 INCHES THICK. THE SUBSOIL AND SUBSTRATUM ARE PALE BROWN, VERY PALE BROWN, LIGHT GRAY, LIGHT BROWNISH GRAY AND GRAY FINE SANDY LOAM AND LOAMY FINE SAND TO 60 INCHES OR MORE.

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT >3 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	LIQUID LIMIT	PLASTICITY INDEX
0-5	LFS	SM	A-2, A-4	0-5	95-100	95-100	80-90	30-40	-	NP
5-15	FSL, VFSL	SM	A-4	0-5	95-100	95-100	80-95	35-50	20-30	NP-5
15-60	SR-VFSL-FS	SM	A-2, A-4	0-5	95-100	95-100	80-95	30-45	20-30	NP-5

DEPTH (IN.)	CLAY (PCT)	MOIST BULK DENSITY (G/CM3)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	T	WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY STEEL	CONCRETE
0-5	2-8	1.25-1.45	6.0-20	0.09-0.11	6.6-7.8	-	LOW	.32	5	2	.5-1	HIGH	LOW
5-15	5-10	1.30-1.50	2.0-6.0	0.12-0.16	6.6-7.8	-	LOW	.37					
15-60	3-10	1.40-1.60	2.0-6.0	0.10-0.14	7.9-9.0	<2	LOW	.37					

FLOODING FREQUENCY	DURATION	MONTHS	HIGH WATER TABLE DEPTH (FT)	KIND	MONTHS	CEMENTED PAN DEPTH (IN)	HARDNESS	BEDROCK DEPTH (IN)	HARDNESS	SUBSIDENCE INIT. (IN)	TOTAL (IN)	HYD GRP	POTENTIAL FROST ACTION
NONE			>6.0			-		>60		-		B	HIGH

	SANITARY FACILITIES		CONSTRUCTION MATERIAL
SEPTIC TANK ABSORPTION FIELDS	SLIGHT	ROADFILL	GOOD
SEWAGE LAGOON AREAS	SEVERE-SEEPAGE	SAND	IMPROBABLE-EXCESS FINES
SANITARY LANDFILL (TRENCH)	SEVERE-TOO SANDY	GRAVEL	IMPROBABLE-EXCESS FINES
SANITARY LANDFILL (AREA)	SLIGHT	TOPSOIL	POOR-TOO SANDY
DAILY COVER FOR LANDFILL	POOR-TOO SANDY		
			WATER MANAGEMENT
		POND RESERVOIR AREA	SEVERE-SEEPAGE
	BUILDING SITE DEVELOPMENT		
SHALLOW EXCAVATIONS	SEVERE-CUTBANKS CAVE	EMBANKMENTS DIKES AND LEVEES	SEVERE-PIPING
DWELLINGS WITHOUT BASEMENTS	SLIGHT	EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DWELLINGS WITH BASEMENTS	SLIGHT	DRAINAGE	DEEP TO WATER
SMALL COMMERCIAL BUILDINGS	MODERATE-SLOPE	IRRIGATION	FAST INTAKE,SLOPE
LOCAL ROADS AND STREETS	SEVERE-FROST ACTION	TERRACES AND DIVERSIONS	ERODES EASILY,TOO SANDY
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	SLIGHT	GRASSED WATERWAYS	TOO ARID,ERODES EASILY

REF H

RECREATIONAL DEVELOPMENT

CAMP AREAS	SLIGHT	PLAYGROUNDS	MODERATE-SLOPE
PICNIC AREAS	SLIGHT	PATHS AND TRAILS	SLIGHT

CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)

	CAPABILITY		ALFALFA HAY (TONS)		BEANS, OTHER DRY (BU)		PEAS, GREEN (BU)		POTATOES, IRISH (CWT)		SUGAR BEETS (TONS)		WHEAT, WINTER (BU)		PASTURE (AUM)	
	IRR	IRR.	IRR	IRR.	IRR	IRR.	IRR	IRR.	IRR	IRR.	IRR	IRR.	IRR	IRR.	IRR	IRR.
	7C	4E		7		-		1800		500		24		90		12

WOODLAND SUITABILITY

ORDINATION SYMBOL	MANAGEMENT PROBLEMS: EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WINDTHROW HAZARD	PLANT COMPETITION	POTENTIAL PRODUCTIVITY: COMMON TREES	SITE INDEX	PRODUCTIVITY CLASS	TREES TO PLANT
						NONE			

WINDBREAKS

SPECIES	HT	SPECIES	HT	SPECIES	HT	SPECIES	HT
AUSTRIAN PINE	40	GREEN ASH	50	NORTHERN WHITE-CEDAR	25	RUSSIAN-OLIVE	30
BLUE SPRUCE	20	LOMBARDY POPLAR	65	GOLDEN WILLOW	35	HONEYSUCKLE	10
LILAC	15	PEKING COTONEASTER	15	ROCKY MT. JUNIPER	20	SIBERIAN PEASHRUB	15

WILDLIFE HABITAT SUITABILITY

POTENTIAL FOR HABITAT ELEMENTS: GRAIN & SEED	GRASS & LEGUME	WILD HERB.	HARDWD TREES	CONIFER PLANTS	SHRUBS	WETLAND PLANTS	SHALLOW WATER	OPEN-LAND WILDLIFE	POTENTIAL AS HABITAT FOR: WOODLAND WILDLIFE	WETLAND WILDLIFE	RANGELAND WILDLIFE
FAIR	GOOD	GOOD	GOOD	GOOD	GOOD	POOR	V. POOR	GOOD	-	V. POOR	-

POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST UNDERSTORY VEGETATION)

COMMON PLANT NAME	PLANT SYMBOL (NRCS)	PERCENTAGE COMPOSITION (DRY WEIGHT)				
NEEDLEANDTHREAD	STCO4					
SANDBERG BLUEGRASS	POSE					
INDIAN RICEGRASS	ORHY					
BLUEBUNCH WHEATGRASS	AGSP					
THURBER NEEDLEGRASS	STTH2					
BIG SAGEBRUSH	ARTR2					
EVENINGPRIMROSE	OENOT					
YARROW	ACMI					
BALSAMROOT	BALSA					
LUPINE	LUPIN					
OTHER PERENNIAL FORBS	PPFF					
OTHER PERENNIAL FORBS	PPFF					
RABBITBRUSH	CHRYS9					

POTENTIAL PRODUCTION (LBS./AC. DRY WT):					
FAVORABLE YEARS					
NORMAL YEARS					
UNFAVORABLE YEARS					

FOOTNOTES

REF H

SOIL INTERPRETATIONS RECORD

68 SAGEMILL VERY FINE SANDY LOAM, 0 TO 2 PERCENT SLOPES *ICR*

THE SAGEMILL SERIES CONSIST OF DEEP WELL DRAINED SOILS FORMED IN WIND-MODIFIED GLACIO-FLUVIAL SEDIMENTS ON FOOTSLOPES AND TERRACES. THE VEGETATION IS MAINLY GRASSES AND SHRUBS. MLP IS 6 TO 10 INCHES. MAAT IS 54 F. FFS IS 135 TO 190 DAYS. TYPICALLY, THE SURFACE AND SUBSOIL ARE BROWN, VERY FINE SANDY LOAM 25 INCHES THICK. THE SUBSTRATUM IS LIGHT BROWNISH-GRAY AND PALE BROWN FINE SANDY LOAM AND SILT LOAM TO 60 INCHES OR MORE.

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT >3 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	LIQUID LIMIT	PLASTICITY INDEX
0-6	VFSL	ML, SM	A-4	0-5	95-100	95-100	90-95	45-60	-	NP
6-25	VFSL, SIL, LVFS	ML	A-4	0-5	95-100	95-100	90-95	55-80	-	NP
25-60	SP-SIL-FSL	ML	A-4	0-5	95-100	95-100	90-95	50-75	-	NP

DEPTH (IN.)	CLAY (PCT)	MOIST BULK DENSITY (G/CM3)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	T	WIND EROD. GROUP	ORGANIC MATTER (PCT)	CORROSIVITY STEEL	CONCRETE
0-6	2-8	1.20-1.40	2.0-6.0	0.18-0.20	6.6-8.4	-	LOW	.49	5	3	.8-2	HIGH	LOW
6-25	2-8	1.30-1.55	0.6-6.0	0.18-0.20	6.6-8.4	-	LOW	.49					
25-60	2-8	1.20-1.60	0.6-2.0	0.18-0.20	7.9-9.0	<2	LOW	.55					

FLOODING FREQUENCY	DURATION	MONTHS	HIGH WATER TABLE DEPTH (FT)	KIND	MONTHS	CEMENTED PAN DEPTH (IN)	HARDNESS	BEDROCK DEPTH (IN)	HARDNESS	SUBSIDENCE INIT. (IN)	TOTAL (IN)	HYD GRP	POTENTIAL FROST ACTION
NONE			>6.0			-		>60		-		B	HIGH

SANITARY FACILITIES

SEPTIC TANK ABSORPTION FIELDS	MODERATE-PERCS SLOWLY
SEWAGE LAGOON AREAS	SEVERE-SEEPAGE
SANITARY LANDFILL (TRENCH)	SLIGHT
SANITARY LANDFILL (AREA)	SLIGHT
DAILY COVER FOR LANDFILL	GOOD

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	SLIGHT
DWELLINGS WITHOUT BASEMENTS	SLIGHT
DWELLINGS WITH BASEMENTS	SLIGHT
SMALL COMMERCIAL BUILDINGS	SLIGHT
LOCAL ROADS AND STREETS	SEVERE-FROST ACTION
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	SLIGHT

CONSTRUCTION MATERIAL

ROADFILL	GOOD
SAND	IMPROBABLE-EXCESS FINES
GRAVEL	IMPROBABLE-EXCESS FINES
TOPSOIL	FAIR-LARGE STONES

WATER MANAGEMENT

POND RESERVOIR AREA	MODERATE-SEEPAGE
EMBANKMENTS DIKES AND LEVEES	SEVERE-PIPING
EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DRAINAGE	DEEP TO WATER
IRRIGATION	SOIL BLOWING
TERRACES AND DIVERSIONS	ERODES EASILY,SOIL BLOWING
GRASSED WATERWAYS	TOO ARID,ERODES EASILY

REF H

RECREATIONAL DEVELOPMENT

CAMP AREAS	MODERATE-DUSTY	PLAYGROUNDS	MODERATE-DUSTY
PICNIC AREAS	MODERATE-DUSTY	PATHS AND TRAILS	SEVERE-ERODES EASILY

CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)

	CAPA-BILITY		ALFALFA HAY (TONS)		BEANS, OTHER DRY (BU)		CORN (BU)		PASTURE (AUM)		PEAS, DRY (LBS)		POTATOES, IRISH (CWT)		WHEAT, WINTER (BU)	
	IRR	NIRR	IRR	NIRR	IRR	NIRR	IRR	NIRR	IRR	NIRR	IRR	NIRR	IRR	NIRR	IRR	NIRR
	4E	2E			8		45		150		14		2700		560		120

WOODLAND SUITABILITY

ORDI-NATION SYMBOL	MANAGEMENT PROBLEMS: EROSION HAZARD	EQUIPMENT LIMITATION	SEEDLING MORTALITY	WINDTHROW HAZARD	PLANT COMPETITION	POTENTIAL PRODUCTIVITY: COMMON TREES	SITE INDEX	PRODUCTIVITY CLASS	TREES TO PLANT
						NONE			

WINDBREAKS

SPECIES	HT	SPECIES	HT	SPECIES	HT	SPECIES	HT
AUSTRIAN PINE	40	GREEN ASH	50	NORTHERN WHITE-CEDAR	25	RUSSIAN-OLIVE	30
BLUE SPRUCE	20	LOMBARDY POPLAR	65	GOLDEN WILLOW	35	HONEYSUCKLE	10
LILAC	15	PEKING COTONEASTER	15	ROCKY MT. JUNIPER	20	SIBERIAN PEASHRUB	15

WILDLIFE HABITAT SUITABILITY

POTENTIAL FOR HABITAT ELEMENTS: GRAIN & SEED	GRASS & LEGUME	WILD HERB	HARDWD TREES	CONIFER PLANTS	SHRUBS	WETLAND PLANTS	SHALLOW WATER	OPEN LD WILDLF	POTENTIAL AS HABITAT FOR: WOODLD WILDLF	WETLAND WILDLF	RANGELD WILDLF
GOOD	GOOD	GOOD	GOOD	GOOD	GOOD	POOR	POOR	GOOD	-	POOR	-

POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST UNDERSTORY VEGETATION)

COMMON PLANT NAME	PLANT SYMBOL (NLSPN)	PERCENTAGE COMPOSITION (DRY WEIGHT)				
BLUEBUNCH WHEATGRASS	AGSP					
SANDBERG BLUEGRASS	POSE					
OTHER PERENNIAL GRASSES	PPGG					
BIG SAGEBRUSH	ARTR2					
OTHER SHRUBS	SSSS					
NEEDLEANDTHREAD	STCO4					
BALSAMROOT	BALSA					
LUPINE	LUPI4					
OTHER PERENNIAL FORBS	PPFF					

POTENTIAL PRODUCTION (LBS./AC. DRY WT):

FAVORABLE YEARS					
NORMAL YEARS					
UNFAVORABLE YEARS					

FOOTNOTES

/ REF H

SOIL INTERPRETATIONS RECORD

98 WINCHESTER LOAMY COARSE SAND, 2 TO 5 PERCENT SLOPES *NFER*

THE WINCHESTER SERIES ARE VERY DEEP EXCESSIVELY DRAINED SOILS FORMED IN ALLUVIAL AND EOLIAN SAND ON TERRACES. THE VEGETATION IS MAINLY FORBS, GRASSES, AND SHRUBS. MAP IS 6 TO 12 INCHES. MAAT IS 52F. FFS IS 110 TO 290 DAYS. TYPICALLY, THE SURFACE LAYER IS GRAYISH BROWN LOAMY COARSE SAND 12 THICK. THE SUBSTRATUM IS DARK GRAY AND GRAY COARSE SAND EXTENDING TO A DEPTH OF 60 INCHES OR MORE.

ESTIMATED SOIL PROPERTIES

DEPTH (IN.)	USDA TEXTURE	UNIFIED	AASHTO	FRACT >3 IN (PCT)	PERCENT OF MATERIAL LESS THAN 3" PASSING SIEVE NO. 4	10	40	200	LIQUID LIMIT	PLASTICITY INDEX
0-15	LCOS	SM	A-1, A-2	0-5	95-100	95-100	30-50	15-30	-	NP
15-60	COS, S	SP-SM, SP	A-1, A-3, A-2	0-5	95-100	95-100	30-55	0-10	-	NP

DEPTH (IN.)	CLAY (PCT)	MOIST BULK DENSITY (G/CM3)	PERMEABILITY (IN/HR)	AVAILABLE WATER CAPACITY (IN/IN)	SOIL REACTION (PH)	SALINITY (MMHOS/CM)	SHRINK-SWELL POTENTIAL	EROSION FACTORS K	T	WIND ERODIBILITY GROUP	ORGANIC MATTER (PCT)	CORROSIVITY STEEL	CONCRETE
0-15	0-5	1.40-1.65	6.0-20	0.07-0.10	6.1-8.4	-	LOW	.15	5	1	.5-1	HIGH	LOW
15-60	0-5	1.50-1.70	6.0-20	0.05-0.07	6.6-8.4	<2	LOW	.15					

FLOODING FREQUENCY	DURATION	MONTHS	HIGH WATER TABLE DEPTH (FT)	KIND	MONTHS	CEMENTED PAN DEPTH (IN)	HARDNESS	BEDROCK DEPTH (IN)	HARDNESS	SUBSIDENCE INIT. (IN)	TOTAL (IN)	HYDROGRP	POTENTIAL FROST ACTION
NONE			25.0			-		>60		-		A	LOW

SANITARY FACILITIES

SEPTIC TANK ABSORPTION FIELDS	SEVERE-POOR FILTER
SEWAGE LAGOON AREAS	SEVERE-SEEPAGE
SANITARY LANDFILL (TRENCH)	SEVERE-TOO SANDY
SANITARY LANDFILL (AREA)	SLIGHT
DAILY COVER FOR LANDFILL	POOR-SEEPAGE,TOO SANDY

BUILDING SITE DEVELOPMENT

SHALLOW EXCAVATIONS	SEVERE-CUTBANKS CAVE
DWELLINGS WITHOUT BASEMENTS	SLIGHT
DWELLINGS WITH BASEMENTS	SLIGHT
SMALL COMMERCIAL BUILDINGS	SLIGHT
LOCAL ROADS AND STREETS	SLIGHT
LAWNS, LANDSCAPING AND GOLF FAIRWAYS	MODERATE-DROUGHTY

CONSTRUCTION MATERIAL

ROADFILL	GOOD
SAND	PROBABLE
GRAVEL	IMPROBABLE-TOO SANDY
TOPSOIL	POOR-TOO SANDY

WATER MANAGEMENT

POND RESERVOIR AREA	SEVERE-SEEPAGE
EMBANKMENTS DIKES AND LEVEES	SEVERE-SEEPAGE,PIPING
EXCAVATED PONDS AQUIFER FED	SEVERE-NO WATER
DRAINAGE	DEEP TO WATER
IRRIGATION	SLOPE,DROUGHTY,FAST INTAKE
TERRACES AND DIVERSIONS	TOO SANDY,SOIL BLOWING
GRASSED WATERWAYS	TOO ARID,DROUGHTY

REF H

RECREATIONAL DEVELOPMENT

CAMP AREAS	MODERATE-TOO SANDY	PLAYGROUNDS	MODERATE-SLOPE, TOO SANDY
PICNIC AREAS	MODERATE-TOO SANDY	PATHS AND TRAILS	MODERATE-TOO SANDY

CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)

	CAPABILITY		ALFALFA HAY (TONS)		POTATOES, IRISH (CWT)		PASTURE (AUM)		WHEAT, WINTER (BU)					
	IRR.	NON IRR.	IRR.	NON IRR.	IRR.	NON IRR.	IRR.	NON IRR.	IRR.	NON IRR.	IRR.	NON IRR.	IRR.	NON IRR.
	7E	4E		6		460		10		90				

WOODLAND SUITABILITY

ORD. SYM.	MANAGEMENT PROBLEMS: EROS. HAZARD	EQUIP. LIMIT.	SEEDL. MORTY.	WINDTHW. HAZARD	PLANT COMPET.	POTENTIAL PRODUCTIVITY: COMMON TREES	SITE INDX	POD. CLAS	TREES TO PLANT
						NONE			

WINDBREAKS

SPECIES	HT.	SPECIES	HT.	SPECIES	HT.	SPECIES	HT.

WILDLIFE HABITAT SUITABILITY

POTENTIAL FOR HABITAT ELEMENTS: GRAIN & SEED	GRASS & LEGUME	WILD HERB.	HARDWD TREES	CONIFER PLANTS	SHRUBS	WETLAND PLANTS	SHALLOW WATER	OPEN LD WILDLF	POTENTIAL AS HABITAT FOR: WOODLD WILDLF	WETLAND WILDLF	RANGELD WILDLF
V. POOR	V. POOR	POOR	V. POOR	V. POOR	POOR	V. POOR	V. POOR	POOR	-	V. POOR	FAIR

POTENTIAL NATIVE PLANT COMMUNITY (RANGELAND OR FOREST UNDERSTORY VEGETATION)

COMMON PLANT NAME	PLANT SYMBOL (NRCS PV)	PERCENTAGE COMPOSITION (DRY WEIGHT)				
SANDBERG BLUEGRASS	POSE	5				
INDIAN RICEGRASS	ORHY	15				
NEEDLEANDTHREAD	STCOM	50				
ANTELOPE BITTERBRUSH	PUTR2	5				
BIG SAGEBRUSH	ARTR2	2				
RABBITBRUSH	CHRYS9	5				
OTHER SHRUBS	SHRS	5				
OTHER PERENNIAL GRASSES	PRGG	5				
OTHER PERENNIAL FORBS	PRFF	8				
POTENTIAL PRODUCTION (LBS./AC. DRY WT):						
FAVORABLE YEARS		700				
NORMAL YEARS		500				
UNFAVORABLE YEARS		300				

RANGE SITE -- SANDY

FOOTNOTES

REF H

United States Testing Company, Inc.
Richland Division
2800 GEORGE WASHINGTON WAY
RICHLAND, WASHINGTON 99352 (509) 376-3131

RADIOCHEMISTRY
RADIATION DOSIMETRY
NUCLEAR SERVICES
BIOASSAY
AGRICULTURAL SERVICES
ANALYTICAL CHEMISTRY
ENGINEERING INSPECTION
POLLUTION CONTROL

February 17, 1987

Harold Postuma, Superintendent
Public Works Division
City of Pasco
PO Box 293
Pasco WA 99301

Dear Sir:

Below are the results of analyses performed on the Pasco Sludge sample submitted on January 13, 1987. The results are for the sample "as received" and are not adjusted for water content. On a "dry weight" basis the results could be as much as 30 times higher.

	Analysis	Result	
1.	pH	7.16	
2.	% Solids	3.1%	
3.	Total nitrogen	0.2253% as N (2253 ppm)	
4.	Ammonia nitrogen	0.0776% as N (776 ppm)	
5.	Nitrate nitrogen	0.0537% as N (537 ppm)	
6.	Inorganic nitrogen	0.1313% as N (1313 ppm)	
7.	Total phosphorus	0.0061% as P (61 ppm)	
8.	Total potassium	94,240 ppb	
		EP TOX	TOTAL LEACHABLE
9.	Cadmium	8 ppb	400 ppb
10.	Copper	229 ppb	35460 ppb
11.	Lead	118 ppb	2029 ppb
12.	Nickel	180 ~~030~~ ppb	~~196~~ ppb 830
13.	Zinc	10519 ppb	73730 ppb

REF I

SOIL ANALYSIS

OUR LETTERS AND REPORTS ARE FOR THE EXCLUSIVE USE OF THE CLIENT TO WHOM THEY ARE ADDRESSED, AND THEY AND THE NAME OF THE UNITED STATES TESTING COMPANY, INC. OR ITS SEALS OR INSIGNIA, ARE NOT TO BE USED UNDER ANY CIRCUMSTANCES IN ADVERTISING TO THE GENERAL PUBLIC AND MAY NOT BE USED IN ANY OTHER MANNER WITHOUT OUR PRIOR WRITTEN APPROVAL. SAMPLES NOT DESTROYED IN TESTING ARE RETAINED A MAXIMUM OF THIRTY DAYS.
MEMBER OF THE SGS GROUP (SOCIETE GENERALE DE SURVEILLANCE)

UNITED STATES TESTING COMPANY, INC.

Should you have any questions, please call me at 375-3131 (Reference UST # 12031).

Sincerely,

UNITED STATES TESTING COMPANY, INC.

Lee Scott

Lee Scott
Supervisor
Hazardous Substance Analysis

LS:kdb

xc: Denise Sauer

DR71 57-2

REF. J

SOIL ANALYSIS SUMMARY

Sample #	NO_3 lbs/acre	NH_4 lb/acre	pH	P ppm	2M ppm	Cd ppm	Cation Exchange Capacity meq/100 gram
1	7	10	8.5	6	0.99	<.5*	6.5
2	4	11	8.7	5	0.48	<.5	10.6
3	11	32	8.1	23	3.46	<.5	16.6
4	8	16	8.4	23	2.53	<.5	9.5
5	6	9	8.5	13	0.26	<.5	6.1
6	6	12	8.5	11	3.22	<.5	7.1
7	4	7	7.8	10	0.25	<.5	6.2

>0.5 ppm detection limit

Attachments
Soil Analysis fpr samples 1 through 7

NORTHWEST
Agricultural Consultants
2545 West Falls / Kennewick Washington 99336
(509) 783 7450

Date Received and/or Sampled: April 2, 1987

Report No: 2722-1 7k

Harold G. Postuma
City of Pasco
P.O. Box 293
Pasco, WA 99301

Grower:

Sampler:

Last Year's Crop 19:

Fertilizer 19:

Field No: Field Name: Crop To Be Grown 19: Yield Goal:

SOIL CHEMICAL ANALYSES

DEPTH FOOT	SOIL MOISTURE % of Field Capacity	SOIL MOISTURE Available Inches	NITROGEN NO_3 PPM	NITROGEN NO_3 Lbs Per Acre	NITROGEN NH_4 Lbs Per Acre	Sulfur S PPM	pH	Organic Matter Percent	Phosphorus P (ppm)	Potassium K (ppm)	Calcium Ca (meq per 100 grams)	Magnesium Mg (meq per 100 grams)	Total Bases (meq per 100 grams)	Soluble Salts mmhos/cm	Effervescence with acid
1				7	10		8.5		6					.33	
2															
3															
4															
5															
6															
Total															

MINOR ELEMENT ANALYSES

Depth Foot	Boron B (Parts Per Million = PPM)	Zinc Zn (Parts Per Million = PPM)	Manganese Mn (Parts Per Million = PPM)	Copper Cu (Parts Per Million = PPM)	Iron Fe (Parts Per Million = PPM)	Cation Exchange Capacity (meq per 100 grams)	Sodium Na	Percent Base Saturation
1		.99				6.5		
2								

Estimated Nitrogen Release from Organic Matter	
Estimated Total Nitrogen Available to Crop	

Soil Series and Type:

Average Annual Rainfall:

Dryland ___ Irrigated ___ Sprinkler ___ Rill ___ Other ___

Comments and Recommendations:

REF J

Marc Waddoups
Agricultural Consultant

NORTHWEST
Agricultural Consultants
2545 West Falls / Kennewick, Washington 99336
(509) 783 7450

Date Received and/or Sampled: April 2, 1987

Report No: 2722-2 7k

Grower:

Sampler:

Last Year's Crop 19 ____:

Fertilizer 19 ____:

Harold G. Postuma
City of Pasco
P.O. Box 293
Pasco, WA 99301

Field No. 2 Field Name: Crop To Be Grown 19 ____: Yield Goal:

SOIL CHEMICAL ANALYSES

DEPTH FOOT	SOIL MOISTURE % of Field Capacity	SOIL MOISTURE Available Inches	NITROGEN NO_3 PPM	NITROGEN NO_3 lbs Per Acre	NITROGEN NH_4 lbs Per Acre	Sulfur S PPM	pH	Organic Matter Percent	Phosphorous P ppm	Potassium K ppm	Calcium Ca mec per 100 grams	Magnesium Mg mec per 100 grams	Total Bases mec per 100 grams	Soluble Salts mmhos/cm	Effervescence with acid
1				4	11		8.7		5					.40	
2															
3															
4															
5															
6															
Total															

MINOR ELEMENT ANALYSES

Depth Foot	Boron B (Parts Per Million — PPM)	Zinc Zn (Parts Per Million — PPM)	Manganese Mn (Parts Per Million — PPM)	Copper Cu (Parts Per Million — PPM)	Iron Fe (Parts Per Million — PPM)	Cation Exchange Capacity (meq per 100 grams)	Sodium Na	Percent Base Saturation
1		.48				10.5		
2								

Estimated Nitrogen Release from Organic Matter:

Estimated Total Nitrogen Available to Crop:

Soil Series and Type:

Average Annual Rainfall:

Dryland ____ Irrigated ____ Sprinkler ____ Rill ____ Other ____

Comments and Recommendations:

REF J

Marr Waddings
Agricultural Consultant

NORTHWEST
Agricultural Consultants
2545 West Falls / Kennewick, Washington 99336
(509) 783 7450

Date Received and/or Sampled: April 2, 1987

Report No: 2722-3 7k

Grower:

Sampler:

Last Year's Crop 19:

Fertilizer 19:

Harold G. Postuma
City of Pasco
P.O. Box 293
Pasco, WA 99301

Field No. 3 Field Name: Crop To Be Grown 19: Yield Goal:

SOIL CHEMICAL ANALYSES

DEPTH FOOT	SOIL MOISTURE % of Field Capacity	SOIL MOISTURE Available Inches	NITROGEN NO_3 PPM	NITROGEN NO_3 Lbs. Per Acre	NITROGEN NH_4 Lbs. Per Acre	Sulfur S PPM	pH	Organic Matter Percent	Phosphorous P (ppm)	Potassium K (ppm)	Calcium Ca (meq per 100 grams)	Magnesium Mg (meq per 100 grams)	Total Bases (meq per 100 grams)	Soluble Salts mmhos/cm	Effervescence with acid
1				11	32		8.1		23					1.10	
2															
3															
4															
5															
6															
Total	X		X			X									

MINOR ELEMENT ANALYSES

Depth Foot	Boron B (Parts Per Million — PPM)	Zinc Zn (Parts Per Million — PPM)	Manganese Mn (Parts Per Million — PPM)	Copper Cu (Parts Per Million — PPM)	Iron Fe (Parts Per Million — PPM)	Cation Exchange Capacity (meq per 100 grams)	Sodium Na (meq per 100 grams)	Percent Base Saturation
1		3.46				16.6		
2								

Estimated Nitrogen Release from Organic Matter	
Estimated Total Nitrogen Available to Crop	

Soil Series and Type:

Average Annual Rainfall:

Dryland — Irrigated — Sprinkler — Rill — Other:

Comments and Recommendations:

REF J

Marc Waldongs
Agricultural Consultant

NORTHWEST
Agricultural Consultants
2545 West Falls / Kennewick, Washington 99336
(509) 783-7450

Date Received and/or Sampled: April 2, 1987

Report No: 2722-4 7k

Grower:

Sampler:

Last Year's Crop 19:

Fertilizer 19:

Harold G. Postuma
City of Pasco
P.O. Box 293
Pasco, WA 99301

Field No. 4 Field Name: Crop To Be Grown 19: Yield Goal:

SOIL CHEMICAL ANALYSES

Depth Foot	Soil Moisture: % of Field Capacity	Soil Moisture: Available Inches	Nitrogen: NO_3 PPM	Nitrogen: NO_3 (Lbs. Per Acre)	Nitrogen: NH_4 (Lbs. Per Acre)	Sulfur S PPM	pH	Organic Matter Percent	Phosphorus P (ppm)	Potassium K (meq. per 100 grams)	Calcium Ca (meq. per 100 grams)	Magnesium Mg (meq. per 100 grams)	Total Bases (meq. per 100 grams)	Soluble Salts mmhos/cm	Effervescence with acid
1				8	16		8.4		23					.48	
2															
3															
4															
5															
6															
Total															

MINOR ELEMENT ANALYSES

Depth Foot	Boron B (Parts Per Million — PPM)	Zinc Zn (Parts Per Million — PPM)	Manganese Mn (Parts Per Million — PPM)	Copper Cu (Parts Per Million — PPM)	Iron Fe (Parts Per Million — PPM)	Cation Exchange Capacity (meq. per 100 grams)	Sodium Na (meq. per 100 grams)	Percent Base Saturation
1		2.53				9.5		
2								

Estimated Nitrogen Release from Organic Matter:

Estimated Total Nitrogen Available to Crop:

Soil Series and Type:

Average Annual Rainfall:

Dryland ____ Irrigated ____ Sprinkler ____ Rill ____ Other ____

Comments and Recommendations:

REF J

Agricultural Consultant

NORTHWEST
Agricultural Consultants
2545 West Falls / Kennewick, Washington 99336
(509) 783 7450

Date Received and/or Sampled: April 2, 1987

Report No. 2722-5 7s

Grower:

Sampler:

Last Year's Crop 19 ____

Fertilizer 19 ____

Harold G Posthuma

Pasco, WA

Field No. 5 Field Name: Crop To Be Grown 19 ____ Yield Goal:

SOIL CHEMICAL ANALYSES

DEPTH FOOT	SOIL MOISTURE: % of Field Capacity	SOIL MOISTURE: Available Inches	NITROGEN: NO_3 PPM	NITROGEN: NO_3 Lbs Per Acre	NITROGEN: NH_4 Lbs Per Acre	Sulfur S PPM	pH	Organic Matter Percent	Phosphorous P (ppm)	Potassium K (ppm)	Calcium Ca (meq. per 100 grams)	Magnesium Mg (meq. per 100 grams)	Total Bases (meq. per 100 grams)	Soluble Salts mmhos/cm	Effervescence with acid
1				6	9		8.5		13					.29	
2															
3															
4															
5															
6															
Total															

MINOR ELEMENT ANALYSES

Depth Foot	Boron B (Parts Per Million — PPM)	Zinc Zn (Parts Per Million — PPM)	Manganese Mn (Parts Per Million — PPM)	Copper Cu (Parts Per Million — PPM)	Iron Fe (Parts Per Million — PPM)	Cation Exchange Capacity (meq. per 100 grams)	Sodium Na (meq. per 100 grams)	Percent Base Saturation
1		.26				6.1		
2								

Estimated Nitrogen Release from Organic Matter	
Estimated Total Nitrogen Available to Crop	

Soil Series and Type:

Average Annual Rainfall:

Dryland ____ Irrigated ____ Sprinkler ____ Rill ____ Other ____

Comments and Recommendations:

REF J

Marc Wakkings
Agricultural Consultant

NORTHWEST
Agricultural Consultants
2545 West Falls / Kennewick, Washington 99336
(509) 783-7450

Date Received and/or Sampled: April 2, 1987

Report No: 2722-6 7s

Grower:

Sampler:

Last Year's Crop 19:

Fertilizer 19:

Harold G Posthuma

Pasco, WA

Field No. 6 Field Name: Crop To Be Grown 19: Yield Goal:

SOIL CHEMICAL ANALYSES

DEPTH FOOT	SOIL MOISTURE % of Field Capacity	SOIL MOISTURE Available Inches	NITROGEN NO_3 PPM	NITROGEN NO_3 Lbs. Per Acre	NITROGEN NH_4 Lbs. Per Acre	Sulfur S PPM	pH	Organic Matter Percent	Phosphorus P ppm	Potassium K ppm	Calcium Ca meq per 100 grams	Magnesium Mg meq per 100 grams	Total Bases meq per 100 grams	Soluble Salts mmhos/cm	Effervescence with acid
1				6	12		8.5		11					.37	
2															
3															
4															
5															
6															
Total															

MINOR ELEMENT ANALYSES

Depth Foot	Boron B (Parts Per Million — PPM)	Zinc Zn (Parts Per Million — PPM)	Manganese Mn (Parts Per Million — PPM)	Copper Cu (Parts Per Million — PPM)	Iron Fe (Parts Per Million — PPM)	Cation Exchange Capacity meq per 100 grams	Sodium Na meq per 100 grams	Percent Base Saturation
1		3.22				7.1		
2								

Estimated Nitrogen Release from Organic Matter	
Estimated Total Nitrogen Available to Crop	

Soil Series and Type:

Average Annual Rainfall:

Dryland — Irrigated — Sprinkler — Rill — Other

Comments and Recommendations:

REF J

Matt Waddings
Agricultural Consultant

NORTHWEST
Agricultural Consultants
2545 West Falls / Kennewick, Washington 99336
(509) 783-7450

Date Received and/or Sampled: April 2, 1987

Report No: 2722-7 7s

Grower:

Sampler:

Last Year's Crop 19:

Fertilizer 19:

Harold G Posthuma

Pasco, WA

Field No. 7 Field Name: Crop To Be Grown 19: Yield Goal:

SOIL CHEMICAL ANALYSES

DEPTH FOOT	SOIL MOISTURE % of Field Capacity	SOIL MOISTURE Available Inches	NITROGEN NO_3 PPM	NITROGEN NO_3 Lbs. Per Acre	NITROGEN NH_4 Lbs. Per Acre	Sulfur S PPM	pH	Organic Matter Percent	Phosphorous P (ppm)	Potassium K (ppm)	Calcium Ca (meq per 100 grams)	Magnesium Mg (meq per 100 grams)	Total Bases (meq per 100 grams)	Soluble Salts mmhos/cm	Effervescence with acid
1				4	7		7.8		10					22	
2															
3															
4															
5															
6															
Total															

MINOR ELEMENT ANALYSES

Depth Foot	Boron B (Parts Per Million — PPM)	Zinc Zn (Parts Per Million — PPM)	Manganese Mn (Parts Per Million — PPM)	Copper Cu (Parts Per Million — PPM)	Iron Fe (Parts Per Million — PPM)	Cation Exchange Capacity (meq per 100 grams)	Sodium Na (meq per 100 grams)	Percent Base Saturation
1		.25				6.2		
2								

Estimated Nitrogen Release from Organic Matter	
Estimated Total Nitrogen Available to Crop	

Soil Series and Type:

Average Annual Rainfall:

Dryland ____ Irrigated ____ Sprinkler ____ Rill ____ Other ____

Comments and Recommendations:

REF J

Marc Waldrups
Agricultural Consultant

Sulfur (S)

There is no WSU soil test for S for irrigated soils. Areas irrigated with water from most of the major streams east of the Cascades will not require S because of the high S content in the water. Exceptions are the Roza District, areas above Yakima including the Kittitas Valley, and the Wenatchee Valley. S content of well water may or may not be sufficient to supply crop needs. Water from any new source should be tested for S and other constituents. If S is known to be deficient, apply S fertilizer at a rate which will supply 40 lbs. of S per acre.

Zinc (Zn)

Zn deficiency is frequently seen in sudan grass. Where the soil test for Zn is below 0.8 or on new land where leveling has exposed limey subsoil, apply Zn fertilizer at a rate which will supply 10 lbs. of Zn per acre.

Iron (Fe)

Fe deficiency ("lime-induced chlorosis") is associated with poor drainage, high water table, or high lime soils or a combination of these. Chlorosis (yellowing) of the foliage can be corrected by using Fe sprays containing 3 lbs. of iron sulfate per 100 gals. of water early in the growth of the sudan grass.

Salinity (expressed as mmhos/cm)

Soil salinity (total soluble salts) is determined on all irrigated central Washington soil samples sent to WSU. A salinity level of 3 or 4 mmhos/cm may indicate a salinity problem and further tests should be made. A salinity level above 4 may indicate a serious salinity problem. If a problem exists, refer to E.M. 2435, *Managing Saline Soils in the Columbia Basin*, or consult with your County Extension Agent.

GENERAL COMMENTS

Phosphorus and potassium: P deficiency is more common in sudan grass than K deficiency. Follow a practice of re-sampling once in a crop rotation or every three years. P and K can be fall applied.

Other elements: Other than N, P, K, S, and Zn; research has not shown a need for additional fertilizer materials for sudan grass in central Washington. *The practice of applying mixes of various elements "for insurance" is not recommended.*

IMPORTANT: Fertilizers are of little value where other factors are limiting. For high yields, follow good management practices regarding irrigation, pest control, etc.

Prepared by A. I. Dow, K. J. Morrison, D. W. James, C. E. Nelson, and A. R. Halvorson; all of Washington State University.

kjh
4/70

REF G

HOME LAWNS, PLAYFIELDS & OTHER TURF

for Eastern and Central Washington

FRANKLIN COUNTY EXTENSION SERVICE

The following guides are based on results of fertilizer experiments on turfgrasses in which relationships between WSU soil tests and measured and observed responses have been obtained. Fertilizers alone, however, cannot produce a beautiful turf. Correct time and height of clipping, proper irrigation management, and disease control are also essential for beautiful lawns and playfields.

GUIDES FOR USE OF SPECIFIC FERTILIZING MATERIALS

Fertilizers are commonly added to lawns and turf at a specified rate per 1000 sq. ft. The partial list below provides information on fertilizer material needed to supply 1 lb. of plant nutrient.

			Pounds of Fertilizer Material To Supply 1 lb. of Nutrient			
		(Fertilizer Grade)	*N*	P_2O_5	K_2O	*S*
Nitrogen Sources	Urea	(46-0-0)	2.2	-	-	-
	Ammonium Nitrate	(33-0-0)	3.0	-	-	-
	Ammonium Sulfate	(21-0-0-24s)	5.2	-	-	4.1
	Ammonium Nitrate-Sulfate	(30-0-0-6s)	3.3	-	-	16.7
	Manure–Average Composition	(.6-.35-.5)	167	285	200	-
Phosphorus Sources	Single Superphosphate	(0-20-0-12s)	-	5.0	-	8.3
	Treble Superphosphate	(0-45-0)	-	2.2	-	-
	Ammonium Phosphate	(16-20-0-15s)	6.2	5.0	-	6.7
Potassium Sources	Murate of Potash	(0-0-62)	-	-	1.6	-
	Potassium Sulfate	(0-0-53-18s)	-	-	1.9	5.6

Nitrogen (N)

Any N fertilizer as a source of N is satisfactory. However, N from organic sources is less rapidly available at low temperature, hence manures, etc., should be used in the summer period. Broadcast the fertilizer uniformly on dry turf, and water to move the fertilizer into the soil. The rate indicated for existing turf should be divided into 4 equal applications between April and September.

	N to apply/1000 sq. ft.
For turf establishment	1 lb.
For existing turf	
a. Maximum quality	8-10 lbs. per season
b. Average quality	4 lbs. per season

43,560 ft²/acre

COOPERATIVE EXTENSION SERVICE • COLLEGE OF AGRICULTURE • WASHINGTON STATE UNIVERSITY • PULLMAN
in cooperation with the United States Department of Agriculture
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Cooperative Extension Service, J. D. Young, Director