DEPARTMENT OF ECOLOGY
State of Washington

Application for a State Waste Discharge Permit to Discharge Domestic Wastewater to Ground Water by Land Treatment or Application

This application is for a state waste discharge permit as required by Chapter 90.48 RCW and Chapter 173-216 WAC. Permit applications provide Ecology with information on pollutants in the waste stream, materials that may enter the waste stream, the flow characteristics of the discharge, and site characteristics at the point of discharge.

Ecology may request additional information to clarify the conditions of this discharge. The applicant should reference information previously submitted to Ecology that applies to this application in the appropriate section.

SECTION A. GENERAL INFORMATION

1. Applicant Name: City of Moses Lake
2. Facility Name: Larson Wastewater Treatment Facility
   (if different from applicant)
3. Applicant Address:
   Street P.O. Box 1579
   City/State Moses Lake, Wa. Zip 98837
4. Facility Location Address:
   (if different from above) Street 6691 Randolph Road
   City/State Moses Lake, Wa. Zip 98837
5. Latitude/longitude of the processing facility as decimal degrees (NAD83/WGS84):
   47.188144 / 119.294105
6. Latitude/longitude of sprayfield/infiltration site discharge location (approximate center) as decimal degrees (NAD83/WGS84):
   47.186898/ 119.291185
7. Person to contact who is familiar with the information contained in this application:

Name		Title
Tony Pfluger		Wastewater Division Supervisor
Telephone Number	Fax Number	Email
509-764-3966	509-764-3971	tpfluger@cityofml.com

FOR ECOLOGY USE ONLY		Check One	New/Renewal ☐ Modification ☐
Date Application Received	____		Application/Permit No. ____
Date Application Accepted	____		Date Fee Paid ____

8. Check One:

[X] **Permit Renewal** (including renewal of temporary permits)

Does this application request a greater amount of wastewater discharge, a greater amount of pollutant discharge, or a discharge of different pollutants than specified in the last permit application for this facility? [ ] YES [X] NO

For permit renewals, the current permit is an attachment, by reference, to this application.

[ ] **Permit Modification**

[ ] **Existing Unpermitted Discharge**

[ ] **Proposed Discharge**

Anticipated date of discharge:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of a fine and/or imprisonment for knowing violations.

Signature*	Date	Title
	2/12/14	City Manager

Printed Name

*Applications must be signed by either a principal executive officer or a ranking elected official. If these titles do not apply to your organization, the person who makes budget decisions for this facility must sign the application. For state facilities, this is typically a program manager.

The application signatory may delegate signature authority for submittals required by the permit, such as monthly reports, to a suitable employee. You can delegate this authority to a qualified individual or to a position, which you expect to fill with a qualified individual. If you wish to delegate signature authority, please complete the following:

Signature of delegated employee	Date	Title or function at the facility

Printed name

SECTION B. TREATMENT PLANT INFORMATION

1. Identify all industries, commercial facilities or communities discharging to this publicly owned treatment works (POTW) by name, type of industry, address, telephone number and contact name. Attach extra sheet(s) if needed and label as attachment B1.

	INDUSTRY #1	INDUSTRY #2
NAME:	See Attachment B-1	
INDUSTRY:		
ADDRESS:		
TELEPHONE:		
CONTACT NAME:		
INDUSTRIAL PRODUCT(S):		

2. POTW design and operation manuals available for this treatment facility:

Type of Manual	Date	Is there a copy at the POTW?
[X] Engineering Report	April 2000	[X] YES [ ] NO
[X] Operation and Maintenance Manual	March 2003	[X] YES [ ] NO
[ ] Crop Management Plan		[ ] YES [ ] NO
[ ] Sprayfield Management Plan		[ ] YES [ ] NO

3. POTW Design Data:
   a. Average Influent Flow for Maximum Month (MGD): 0.75 MGD
   b. Influent BOD Load (lbs/day): 1,877 lbs/day
   c. Influent SS Load (lbs/day): 1,877 lbs/day
   d. Began Operation (year): 1943
   e. Last Major Upgrade (year): 2003
   f. Planned Upgrades (year): 2025
   g. Design Population: 7,500
   h. Actual Population: N/A
   i. Sprayfield loading - attach copy of the irrigation schedule if schedule if available: N/A

4. Are there plans to modify this facility within the next five years? If so, briefly describe what and when. No

Industries Identification
Attachment B-1

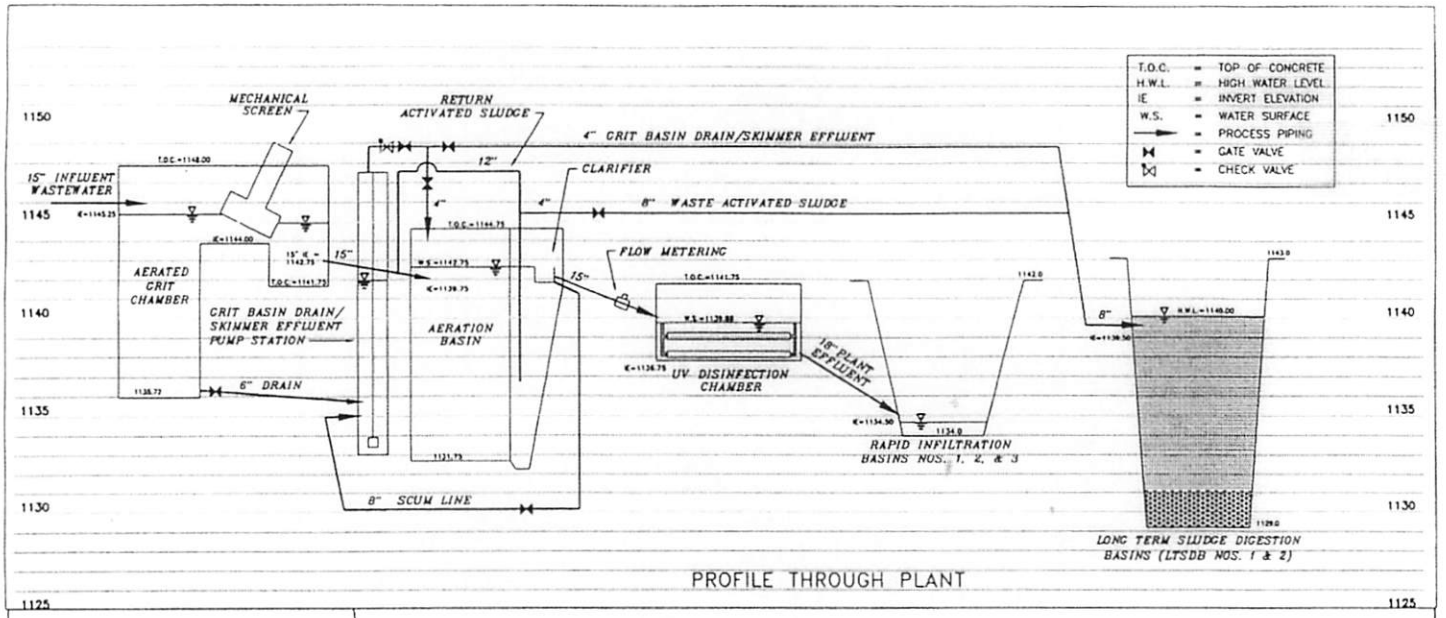
	INDUSTRY #1	INDUSTRY # 2
NAME:	Moses Lake Industries	SGL Automotive Carbon Fiber, LLC
INDUSTRY:	Chemical Production	Automotive
ADDRESS:	8248 Randolph Road NE	8781 Randolph Road NE
TELEPHONE:	(509) 762-5336	(509) 762-4600
CONTACT NAME:	Jon Erienmeyer, EHSS Manager	Lee Gjetley, Environmental Manager
INDUSTRIAL PRODUCT:	Chemicals for Semiconductor Industry	Carbon Fiber
STATE PERMIT No.	ST 00005375	ST 0501273
	INDUSTRY # 3	INDUSTRY # 4
NAME:	TK Holdings (Takata)	Titan Data Center
INDUSTRY:	Automotive	Computer
ADDRESS:	9138 Randolph Road NE	4949 Randolph Road NE
TELEPHONE:	(509) 762-5549	(509) 762-1332
CONTACT NAME:	Don Kersey, Plant Manager	Lee Durbin, Facility Manager
INDUSTRIAL PRODUCT:	Motor Vehicle Parts	DNA
STATE PERMIT No.	DNA	ST 0008105

5. Attach a simple schematic drawing of the POTW. *(Label as attachment B.5. Attachments should be 11 x 17"or smaller).* The schematic should show all treatment processes (from B.6 below), flow direction and flow quantities in million gallons per day (MGD) or gallons per day (GPD).

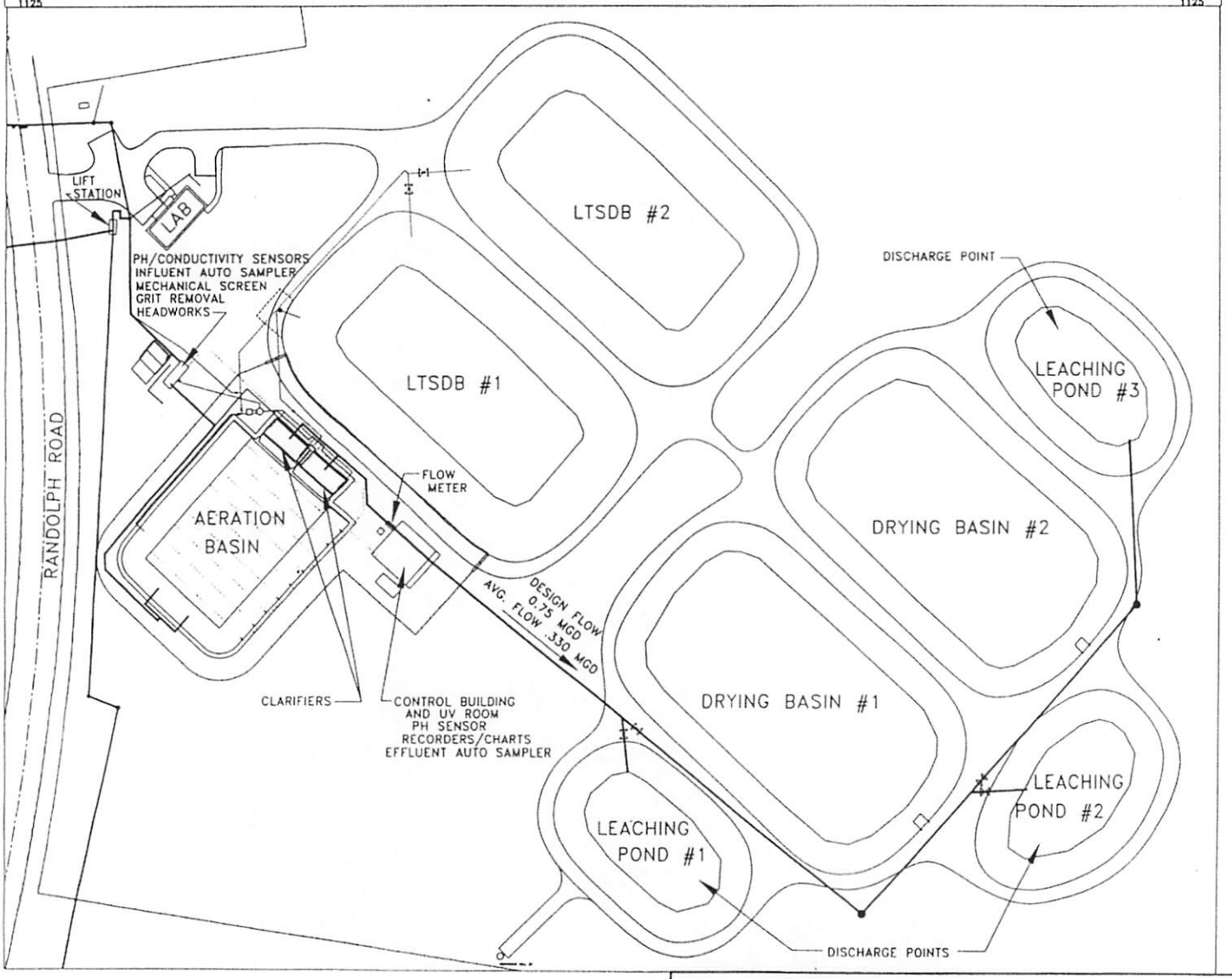
6. Identify the type and number of unit processes at this facility.

Treatment	Unit Process	Number of Units
Lift stations	In collection system	4
	At head of plant	1
Preliminary treatment	Manually operated bar screens	1
	Mechanically operated bar screens	
	Grit removal	1
	Pre-aeration	
	Comminutors/grinders	
	Other *(specify)* Hycor Auger	1
Primary Treatment	Primary Sedimentation Tank/Clarifiers	
	Septic tanks	
	Other *(specify)*	
Secondary Treatment	Oxidation Ditch	
	Package Plant - Activated Sludge	
	Package Plant - Physical/Chemical	
	Aerated Lagoon	
	Non-aerated Lagoon/Facultative Lagoon	
	Rotating Biological Contact	
	Secondary Clarifiers	
	Trickling Filter	
	Polishing Ponds	
	Other *(specify)* Biolac Treatment	1
Additional Treatment	Coagulation	
	Filtration	
	Storage (Lined Lagoon) Biosolids Treatment	2
	Storage (Unlined Lagoon)	
	Other *(specify)*	
Land Treatment or Application	Drainfield	
	Rapid Infiltration/Infiltration Lagoon	3
	Constructed Wetland	
	Sprinkler Irrigation	
	Flood Irrigation	
	Ridge and Furrow Irrigation	
	Subsurface Irrigation	
	Other *(specify)*	
Disinfection	Chlorination	
	Ultraviolet	1
	Other	

Schematic Drawing of POTW
Attachment B-5



PROFILE THROUGH PLANT



ATTACHMENT B.5

PLANT PROFILE AND SYSTEM PIPING PLAN
LARSON SEWAGE TREATMENT PLANT
MOSES LAKE, WASHINGTON

MUNICIPAL SERVICES DEPT. – ENGINEERING DIVISION

DRAWN	CITY OF MOSES LAKE
CHECK	
SCALE	GRANT COUNTY WASHINGTON
DATE	

SECTION C. WASTEWATER INFORMATION

1. The average influent flow to the plant for the maximum month for at least the last 12 months: .319 gallons/day

2. The maximum daily flow applied to the land treatment/application site for the last 12 months: .585 gallons/day inches/acre/month

3. Describe how the influent and effluent flow are measured? Mag Meter

4. Attach flow records for at least the last 12 months. *(Label as attachment C.4.)*

5. Describe the collection method for the samples analyzed below (*i.e.*, grab, 24-hour composite). Applicants must collect grab samples (not composites) for analysis of pH, temperature, cyanide, total phenols, residual chlorine, oil and grease, fecal coliform (including E. coli), and Enterococci (previously known as fecal streptococcus at § 122.26 (d)(2)(iii)(A)(3)),or volatile organics.

6. Provide measurement values or range of measurements for treated wastewater prior to land treatment/application for the parameters with an "X" in the left column of the table below. If you obtain the application from the Internet, contact Ecology's regional office to see if testing for a subset of these parameters is permissible. All analyses (except pH) must be conducted by a laboratory registered or accredited by Ecology (WAC 173-216-125). If this is an application for permit renewal, provide data for the last year for parameters that are routinely measured. For parameters measured only for this application, place the values under "Maximum." Report the values with units as specified in the parameter name or in the detection level.

   The Permittee must use the specified analytical methods, detection limits (DLs) and quantitation levels (QLs) in the following table unless Ecology approves an alternate method or the method used produces measurable results in the sample and EPA has listed it as an EPA approved method in 40 CFR Part 136. If the Permittee uses an alternative method as allowed above, it must report the test method, DL, and QL on the discharge monitoring report or in the required report.

Flow Records
Attachment C-4

	EFFLUENT FLOW, MGD		
	Total	Monthly Average	Daily Max
January	9.845	0.318	0.345
February	8.870	0.317	0.374
March	9.877	0.319	0.362
April	9.807	0.327	0.374
May	9.977	0.322	0.376
June	9.698	0.323	0.428
July	9.676	0.312	0.585
August	9.296	0.300	0.340
September	9.738	0.325	0.412
October	9.964	0.321	0.389
November	9.494	0.375	0.375
December	9.129	0.294	0.360
Total	115.371		
Max	9.977	0.375	0.585
MIN.			
Annual Average		0.321	0.393
Design Criteria			
Daily Maximum			33%
Annual Average		43%	

Collection Method
Section C-5

Section C-5 Described Collection Method:

CBOD, TSS, TDS:

Samples are collected over a 24 hour period via automatic sampler. When sample are collected by Wastewater personnel, temperatures and times are documented and records retained. Samples are then transferred to the accredited lab at the City owned Dunes Wastewater Facility for determination.

pH, Dissolved Oxygen:

pH and Dissolved Oxygen Readings are taken by stationary in stream probes sent to analyzer and graphed for each 24 hour day. High and Low readings are recorded and records retained for five years.

Fecal Coliform:

Grab samples are taken in Clean and sterilized containers. Samples are then transported to the accredited Dunes Wastewater facility lab and immediately analyzed.

Ammonia-N as N, Nitrate+Nitrite, TKN as N, Calcium, Magnesium, Potassium, Sodium, Arsenic, Cadmium, Chromium, Copper, Iron, Manganese, Mercury, Silver, Zinc:

Samples are collected over a 24 hour period via automatic sampler. When sample are collected by Wastewater personnel, temperatures and times are documented and records retained. These samples are bottled in sterile containers and placed in iced chests and transported via outside carrier to an accredited lab in Wenatchee. Chain of custody is filed and retained for five years.

X	Parameter	Measurement Values			Number of Analyses	Analytical Method Std. Methods 19th, 20th edition or EPA	Detection Limit/Quantitation Level
		Minimum	Maximum	Average			
X	BOD (5 day)	1	4	2	52	SM 5210 B	/2 mg/l
	COD					SM 5220 D	/10 mg/l
X	Total suspended solids	1	7	3	52	SM 2540 D	/5 mg/l
X	Total dissolved solids	252	460	332	52	SM 2540 C	
	Conductivity (micromhos/cm)					SM 2510 B	
X	Ammonia-N as N	<0.07	3.11	<0.31	52	SM 4500-NH_3 C	/0.3 mg/L
X	pH	6.54	7.32	6.89	365	SM 4500-H	0.1 standard units
	Total Residual Chlorine					SM4500-Cl G	50/ µg/L L
	Fecal coliform (organisms/100 mL)	1	15	5	53	SM 9221 E or 9222 D	
	Total coliform (organisms/100 mL)					SM 9221 B or 9222 B	
X	Dissolved oxygen	0.38	4.60	2.95	365	SM 4500-O C/G	
X	Nitrate + nitrite-N as N	0.23	<7.04	<1.81	52	SM 4500-NO_3 E	100 µg/L
X	Total kjeldahl N as N	0.90	5.0	1.42	52	SM 4500-N_{org} C/E/FG	300 µg/l
	Ortho-phosphate-P as P					SM 4500-P E/F	10 µg/l
	Total-phosphorous-P as P					SM 4500-P E/P/F	10 µg/l
	Total Oil & grease					EPA 1664A	1.4/5 mg/l
	NWTPH - Dx					Ecology NWTPH Dx	250/250 µg/l
	NWTPH - Gx					Ecology NWTPH Gx	250/250 µg/l
X	Calcium		27.9		1	EPA 200.7	10 µg/l
	Chloride					SM 4500-Cl C	0.15 µg/l
	Fluoride					SM 4500-F E	.025/0.1 mg/l
X	Magnesium		10.9		1	EPA 200.7	10/50 µg/l
X	Potassium		22.1		1	EPA 200.7	700/ µg/l
X	Sodium		82.0		1	EPA 200.7	29/ µg/l
	Sulfate					SM 4500-SO_4 C/D	/200 µg/l
	Alkalinity mg/L as $CaCO_3$					SM 2320 B	/5 mg/L as $CaCO_3$

X	Parameter	Measurement Values			Number of Analyses	Analytical Method Std. Methods 19th, 20th edition or EPA	Detection Limit/Quantitation Level
		Minimum	Maximum	Average			
X	Arsenic(total)	1.86	2.74	2.20	4	EPA 200.8	0.1/0.5 µg/l
	Barium (total)					EPA 200.8	0.5/2 µg/l
X	Cadmium (total)	<0.3	3.90	<1.2	4	EPA 200.8	.05/.25 µg/l
X	Chromium (total)	<4.7	<4.7	<4.7	4	EPA 200.8	0.2/1 µg/l
X	Copper (total)		4.0		1	EPA 200.8	0.4/2 µg/l
X	Iron (total)		306.0		1	EPA 200.7	12.5/50 µg/l
	Lead (total)					EPA 200.8	0.1/0.5 µg/l
X	Manganese (total)		12.2		1	EPA 200.8	0.1/0.5 µg/l
X	Mercury (total) pg/L	<0.2	<0.2	<0.2	4	EPA 1631E	0.2/.5 pg/l
	Molybdenum(total)					EPA 200.8	0.1/0.5 µg/l
	Nickel(total)					EPA 200.8	0.1/0.5 µg/l
	Selenium (total)					EPA 200.8	1/1 µg/l
X	Silver (total)	<4.7	<4.7	<4.7	4	EPA 200.8	.04/.2 µg/l
X	Zinc (total)		89.0		1	EPA 200.8	0.5/2.5 µg/l

Detection level (DL) or detection limit means the minimum concentration of an analyte (substance) that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero as determined by the procedure given in 40 CFR part 136, Appendix B.

Quantitation Level (QL) also known as Minimum Level of Quantitation (ML) – The lowest level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that the lab has used all method-specified sample weights, volumes, and cleanup procedures. The QL is calculated by multiplying the MDL by 3.18 and rounding the result to the number nearest to (1, 2, or 5) x 10^n, where n is an integer. (64 FR 30417).
ALSO GIVEN AS:
The smallest detectable concentration of analyte greater than the Detection Limit (DL) where the accuracy (precision & bias) achieves the objectives of the intended purpose. (Report of the Federal Advisory Committee on Detection and Quantitation Approaches and Uses in Clean Water Act Programs Submitted to the US Environmental Protection Agency December 2007).

Annual Assesment of Flow and Waste Load for the City of Moses Lake Larson WWTP, Permit No. ST 8024

January 2015 to December 2015

	Effluent Monthly Averages																	
	pH s.u.		CBOD5				TSS				TDS	TKN as N	Nitrate	Ammonia	TN as N	DO	TEMP	Fecal
	Avg. Monthly Max	Avg. Monthly Min	MG/L Daily Max	MG/L Average	lbs/day Average	% REM	MG/L Daily Max	MG/L Average	lbs/day	% REM	MG/L Daily Max	MG/L	MG/L Daily Max	MG/l NH3 as N	MG/L Daily Max	MG/L	DEG. F	CFU/100 ml Daily Max
January	6.85	6.81	4	2	6	99	7	4	9	99	349	2.10	3.19	0.95	4.06	3.54	51	7
February	6.86	6.82	3	2	5	99	5	3	8	99	339	3.70	1.63	0.24	2.61	3.64	54	4
March	6.88	6.84	4	3	9	98	5	3	9	99	336	1.70	3.97	0.27	3.03	3.96	57	13
April	6.82	6.77	4	3	9	98	5	3	10	99	365	4.50	0.67	0.18	2.09	3.80	60	12
May	6.84	6.77	3	3	7	99	5	3	7	99	424	1.50	0.50	0.16	1.78	3.40	68	13
June	6.98	6.92	2	2	5	99	4	2	7	99	382	1.20	2.21	0.18	2.12	1.81	74	8
July	7.09	7.01	4	3	7	99	5	3	7	99	336	1.10	1.07	0.12	2.01	2.15	77	15
August	7.04	6.97	2	2	4	99	3	2	6	99	354	1.30	2.08	0.10	2.97	2.15	75	2
September	7.04	6.96	3	2	5	99	3	2	5	99	397	1.30	3.08	0.15	3.37	2.79	71	6
October	7.00	6.93	2	1	3	99	6	3	9	99	389	1.30	4.91	0.12	4.59	2.86	67	4
November	7.06	6.98	4	2	6	99	6	5	12	98	393	1.50	2.44	0.34	3.57	2.80	58	12
December	6.96	6.86	3	2	5	99	5	3	7	99	365	0.00	0.00	0.00	0.00	3.12	53	4
Max	7.09		4	3	9	99	7	5	12	99	424	4.50	4.91	0.95	4.59	3.96	77	15
Min		6.77																
Annual Average	6.95	6.89	3	2	6	99	5	3	8	99	369	1.77	2.15	0.23	2.68	3.00	64	8
Permit Limits:																		
Daily Maximum			15				23				1000							50
Monthly Average	6.5 to 8.5			10				15					6		8			

Quarterly February			Quarterly May			Quarterly August			Quarterly November		
	Total	Units		Total	Units		Total	Units		Total	Units
Arsenic	**2.74**	ug/l	Arsenic	**1.86**	ug/l	Arsenic	**2.02**	ug/l	Arsenic	**2.16**	ug/l
Cadmium	**<0.3**	ug/l	Cadmium	**3.9**	ug/l	Cadmium	**<0.3**	ug/l	Cadmium	**<0.3**	ug/l
Chromium	**<4.7**	ug/l	Chromium	**<4.7**	ug/l	Chromium	**<4.7**	ug/l	Chromium	**<4.7**	ug/l
Mercury	**<0.2**	ug/l	Mercury	**<0.2**	ug/l	Mercury	**<0.2**	ug/l	Mercury	**<0.2**	ug/l
Silver	**<4.7**	ug/l	Silver	**<4.7**	ug/l	Silver	**<4.7**	ug/l	Silver	**<4.7**	ug/l

Annual February		total	units
Copper		**3.97**	**ug/l**
Iron		**306.0**	**ug/l**
Manganese		**12.2**	**ug/l**
Zinc		**89.0**	**ug/l**
Calcium		**27.9**	**mg/l**
Magnesium		**10.9**	**mg/l**
Potassium		**22.1**	**mg/l**
Sodium		**82.0**	**mg/l**

SECTION D. GROUNDWATER INFORMATON

Provide available data measurements or range of measurements from monitoring wells or supply wells in the area of discharge. Provide the analytical method and detection limit, if known. Provide the location of each well on the map required in E.3 below. Attach well logs when available (*label as Attachment D*). Copy this page as necessary for each well (*label as Attachment D*). Provide the latitude and longitude in decimal format.

Ecology Well Tag ID # BCE-785 *(exampleAAB123)*

Well ID # MW-2 *(example MW-1)*

Latitude: 47.186614

Longitude: 119.289044

Well Elevation (to the nearest 0.01 feet) 1142.90 Check the appropriate box; the elevation measurement is relative to: the NAVD88 standard ☐ mean sea level ☒

Parameter	Units	Range of Measurements	Number of Analyses	Analytical Method	Detection Limit
BOD (5 day)	mg/L				
COD	mg/L				
Total organic carbon	mg/L	2.05 to 1.07	4	SM 5310	0.5
Dissolved Fixed Solids	mg/L				
Total dissolved solids	mg/L	343 to 149	4	SM 2540 C	0.001
pH	Standard units	7.03 to 6.45	4	SM 4500 B	4 to 10
Conductivity	(micromhos/cm)	540 to 215	4	SM 2510 B	<1
Alkalinity	mg/L as $CaCO_3$				
Total hardness	mg/L				
Fecal coliform	organisms/100mL				
Total coliform	organisms/100mL	<1 to <1	4	SM 9222 B	<1
Dissolved oxygen	mg/L				
Ammonia-N as N	mg/L				
Nitrate + nitrite-N, as N	mg/L	<2.03 to <0.58	4	SM 4500N03F	0.07
Total kjeldahl N as N	mg/L	0.5 to 0.3	4	SM 4500N-C	0.3
Ortho-phosphate-P as P	mg/L				
Total-phosphorus-P as P	mg/L				
Total Oil & Grease	mg/L				
Total petroleum hydrocarbon	☐mg/L ☐ µg/l				
Calcium	☒mg/L ☐ µg/l	44.6 to 13.4	4	EPA 200.7	.2
Chloride	☒mg/L ☐ µg/l	36.9 to 8.1	4	4500 C1-B	0.5
Fluoride	☐mg/L ☐ µg/l				
Magnesium	☒mg/L ☐ µg/l	20.8 to 7.3	4	EPA 200.7	0.06
Potassium	☒mg/L ☐ µg/l	10.2 to 6.8	4	EPA 200.7	0.62
Sodium	☒mg/L ☐ µg/l	68 to 12.2	4	EPA 200.7	0.35
Sulfate	☐mg/L ☐ µg/l				
Barium	☐mg/L ☐ µg/l				
Cadmium	☐mg/L ☒ µg/l	<.3 to <.3	2	EPA 200.9	0.3
Chromium	☐mg/L ☒ µg/l	<4.7 to <4.7	2	EPA 200.7	4.7
Copper	☐mg/L ☒ µg/l	9.6	1	EPA 200.7	2
Iron	☒mg/L ☐ µg/l	123 to 16.8	4	EPA 200.7	<9.7
Lead	☐mg/L ☒ µg/l	<0.5	1	EPA 200.9	0.5
Manganese	☐mg/L ☒ µg/l	13.4	1	EPA 200.7	1
Mercury	☐mg/L ☒ µg/l	<0.2 to <.2	2	EPA 245.1	0.2
Selenium	☐mg/L ☐ µg/l				
Silver	☐mg/L ☒ µg/l	<4.7 to <4.7	2	EPA 200.7	4.7
Zinc	☐mg/L ☒ µg/l	5.25	1	EPA 200.7	5
Depth to water level (to the nearest .01 feet)		1080.87			

SECTION D. GROUNDWATER INFORMATON

Provide available data measurements or range of measurements from monitoring wells or supply wells in the area of discharge. Provide the analytical method and detection limit, if known. Provide the location of each well on the map required in E.3 below. Attach well logs when available (*label as Attachment D*). Copy this page as necessary for each well (*label as Attachment D*). Provide the latitude and longitude in decimal format.

Ecology Well Tag ID # BCE-786 *(exampleAAB123)*

Well ID # MW-3 *(example MW-1)*

Latitude: 47.186365

Longitude: 119.292980

Well Elevation (to the nearest 0.01 feet) 1144.83 Check the appropriate box; the elevation measurement is relative to: the NAVD88 standard ☐ mean sea level ☒

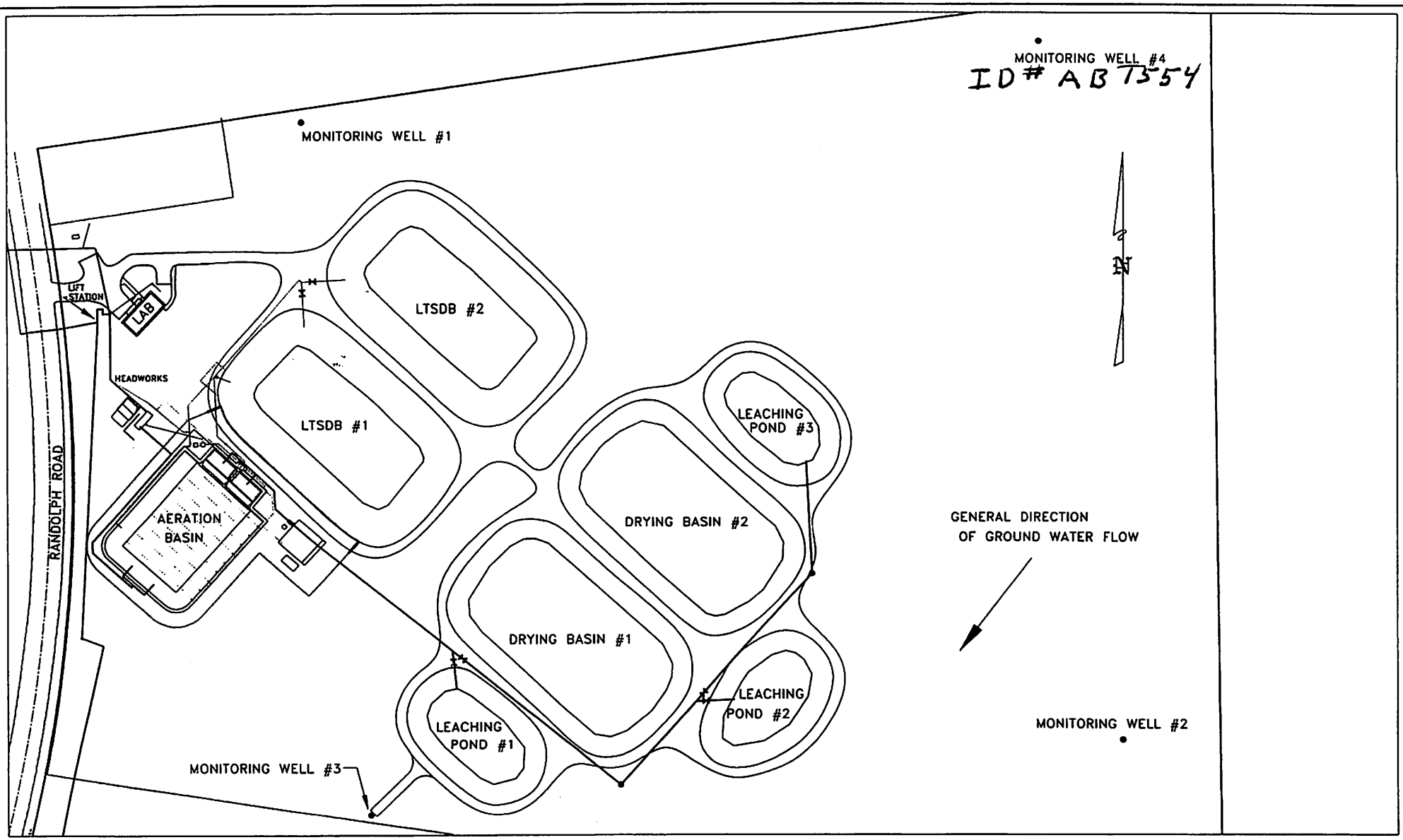
Parameter	Units	Range of Measurements	Number of Analyses	Analytical Method	Detection Limit
BOD (5 day)	mg/L				
COD	mg/L				
Total organic carbon	mg/L	2.71 to 1.85	4	SM 5310	0.5
Dissolved Fixed Solids	mg/L				
Total dissolved solids	mg/L	399 to 294	4	SM 2540 C	0.001
pH	Standard units	7.08 to 6.81	4	SM 4500 B	4 to 10
Conductivity	(micromhos/cm)	715 to 595	4	SM 2510 B	<1
Alkalinity	mg/L as $CaCO_3$				
Total hardness	mg/L				
Fecal coliform	organisms/100mL				
Total coliform	organisms/100mL	<1 to <1	4	SM 9222 B	<1
Dissolved oxygen	mg/L				
Ammonia-N as N	mg/L				
Nitrate + nitrite-N, as N	mg/L	<4.82 to <3.51	4	SM 4500N03F	0.07
Total kjeldahl N as N	mg/L	29 to 0.3	4	SM 4500N-C	0.30
Ortho-phosphate-P as P	mg/L				
Total-phosphorus-P as P	mg/L				
Total Oil & Grease	mg/L				
Total petroleum hydrocarbon	☐mg/L ☐ µg/l				
Calcium	☒mg/L ☐ µg/l	34 to 22.5	4	EPA 200.7	.2
Chloride	☒mg/L ☐ µg/l	51 to 39.8	4	4500 C1-B	0.5
Fluoride	☐mg/L ☐ µg/l				
Magnesium	☒mg/L ☐ µg/l	13.45 to 9.8	4	EPA 200.7	0.06
Potassium	☒mg/L ☐ µg/l	20 to 17	4	EPA 200.7	0.62
Sodium	☒mg/L ☐ µg/l	86.2 to 70.5	4	EPA 200.7	0.35
Sulfate	☐mg/L ☐ µg/l				
Barium	☐mg/L ☐ µg/l				
Cadmium	☐mg/L ☒ µg/l	<.3	2	EPA 200.9	0.3
Chromium	☐mg/L ☒ µg/l	<4.7	2	EPA 200.7	4.7
Copper	☐mg/L ☒ µg/l	14.8	1	EPA 200.7	2
Iron	☒mg/L ☐ µg/l	180 to 26.8	4	EPA 200.7	9.7
Lead	☐mg/L ☒ µg/l	<0.5	1	EPA 200.9	0.5
Manganese	☐mg/L ☒ µg/l	13.4	1	EPA 200.7	1
Mercury	☐mg/L ☒ µg/l	<.2	2	EPA 245.1	0.2
Selenium	☐mg/L ☐ µg/l				
Silver	☐mg/L ☒ µg/l	<4.7	2	EPA 200.7	4.7
Zinc	☐mg/L ☒ µg/l	<.5	1	EPA 200.7	5
Depth to water level (to the nearest .01 feet)		1079.65			

SECTION D. GROUNDWATER INFORMATON

Provide available data measurements or range of measurements from monitoring wells or supply wells in the area of discharge. Provide the analytical method and detection limit, if known. Provide the location of each well on the map required in E.3 below. Attach well logs when available (*label as Attachment D*). Copy this page as necessary for each well (*label as Attachment D*). Provide the latitude and longitude in decimal format.

Ecology Well Tag ID # ABT-554 Well ID # MW-4 *(example MW-1)*
(exampleAAB123)
Latitude: 47.189079 Longitude: 119.289475
Well Elevation (to the nearest 0.01 feet) 1145.97 Check the appropriate box; the elevation measurement is relative to: the NAVD88 standard ☐ mean sea level ☒

Parameter	Units	Range of Measurements	Number of Analyses	Analytical Method	Detection Limit
BOD (5 day)	mg/L				
COD	mg/L				
Total organic carbon	mg/L	1.66 to 1.44	4	SM 5310	0.5
Dissolved Fixed Solids	mg/L				
Total dissolved solids	mg/L	348 to 282	4	SM 2540 C	0.001
pH	Standard units	7.43 to 6.82	4	SM 4500 B	4 to 10
Conductivity	(micromhos/cm)	618 to 531	4	SM 2510 B	<1
Alkalinity	mg/L as $CaCO_3$				
Total hardness	mg/L				
Fecal coliform	organisms/100mL				
Total coliform	organisms/100mL	<1	4	SM 9222 B	<1
Dissolved oxygen	mg/L				
Ammonia-N as N	mg/L				
Nitrate + nitrite-N, as N	mg/L	<4.64 to <3.76	4	SM 4500N03F	0.07
Total kjeldahl N as N	mg/L	0.5 to <0.3	4	SM 4500N-C	0.3
Ortho-phosphate-P as P	mg/L				
Total-phosphorus-P as P	mg/L				
Total Oil & Grease	mg/L				
Total petroleum hydrocarbon	☐mg/L ☐ µg/l				
Calcium	☒mg/L ☐ µg/l	52 to 46.6	4	EPA 200.7	.2
Chloride	☒mg/L ☐ µg/l	10.4 to 9.6	4	4500 C1-B	0.5
Fluoride	☐mg/L ☐ µg/l				
Magnesium	☒mg/L ☐ µg/l	22.5 to 19.6	4	EPA 200.7	0.06
Potassium	☒mg/L ☐ µg/l	6.55 to 6.2	4	EPA 200.7	0.62
Sodium	☒mg/L ☐ µg/l	36.2 to 32.1	4	EPA 200.7	0.35
Sulfate	☐mg/L ☐ µg/l				
Barium	☐mg/L ☐ µg/l				
Cadmium	☐mg/L ☒ µg/l	<.3	2	EPA 200.9	0.3
Chromium	☐mg/L ☒ µg/l	14.2 to <4.7	2	EPA 200.7	4.7
Copper	☐mg/L ☒ µg/l	<2	1	EPA 200.7	2
Iron	☒mg/L ☐ µg/l	104 to <9.7	4	EPA 200.7	<9.7
Lead	☐mg/L ☒ µg/l	<0.5	1	EPA 200.9	0.5
Manganese	☐mg/L ☒ µg/l	3	1	EPA 200.7	1
Mercury	☐mg/L ☒ µg/l	<0.2	2	EPA 245.1	0.2
Selenium	☐mg/L ☐ µg/l				
Silver	☐mg/L ☒ µg/l	<4.7	2	EPA 200.7	4.7
Zinc	☐mg/L ☒ µg/l	<5	1	EPA 200.7	5
Depth to water level (to the nearest .01 feet)		1082.94			



Attachment D
Page 4 of 8

MONITORING WELL LOCATIONS		
MUNICIPAL SERVICES DEPT. – ENGINEERING DIVISION		
DRAWN CHECK SCALE DATE	CITY OF MOSES LAKE GRANT COUNTY WASHINGTON	

Annual Assesment of Ground Water Monitoring for the City of Moses Lake Larson WWTP
January 2015 to December 2015

Monitoring Well # 2

	pH s.u.	Conductivity umhos/cm	TOC mg/l	Chloride mg/l	Nitrate + Nitrite NO3 as N mg/l MG/l	TKN as N mg/l	TDS mg/l	Temperature Deg. F	Total Coliform CFU/100 ml	Static Level Feet Above Sea Level	Monitoring Well # 1 Static Level Feet Above Sea Level
January											
February	6.99	512	1.46	31.4	<1.62	0.30	269	61	<1	1079.00	1081.00
March											
April											
May	6.45	540	2.15	36.9	<1.20	0.40	343	56	<1	1079.99	1080.50
June											
July											
August	7.03	215	1.17	<0.5	<0.58	0.50	149	61	<1	1081.60	1082.13
September											
October											
November	6.78	400	1.07	8.1	<2.03	0.40	202	63	<1	1080.28	1082.48
December											
Annual Average	6.81	417	1.46	25.5	<1.36	0.40	241	60	<1	1080.22	1081.53
Minumum	6.45	215	1.07	8.1	<0.58	0.30	149	56	<1	1079.00	1080.50

Comments:

Annually

	Copper (Total) Cu ug/l	Lead (Total) Pb ug/l	Maganese Mn ug/l	Zinc (Total) Zn ug/l
February	9.6	<0.5	13.4	5.25

2/year- 1st & 3rd quarters

	Calcium mg/l	Magnesium mg/l	Potassium mg/l	Sodium mg/l	Iron (Total) mg/l	Ferrous Iron Present/Absent Field Measurement	Arsenic (Total) As ug/l	Cadmium (Total) Cd ug/l	Chromium (Total) Cr ug/l	Mercury (Total) Hg ug/l	Silver (Total) Ag ug/l
February	44.60	20.80	8.95	15.80	123.00	A	<1.4	<0.3	<4.7	<0.2	<4.7
August	13.40	7.30	7.50	16.00	16.80	A	<1.4	<0.3	<4.7	<0.2	<4.7

Quarterly	Calcium mg/l	Magnesium mg/l	Potassium mg/l	Sodium mg/l	Iron (Total) mg/l	Ferrous Iron Present/Absent Field Measurement
May	25.80	11.15	10.20	68.00	18.40	A
November	31.80	14.00	6.80	12.20	51.00	A

Annual Assesment of Ground Water Monitoring for the City of Moses Lake Larson WWTP
January 2015 to December 2015

Monitoring Well # 3

	pH s.u.	Conductivity umhos/cm	TOC mg/l	Chloride mg/l	Nitrate + Nitrite NO3 as N mg/l MG/l	TKN as N mg/l	TDS mg/l	Temperature Deg. F	Total Coliform CFU/100 ml	Static Level Feet Above Sea Level
January										
February	7.08	610	1.85	39.8	<3.51	0.40	294	62	<1	1078.70
March										
April										
May	6.81	595	2.35	51.0	<3.53	0.30	306	61	<1	1078.68
June										
July										
August	6.91	626	2.30	40.0	<4.51	0.80	399	61	<1	1080.23
September										
October										
November	6.82	715	2.71	46.1	<4.82	0.30	374	59	<1	1079.46
December										
Annual Average	6.91	637	2.30	44.2	<4.09	0.45	343	61	<1	1079.27
Minumum	6.81	595	1.85	39.8	<3.51	0.30	294	59	<1	1078.68

Comments:

Annually	Copper (Total) Cu ug/l	Lead (Total) Pb ug/l	Maganese Mn ug/l	Zinc (Total) Zn ug/l
February	14.80	<0.5	13.40	<5.0

2/year- 1st & 3rd quarters	Calcium mg/l	Magnesium mg/l	Potassium mg/l	Sodium mg/l	Iron (Total) mg/l	Ferrous Iron Present/Absent Field Measurement	Arsenic (Total) As ug/l	Cadmium (Total) Cd ug/l	Chromium (Total) Cr ug/l	Mercury (Total) Hg ug/l	Silver (Total) Ag ug/l
February	22.50	9.80	17.00	70.50	40.80	A	3.28	<0.3	<4.7	<0.2	<4.7
August	27.00	12.75	18.60	79.50	26.80	A	2.6	<0.3	<4.7	<0.2	<4.7

Quarterly	Calcium mg/l	Magnesium mg/l	Potassium mg/l	Sodium mg/l	Iron (Total) mg/l	Ferrous Iron Present/Absent Field Measurement
May	34.0	13.5	20.0	86.5	34.8	A
November	29.0	12.0	18.4	84.0	180.0	A

Annual Assesment of Ground Water Monitoring for the City of Moses Lake Larson WWTP
January 2015 to December 2015

Monitoring Well # 4

	pH s.u.	Conductivity umhos/cm	TOC mg/l	Chloride mg/l	Nitrate + Nitrite NO3 as N mg/l MG/l	TKN as N mg/l	TDS mg/l	Temperature Deg. F	Total Coliform CFU/100 ml	Static Level Feet Above Sea Level
January										
February	7.38	570	1.44	9.9	<3.97	0.30	282	57	<1	1081.97
March										
April										
May	6.82	531	1.54	9.6	<4.01	<0.3	299	56	<1	1082.51
June										
July										
August	7.43	541	1.46	10.4	<3.76	0.50	348	60	<1	1083.77
September										
October										
November	7.15	618	1.66	10.4	<4.64	0.30	335	58	<1	1082.97
December										
Annual Average	7.20	565	1.53	10.1	<4.10	0.37	316	58	<1	1082.81
Minumum	6.82	531	1.44	9.6	<3.76	0.30	282	56	<1	1081.97

Comments: *T well was re sampled on 6-2-14 with a <1 result This well is up gradient.

Annually

	Copper (Total) Cu ug/l	Lead (Total) Pb ug/l	Maganese Mn ug/l	Zinc (Total) Zn ug/l
February	<2	<0.5	3.00	<5.0

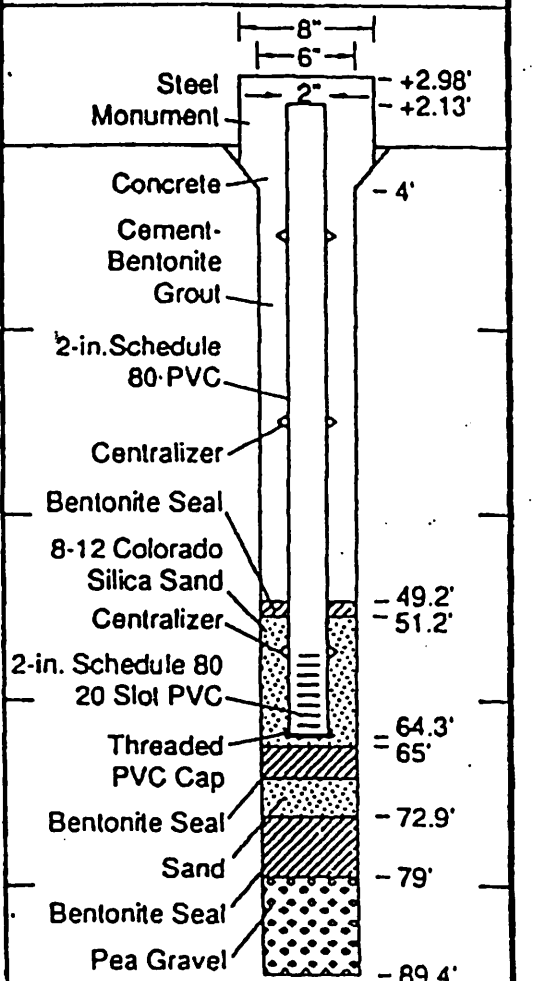
2/year- 1st & 3rd quarters

	Calcium mg/l	Magnesium mg/l	Potassium mg/l	Sodium mg/l	Iron (Total) mg/l	Ferrous Iron Present/Absent Field Measurement	Arsenic (Total) As ug/l	Cadmium (Total) Cd ug/l	Chromium (Total) Cr ug/l	Mercury (Total) Hg ug/l	Silver (Total) Ag ug/l
February	46.60	20.55	6.20	32.40	104.00	A	5.68	<0.3	14.20	<0.2	<4.7
August	48.20	22.55	6.45	33.40	<9.7	A	5.04	<0.3	<4.7	<0.2	<4.7

Quarterly	Calcium mg/l	Magnesium mg/l	Potassium mg/l	Sodium mg/l	Iron (Total) mg/l	Ferrous Iron Present/Absent Field Measurement
May	49.80	19.60	6.35	32.10	14.0	A
November	52.00	21.80	6.55	36.20	22.7	A

LOG & AS-BUILT DIAGRAM

GEOLOGIC LOG	Hydrologic Unit	Depth in Feet	Water Level
Driller: Bartholomew Brothers Completion Date: 12-15-88 Elevation: Approx. 1142.6'			
Ground Surface			
Brown, silty SAND	Unsaturated Zone		
Dark gray, sandy GRAVEL with cobbles		20	
		40	
Dark gray, coarse SAND with gravel and some silty sand			
		60	
Brown, silty SAND with gravel; wet	Aquifer		12-15-88
Dark gray BASALT with approx. 3 in. layers of soft rock; wet		80	
Dark brown, weathered BASALT with silica chips; wet			
Bottom of Well at 89.4 Feet		100	
		120	



SHANNON & WILSON, INC. WASTE MANAGEMENT SERVICES SEATTLE, WASHINGTON (206) 632-8020	Larson Sewage Treatment Plant Moses Lake, Washington GROUNDWATER MONITORING WELL MW-1	December 1988 T-1066-01 FIG. A-1

ATTACHMENT D.
PAGE 3 OF 8

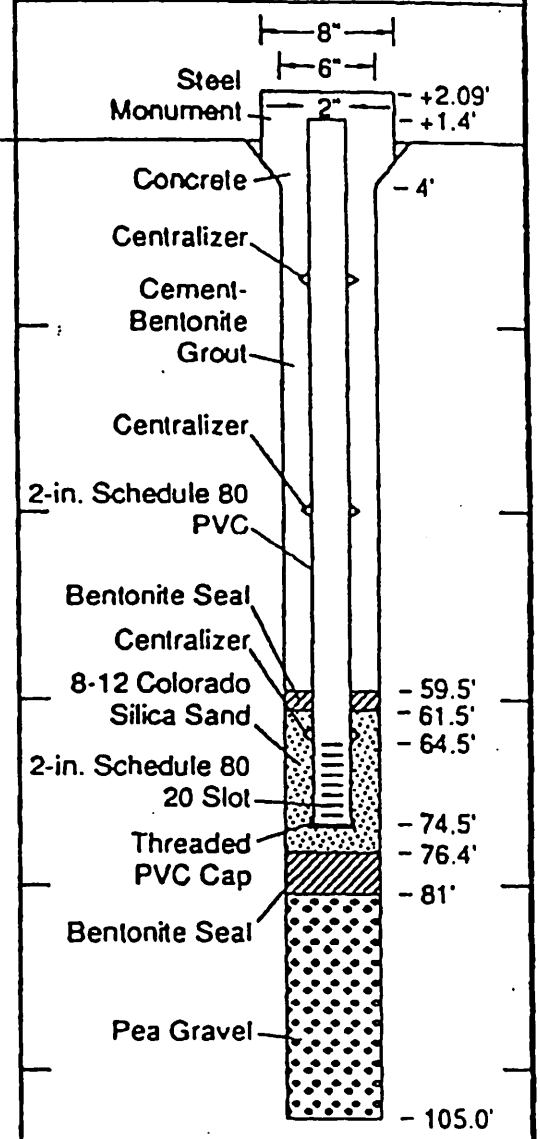
LOG & AS-BUILT DIAGRAM ID BCE-785

GEOLOGIC LOG	Hydrologic Unit
Driller: Bartholomew Brothers Completion Date: 12-13-88 Elevation: Approx. 1141.5'	
Ground Surface	
Brown, silty SAND	Unsaturated Zone
Dark gray, sandy GRAVEL with cobbles	
Dark gray, sandy GRAVEL with cobbles; moist	
Brown, silty SAND; wet	Aquifer
Brown, silty SAND with gravel; wet	
Brown CLAY with gravel; wet	Aquitard
Dark brown, weathered BASALT with clay infilling	Aquifer
Bottom of Well at 105 Feet	

Depth in Feet: 20, 40, 60, 80, 100, 120

Water Level: 12-15-88

AS-BUILT

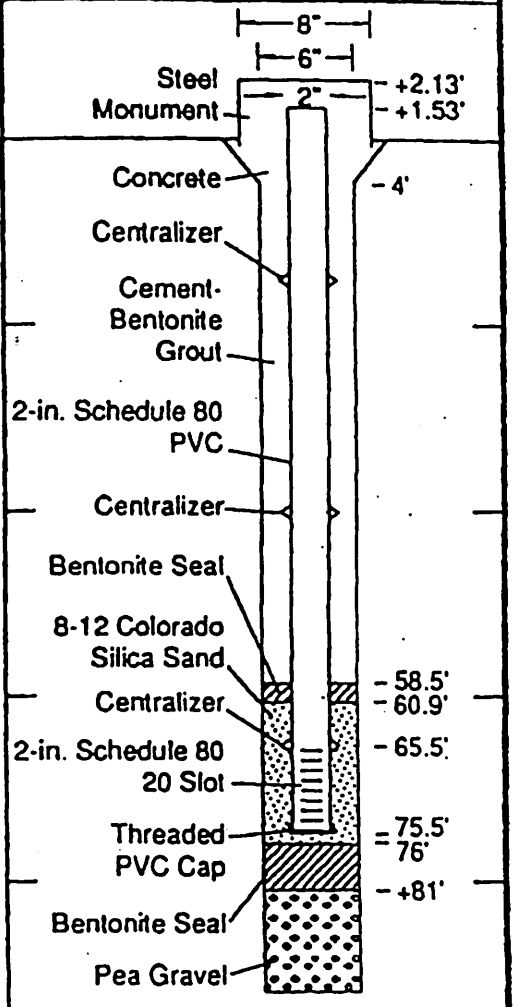


SHANNON & WILSON, INC.	Larson Sewage Treatment Plant Moses Lake, Washington	December 1988
WASTE MANAGEMENT SERVICES SEATTLE, WASHINGTON (206) 632-8020	GROUNDWATER MONITORING WELL MW-2	T-1066-01 FIG. A-2

ATTACHMENT D.
PAGE 6 OF 8

LOG & AS-BUILT DIAGRAM ID BCE-786

GEOLOGIC LOG	Hydrologic Unit	Depth in Feet	Water Level
Driller: Bartholomew Brothers Completion Date: 12-9-88 Elevation: Approx. 1143.3'			
Ground Surface			
Light brown, silty SAND	Unsaturated Zone		
Dark gray, sandy GRAVEL		20	
Dark gray, sandy GRAVEL with clay; moist			
Dark gray, sandy GRAVEL		40	
Dark gray, sandy GRAVEL; moist		60	
Dark gray, sandy GRAVEL; wet	Aquifer		12-15-88 ▽
Brown, sandy GRAVEL with sandy clay lenses; wet		80	
Dark brown, weathered BASALT with clay infilling			
Bottom of Well at 92 Feet		100	
		120	



SHANNON & WILSON, INC. WASTE MANAGEMENT SERVICES SEATTLE, WASHINGTON (206) 632-8020	Larson Sewage Treatment Plant Moses Lake, Washington GROUNDWATER MONITORING WELL MW-3	December 1988 T-1066-01 FIG. A-3

ATTACHMENT D.
PAGE 7 OF 8

ID # ABT554

PROJECT NUMBER	BORING NUMBER	
117184.A0.B0	MW-4	SHEET 1 OF 1

WELL COMPLETION LOG

PROJECT City of Moses Lake LOCATION Larson Wastewater Treatment Plant

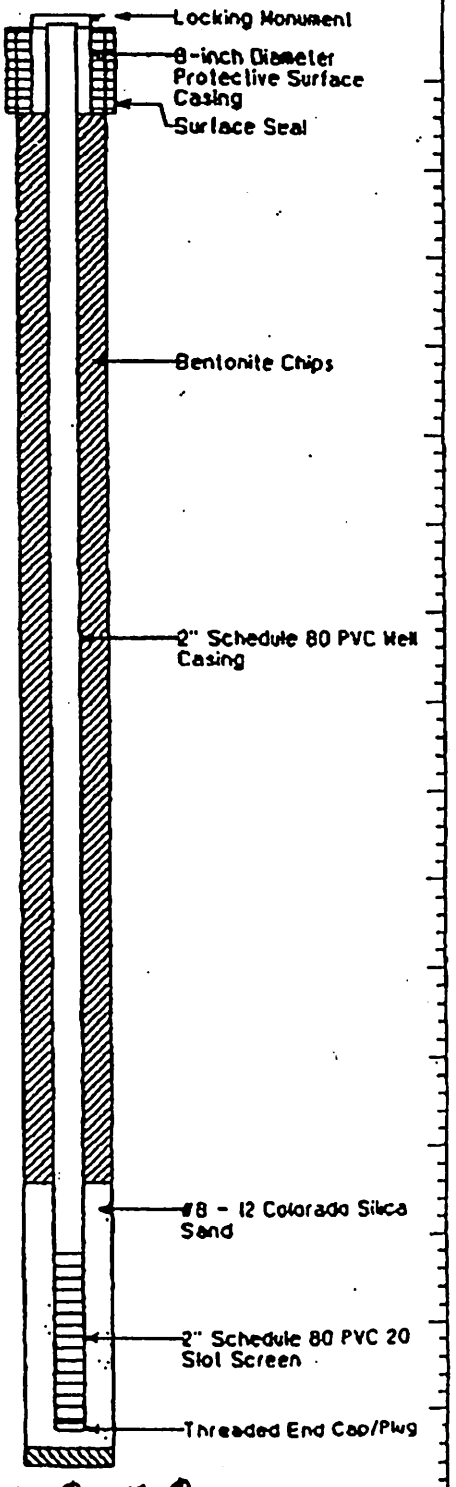
ELEVATION 1145.97 (top of casing) DRILLING CONTRACTOR Environmental West Exploration

DRILLING METHOD AND EQUIPMENT Air Rotary, 8-inch Tubex (Ground surface elevation 1142.9)

WATER LEVELS 810 ft. bgs, 83.92 btc START 3/28/96 FINISH 3/29/96 LOGGER M. Henry

DEPTH BELOW SURFACE (FT)	SAMPLE: INTERVAL	SAMPLE: TYPE AND NUMBER	SAMPLE: RECOVERY	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY
0.0					GRAVELLY SAND, (SW), gray, dry, gravel up to 1/2 inch, subrounded
10.0					GRAVELLY SAND, (SW), gray to black, moist
20.0					SANDY GRAVEL WITH COBBLES, (GW), gray to black, moist, cobbles from 20-35 ft.
40.0					Few cobbles from 40-45 ft. bgs
60.0					At 53 ft., cobbles increasing
80.0					SANDY GRAVEL WITH COBBLES, (GW), moist
					GRAVELLY SAND WITH SILT, (SW), brown, moist to wet
70.0					BASALT, fractured near surface, competent by 77 ft.
78.0					TD Borehole at 78 ft. bgs

WELL COMPLETION DIAGRAM



PAGE 8 OF 8

SECTION E. SITE ASSESSMENT

Note: The Department of Ecology Water Resources Section can be consulted for identifying wells within one mile of your site. The local library and local city or county planning offices may be helpful in providing the information required in this section.

1. Give the legal description of the land treatment/application site(s) by section/township/range and latitude/longitude (approximate center of the site; NAD83/WGS84 reference datum). Indicate the owner for each site. Give the acreage of each land treatment/application site(s). Attach a copy of the contract(s) authorizing use of(s) used land for treatment/application. *(Label as attachment E.1)*

   NW 1/4 of section 34, T.20N, R28EWM
   Latitude47.188250, Longitude 119.294357
   Owned and Operated by City of Moses Lake
   Site is 34 acres

2. If this is a new discharge, list all environmental control permits or approvals needed for this project; for example, SEPA review, engineering reports, hydrogeologic reports, , biosolids permits, or air emissions permits.

   NA

3. Attach an original United States Geological Survey (USGS) 7.5 minute topographic map or aerial photograph that shows the POTW and the land treatment/application site(s).
   USGS topographical maps are available from the Department of Natural Resources (360-902-1234), Metsker Maps (206-588-5222), and some local bookstores and internet sites.
   Show the following on this map: *(Label as attachment E.3.)*

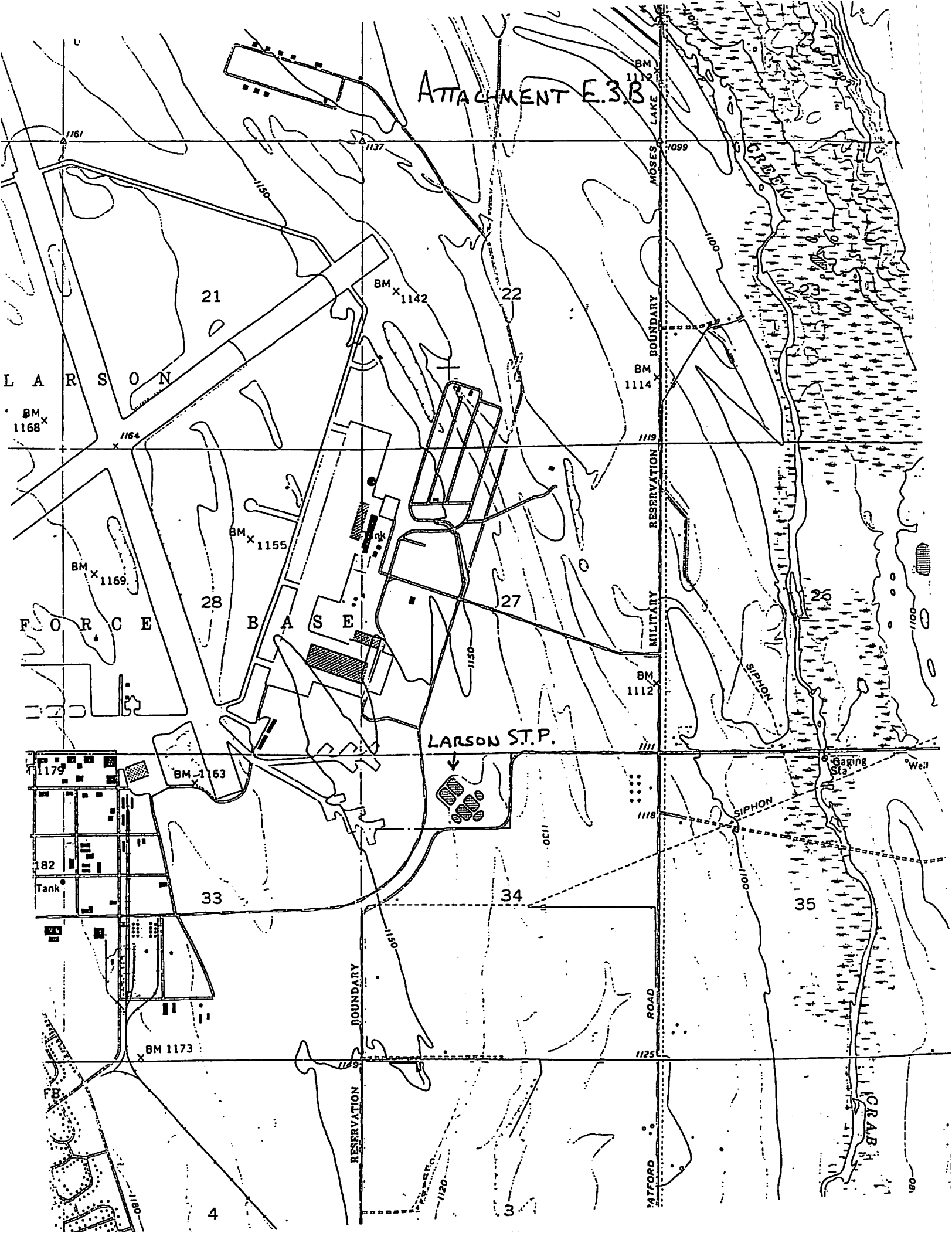
   a. Location and name of internal and adjacent streets.
   b. Surface water drainage systems within ¼ mile of the site.
   c. All wells within 1 mile of the site.
   d. Wastewater discharge points.
   e. Land uses and zoning adjacent to the wastewater application site.
   f. Ground water gradient.

4. Describe the soils on the site using information from local soil survey reports. **Soils information is available from your county conservation district or from information contained in the sites hydrogeologic report..**
   (Label as attachment E.4.)

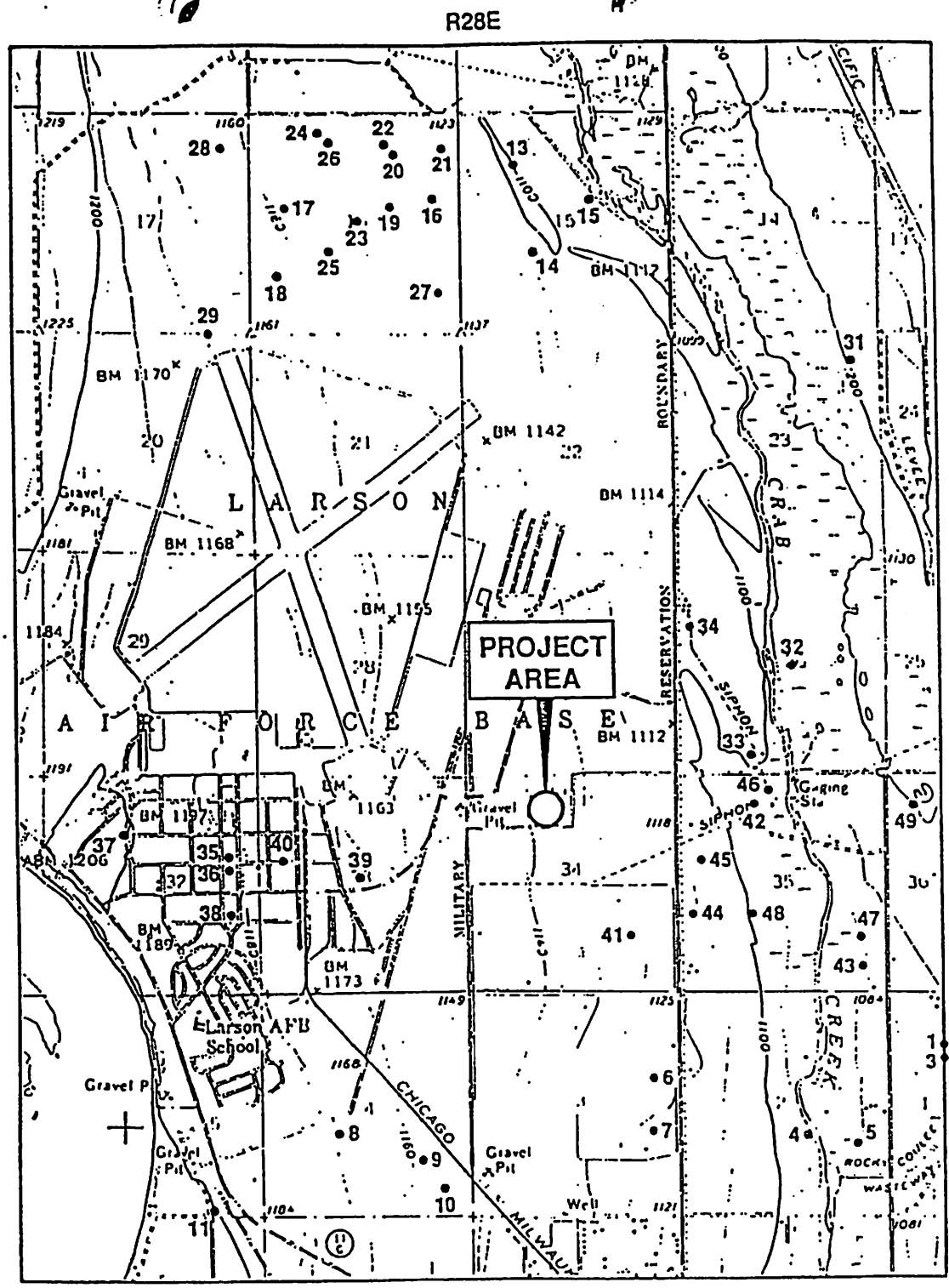
5. Describe the local geology and hydrogeology within one mile of the site. Include any ground water quality data. **The local library, the sites hydrogeologic report, or soil conservation service may have this information.**
   (Label as attachment E.5.)

6. List the names and addresses of contractors or consultants who provided information, and cite sources of information by title and author.

USGS Topographic Map
Attachment E.3


ATTACHMENT E.3.B
LARSON
FORCE BASE
LARSON ST.P.
MOSES LAKE
BOUNDARY
RESERVATION
MILITARY
SIPHON
ROAD
CRAB CREEK
BM 1168
BM 1142
BM 1114
BM 1155
BM 1169
BM 1112
BM 1163
BM 1173
Tank
Gaging Sta
Well
21
22
23
26
27
28
33
34
35
4
3

ATTACHMENT E.3.C



LEGEND

1• Well Location and Designation

NOTE

Map adapted from U.S.G.S. 15 minute series topographic Moses Lake Quadrangle, 1956.

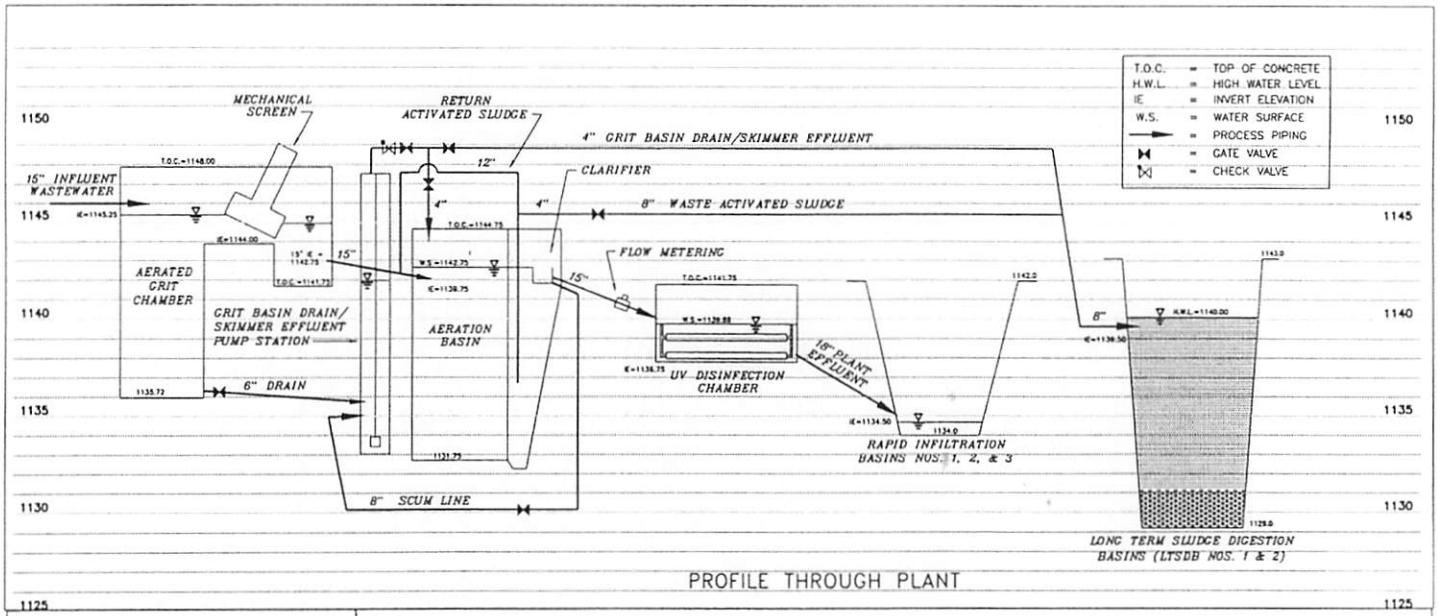
City of Moses Lake
Larson Wastewater Treatment Facility

KNOWN WELLS IN TREATMENT PLANT AREA

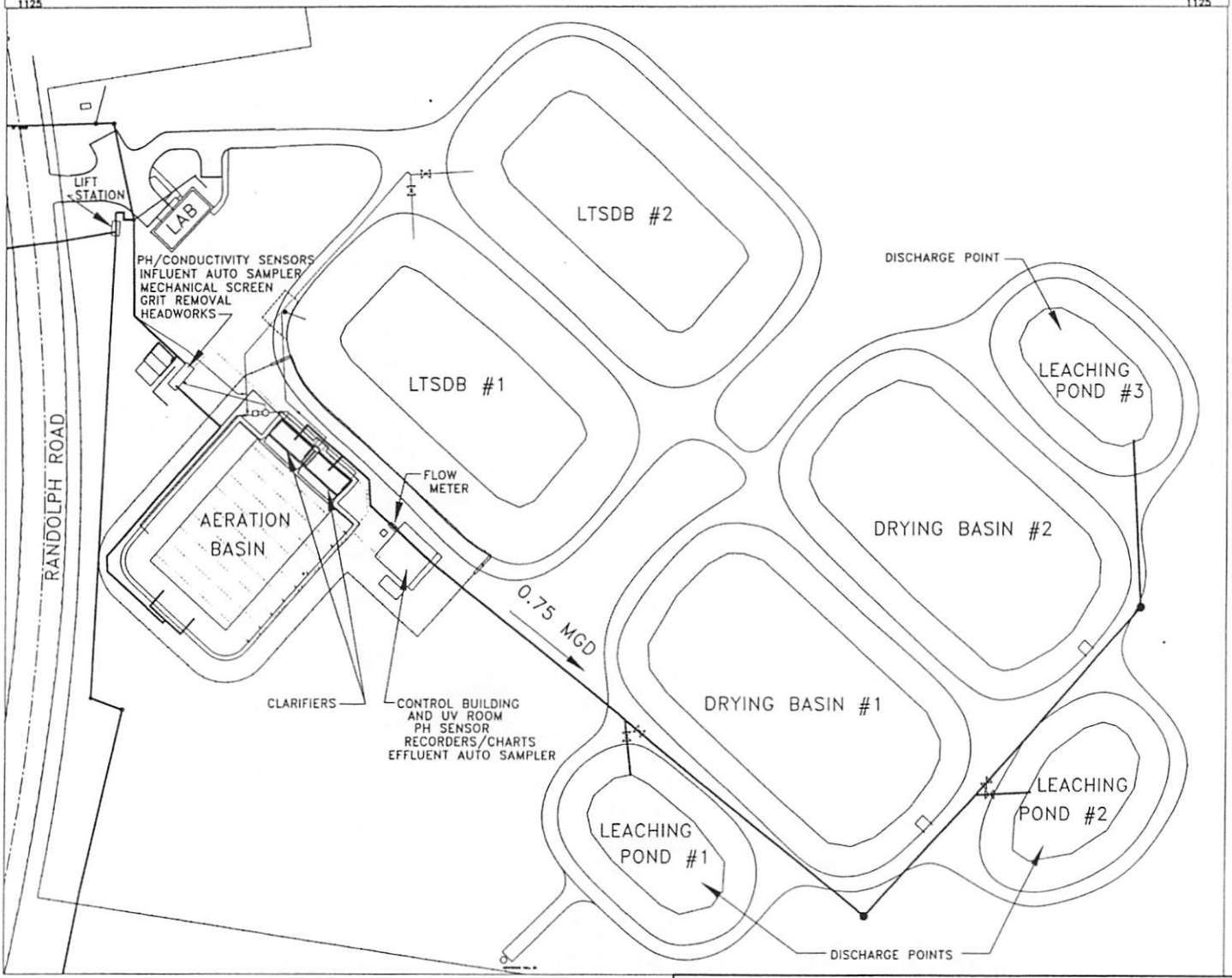
December 1989 T-1066-01

SHANNON & WILSON, INC.
Geotechnical Consultants

FIG. D-1



PROFILE THROUGH PLANT



ATTACHMENT E.3.D

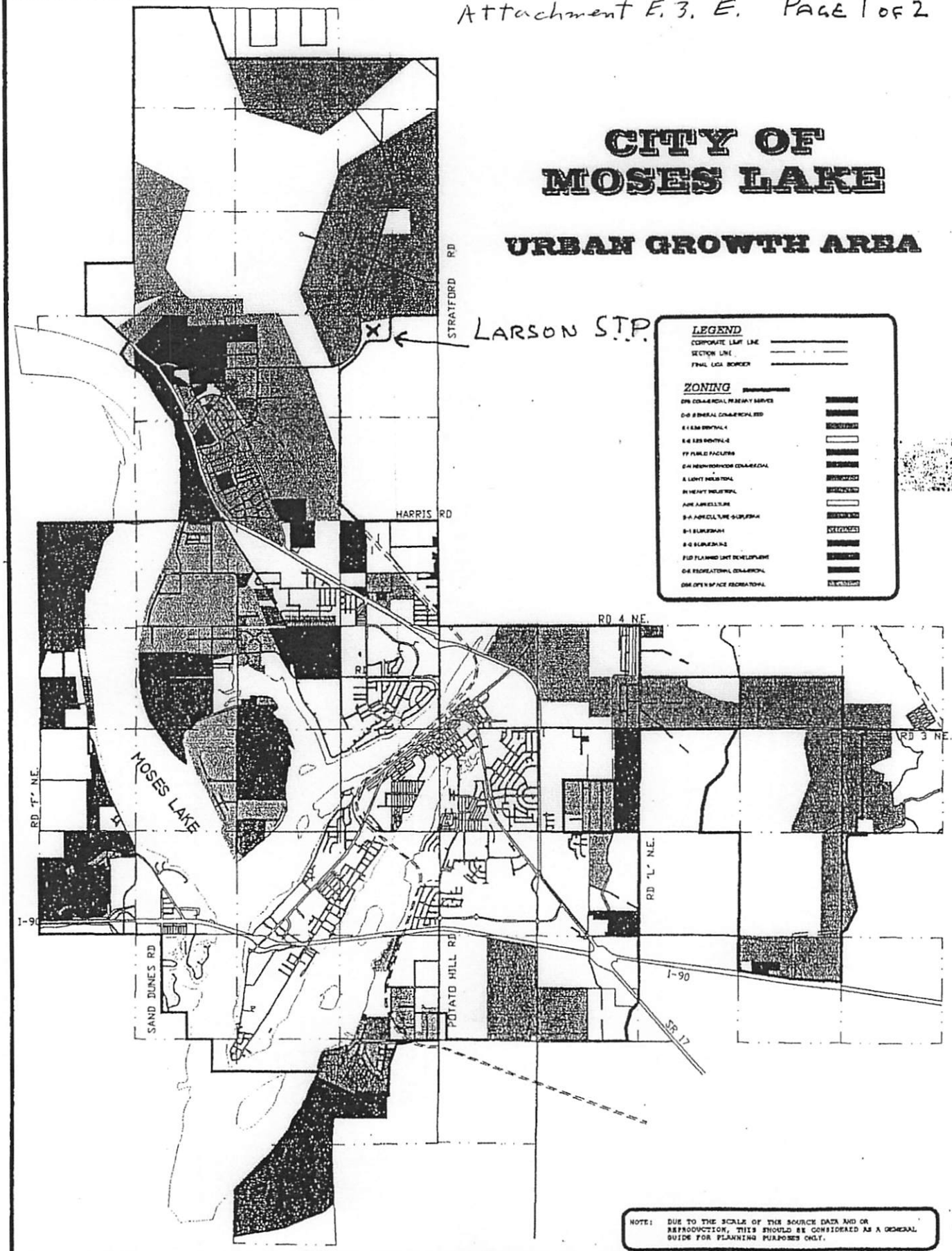
PLANT PROFILE AND SYSTEM PIPING PLAN
LARSON SEWAGE TREATMENT PLANT
MOSES LAKE, WASHINGTON

MUNICIPAL SERVICES DEPT. – ENGINEERING DIVISION

DRAWN	CITY OF MOSES LAKE
CHECK	
SCALE	
DATE	GRANT COUNTY WASHINGTON

CITY OF MOSES LAKE

URBAN GROWTH AREA



NOTE: DUE TO THE SCALE OF THE SOURCE DATA AND OR REPRODUCTION, THIS SHOULD BE CONSIDERED AS A GENERAL GUIDE FOR PLANNING PURPOSES ONLY.

DATE: MARCH 2000

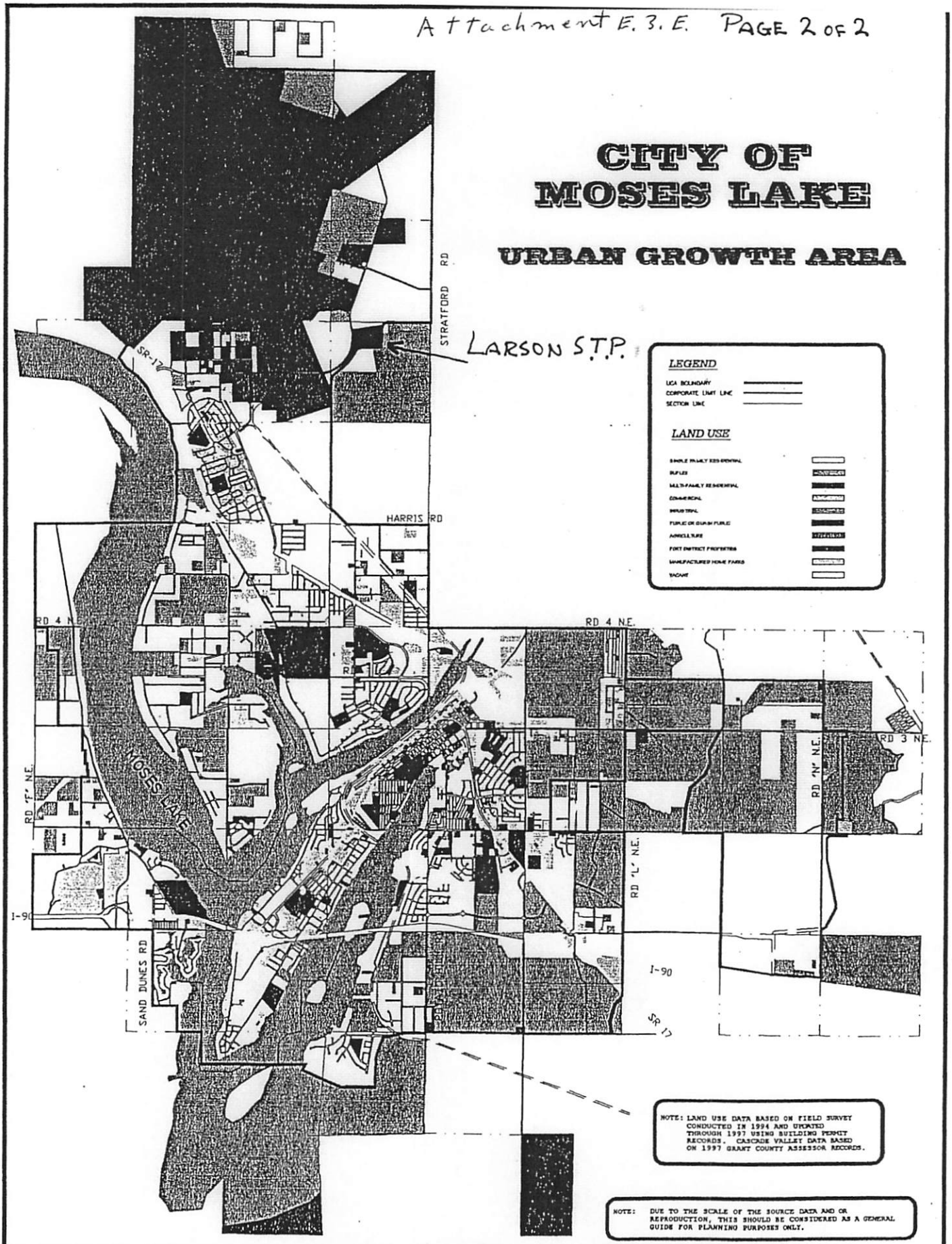
SOURCE:
CITY OF MOSES LAKE COMMUNITY DEVELOPMENT DEPARTMENT
AND GRANT COUNTY COMMUNITY DEVELOPMENT DEPARTMENT

UNINCORPORATED AREA ZONING MAP
LAND USE ELEMENT
FIGURE LU-3

0 500 2000 4000 8000
100 1000 3000 5000
NOT TO SCALE

CITY OF MOSES LAKE

URBAN GROWTH AREA



NOTE: LAND USE DATA BASED ON FIELD SURVEY CONDUCTED IN 1994 AND UPDATED THROUGH 1997 USING BUILDING PERMIT RECORDS. CASCADE VALLEY DATA BASED ON 1997 GRANT COUNTY ASSESSOR RECORDS.

NOTE: DUE TO THE SCALE OF THE SOURCE DATA AND OR REPRODUCTION, THIS SHOULD BE CONSIDERED AS A GENERAL GUIDE FOR PLANNING PURPOSES ONLY.

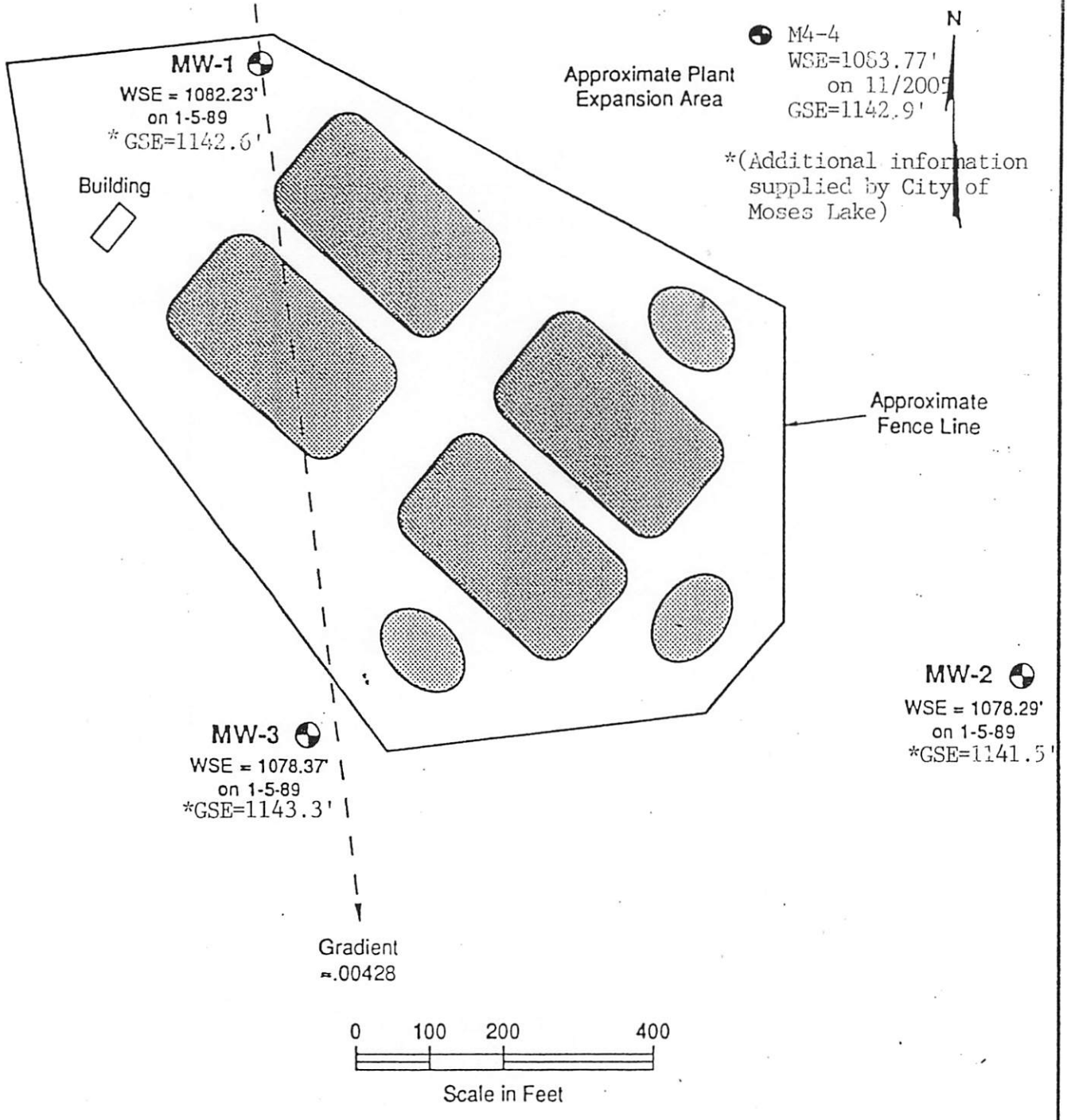
DATE: MARCH 2000

SOURCE:
CITY OF MOSES LAKE COMMUNITY DEVELOPMENT DEPARTMENT AND GRANT COUNTY ASSESSORS OFFICE

EXISTING LAND USE MAP
LAND USE ELEMENT
FIGURE LU-1

0 500 2000 4000 8000
100 1000 3000 5000

S:\PLANNING MAPS\COMP PLAN\FIGURE LU-1.dwg 12/21/2000 02:25:56 PM



EXPLANATION

MW-1 Boring Location and Designation

Unlined Pond

Lined Pond

WSE Water Surface Elevation

City of Moses Lake
Larson Wastewater Treatment Facility

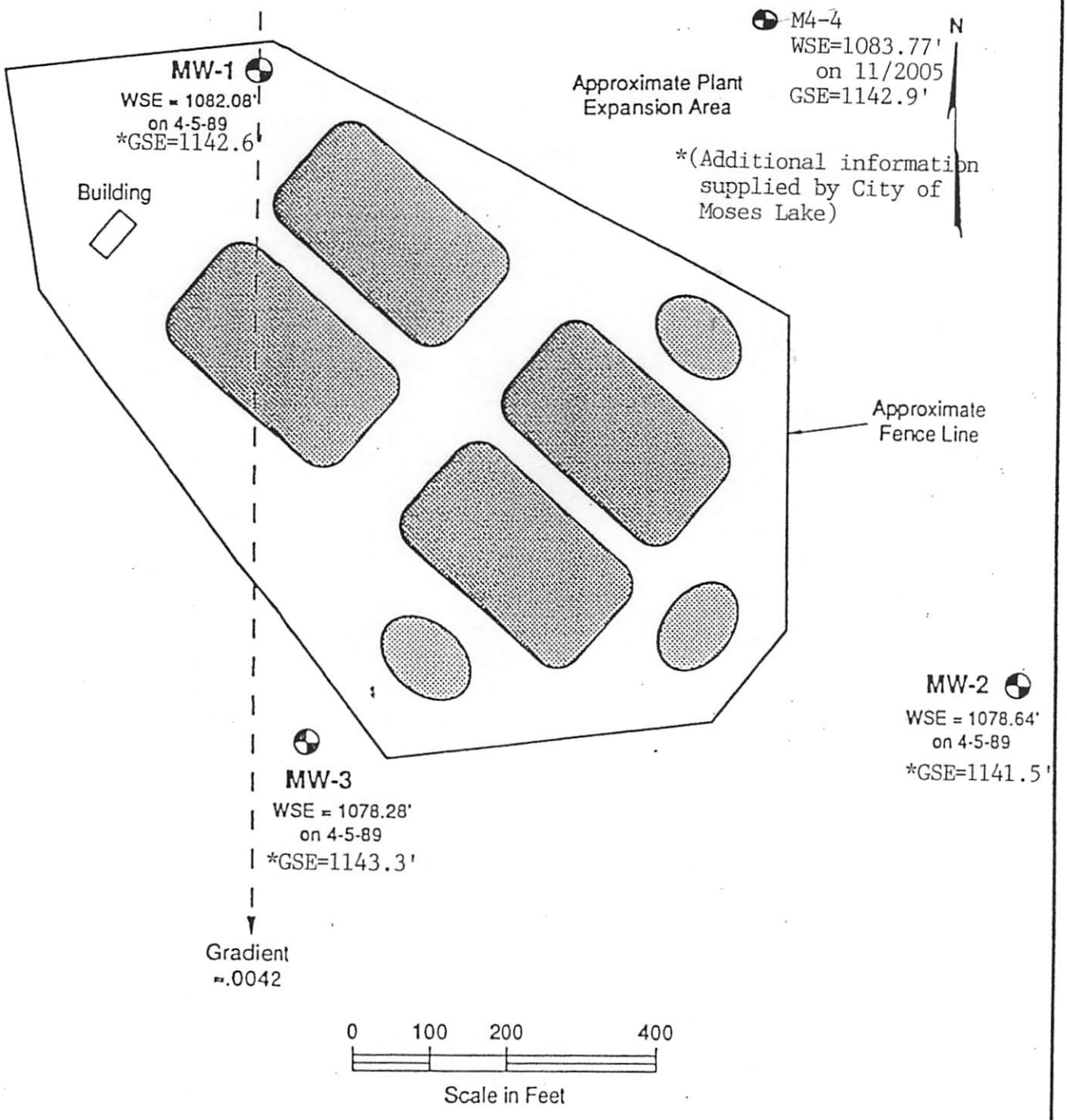
WATER SURFACE ELEVATIONS ON JANUARY 5, 1989

December 1989 T-1066-01

SHANNON & WILSON, INC.
Geotechnical Consultants

FIG. 3

*GSE Ground Surface Elevation



EXPLANATION

MW-1 Boring Location and Designation

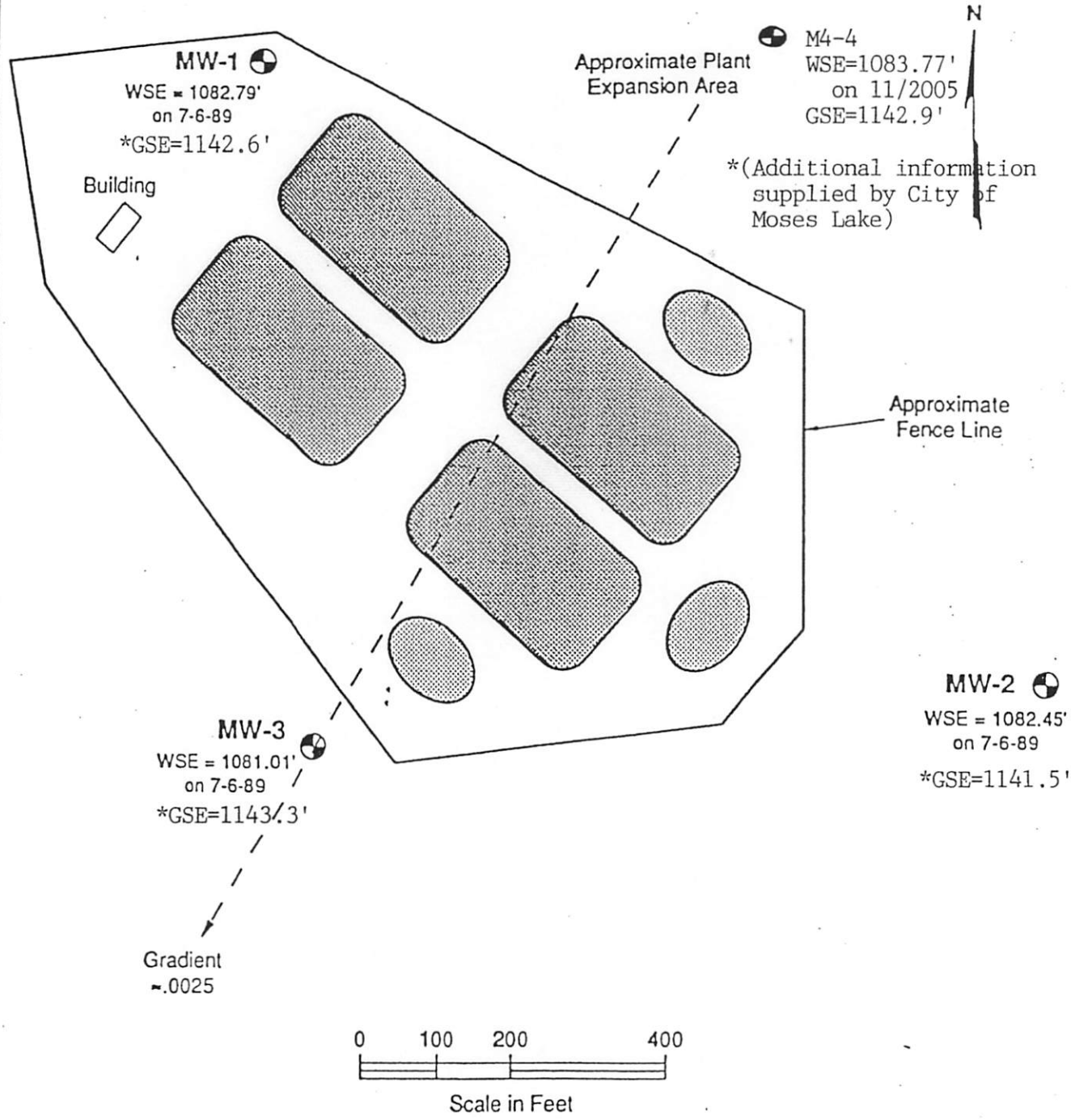
Unlined Pond

Lined Pond

WSE Water Surface Elevation

City of Moses Lake Larson Wastewater Treatment Facility	
WATER SURFACE ELEVATIONS ON APRIL 5, 1989	
December 1989	T-1066-01
SHANNON & WILSON, INC. Geotechnical Consultants	FIG. 4

*GSE Ground Surface Elevation

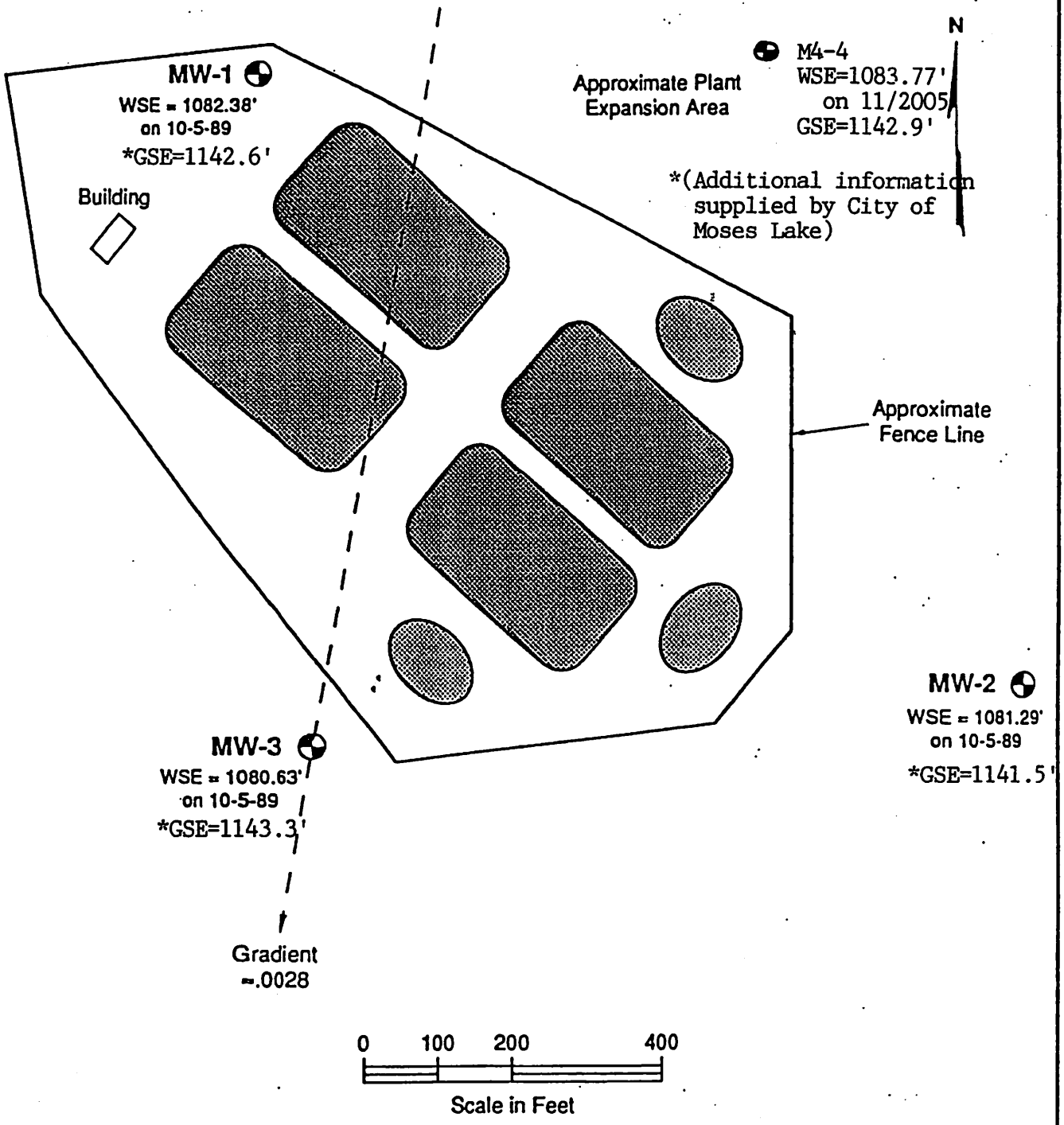


EXPLANATION

MW-1	Boring Location and Designation
	Unlined Pond
	Lined Pond
WSE	Water Surface Elevation

City of Moses Lake Larson Wastewater Treatment Facility	
WATER SURFACE ELEVATIONS ON JULY 6, 1989	
December 1989	T-1066-01
SHANNON & WILSON, INC. Geotechnical Consultants	FIG. 5

*GSE Ground Surface Elevation



EXPLANATION

MW-1 Boring Location and Designation

Unlined Pond

Lined Pond

WSE Water Surface Elevation

City of Moses Lake
Larson Wastewater Treatment Facility

WATER SURFACE ELEVATIONS ON OCTOBER 5, 1989

December 1989 T-1066-01

SHANNON & WILSON, INC.
Geotechnical Consultants

FIG. 6

*GSE Ground Surface Elevation

Soils Information
Attachment E.4.

ATTACHMENT E.4

Soils

To a depth of 3 to 5 feet there is brown, silty sand. From 5 to 30 feet there is a dark gray, sandy gravel with cobbles. From 30 to 60 feet there is a dark gray, coarse sand with gravel and some silty sand.

Geology and Hydrogeology
Attachment E.5.

wells in MW-2 and MW-3. The wells were developed by pumping a minimum of one half hour with the Hydrostar pumps.

3.0 SITE DESCRIPTION

3.1 General

The Larson Wastewater Treatment Plant is located about 4 miles north of Moses Lake, Washington and serves approximately 4,500 people. The facility consists of an operations building, two lined aeration ponds, two lined sedimentation ponds and three infiltration ponds (see Figure 2). MW-1 is located approximately 300 feet northeast of the operations building and is the upgradient well. MW-2 is approximately 450 feet east of the southeast infiltration pond and MW-3 is 500 feet southwest of that infiltration pond.

3.2 Climate

The mean annual temperature at Moses Lake is about 48 degrees F. The temperature ranges from a maximum of about 113 degrees F to a minimum of -23 degrees F. The mean monthly temperatures range from about 26 degrees F in January to 76 degrees F in July. The mean annual precipitation is 10.0 inches, varying from 5.4 inches to 21.0 inches per year. The mean monthly precipitation is a minimum of 0.20 inches in July to 1.03 inches in December. Snow may fall as early as October and may remain as late as April with a mean annual snowfall of 17 inches. Average annual evaporation, as measures from a U.S. Weather Service Class A pan, ranges from 50 to 70 inches. Frost penetration depth is about 4 feet.

3.3 Regional Geology

The study area is located within the northern part of the Columbia Plateau in central Washington. Present day landforms are the result of geologic events that began in Cenozoic time. Large volumes of basaltic magma covered the area

between what is now the Cascade Mountains on the west, the Blue Mountains of Oregon on the south, and the Idaho Rockies on the north and east. Total thickness of these flows ranges from 5,000 to 10,000 feet in the central portion of the Plateau. Stream, river, and lake sediments were deposited during intervals between lava flows. The entire sequence of lava flows and sedimentary deposits has been designated as the Columbia River Basalt Group (see Figure 3). The top several thousand feet of the group has been designated as the Yakima Basalt.

Within the top 1,200 feet of this formation, five separate geologic members have been identified. They are defined (from oldest to youngest) as the Vantage Sandstone Member and four basalt sequences: the Frenchman Springs Member; the Roza Member; the Priest Rapids Member; and the Saddle Mountains Member. Locally, the Ellensburg Formation, a sedimentary formation, interfingers or overlies the Saddle Mountain Member. Structural folding of the basalt sequence occurred after the deposition of the Yakima Basalt.

Sedimentary material, the Ringold Formation, was subsequently deposited in shallow basins, created by the folding. This material consists of interbedded lake sediments, including clay, silt, and sand; river deposits of sand and gravel; deposits of sand and silt transported by the wind; and alluvial fan deposits. During the late Pleistocene time, meltwater runoff and catastrophic flooding, associated with the continental glaciations, scoured the terrain. Gravels were deposited in channels and finer sediments accumulated in temporary lakes that occupied the basins. Wind blown loess and sand, derived from fine-grained parts of glaciofluvial deposits, is currently present at the ground surface.

3.4 Site Geology

Information on the site geology was obtained from the three previously mentioned monitoring wells installed around the Larson Wastewater Treatment Plant and logs of wells around the Grant County Municipal Airport (formerly

Larson Air Force Base). Geologic logs and as-built drawings of the monitoring wells are shown in Appendix B. Four geologic units were encountered on site. These are, with increasing depth, 1) a thin (2 to 5 foot) layer of silty sand, 2) a thick sandy gravel flood deposit, 3) the Ringold Formation consisting of brown silty sand with lenses of clay and gravel and 4) the Yakima Basalt.

Underlying the surficial sand layer, the flood deposited material ranges from 57 to 68 feet in thickness. It is primarily comprised of dark gray basaltic gravel and cobbles with some sand. This unit thickens to the south. The hydraulic conductivity of gravel has been estimated to range from 1 to 100 centimeters/second (cm/s). The lower 1.5 to 8 feet of the formation was found to be saturated, with sufficient permeability to form an aquifer.

The Ringold Formation at this site underlies the gravel flood deposit and varies from a brown silty sand with gravel to a sandy gravel with clay lenses. This formation slopes and increases in thickness to the southeast. A 5-foot-thick gravelly clay zone exists at the contact with the Yakima Basalt in MW-2. The unit is generally permeable and water-bearing and may be considered hydraulically connected to the overlying gravel.

The Yakima basalt underlies the Ringold Formation and consists of weathered dark gray basalt with clay infilling in MW-2 and MW-3. These boreholes penetrated 10 to 18.4 feet into the basalt. In MW-1, the first 13 feet of the flow consists of hard dark gray basalt with 3-inch soft zones. This is underlain by at least 5 feet of soft weathered basalt with silica chips. This formation produced a significantly greater amount of groundwater than the overlying formations. The uppermost aquifer at the site was identified in the lower 1.5 to 8 feet of the flood deposited gravels.

No aquitard was identified within the Ringold Formation in MW-1 and 3; However, the permeability of this zone is probably significantly less than the gravel part of the aquifer. A clay zone does exist in MW-2 that could impede groundwater flow, but this zone is not continuous across the site.

5.0 HYDROGEOLOGY

5.1 General

As was described in Sections 3.3 and 3.4, the regional geology of the LWTF area consists of a thick sequence of lava flows and sedimentary deposits (the Yakima Basalts) overlain by up to 200 feet of unconsolidated Pleistocene outwash deposits. The individual lava flows at the Yakima Basalts are nearly impermeable. It is primarily the interflow zones and the fractured basalt adjacent to the interflow zones that constitute the major aquifers in the Yakima Basalts. The only substantial vertical movement of water between aquifers occurs along vertical faults or fracture zones or by means of leaky well penetrations (Robinson & Noble, 1974).

The regional hydrogeology was studied by Robinson & Noble, Inc. in 1974 during an evaluation of the groundwater supply for the City of Moses Lake. That study focused primarily on the deeper aquifers in the Yakima Basalts as the principal aquifers used for large supplies. The water from the uppermost aquifer in the unconsolidated Pleistocene outwash deposits was reported to be "too hard to be satisfactory for public supply without treatment". The well logs of the known wells in the vicinity of the LWTF (see Appendix D) indicate that private wells also draw their water from the deeper interflow zones of the Yakima Basalts.

In the Robinson & Noble report, the regional gradient of the underlying aquifers was shown to vary between approximately .001 and .01 in a southerly direction. The observed water levels indicated flat drawdown cones (from wells) over a very large area showing that the pumping effect is extensive and confirming the existence of a very low coefficient of storage. If the coefficient of storage is low, then it is concluded that the interconnections between the upper and lower aquifers is very limited. The report concluded that most of the transfer of water between aquifers probably occurs at leaking wells.

Based on the above stated observations, the hydrogeology of interest at the LWTF site is assumed to consist of an upper unconfined aquifer in the unconsolidated materials and weathered basalt isolated from the underlying aquifers by impermeable basalt layers. Based on conditions observed in our groundwater monitoring/exploration wells, the uppermost aquifer in this vicinity could be considered to consist of 12 to 27 feet of silty sand and gravel plus an undetermined thickness of weathered and fractured basalt. The hydraulic properties of the weathered and fractured zone of the underlying basalt is difficult to predict. Our drilling did not penetrate this zone, but according to other well logs in the vicinity, the zone thickness typically ranges between 15 and 25 feet. For purposes of the water balance, this zone was ignored for a conservative estimate of the natural groundwater quantities flowing through the aquifer.

The direction and the magnitude of the calculated gradient for each of the four quarterly sample dates are shown in Figures 3 through 6. In summary, the calculated gradients fluctuated between .0025 and .0042 feet/feet in a direction between 170^0 and 212^0 bearing. Although some mounding of the groundwater may be occurring due to the discharge from LWTF (causing the calculated local gradient to vary somewhat from the regional gradient) these results agree well with the gradients reported in the Robinson & Noble report.

5.2 Water Balance

A water balance analysis is helpful in understanding the site hydrogeology and in evaluating the possible impacts of the facility on the groundwater. A water balance consists of accounting for all the inflow and outflow of water in the site's subsurface.

ATTACHMENT E.6

Information Provided by:

"Hydrogeologic Report, Larson Wastewater Treatment Facility, Moses Lake, Washington", December 1989.
Shannon & Wilson, Inc.
P.O. Box C-30313
Seattle, WA 98103

City of Moses Lake Larson Facility Plan, "Facility Plan Addendum for Wastewater Treatment Facility Improvements , April 2000.
Wilson Engineering, Suite #7
805 Dupont Street
Bellingham, WA 98225

"Operation and Maintenance Manual, Moses Lake-Larson Wastewater Treatment Plant", March 2003.
Wilson Engineering, Suite #7
805 Dupont Street
Bellingham, WA 98225

SECTION F. SLUDGE/BIOSOLIDS MANAGEMENT AND DISPOSAL

1. If your wastewater treatment is by lagoon:

   Has the depth of the sludge been measured in the last five years?

   ☐ YES ☒ NO (IF yes, include the measurements and a map that shows the approximate measurement sites)

   Will sludge be removed from the lagoon(s) in the next five years? If so, describe the sludge, stabilization, utilization, and disposal methods. Attach extra sheets as necessary.

2. If your wastewater treatment is by methods other than lagoon:

   Do you have a Sludge Management Plan? ☒ YES ☐ NO

   Is the Plan approved by:

   ☒ Local health district? Date approved: 11/12/2015

   ☒ Department of Ecology? Date approved: 11/12/2015

3. Does your facility have a biosolids permit issued by Ecology? If so, please provide the permit's number and expiration date.

Biosolids Permit number	Permit expiration Date
ST-8022	July 31, 2016

Summary of Attachments That May be Required for This Application:
(Please check attachments that are included)

- ☒ B.5 Schematic drawing of POTW
- ☒ C.4 Flow records
- ☒ C.6 Additional effluent analysis
- ☒ D. Additional ground water data
- ☐ E.1 Copies of contracts authorizing use of land for treatment
- ☒ E.3 USGS topographic map
- ☒ E.4 Soil information
- ☒ E.5 Local geology and hydrogeology

If you need this document in a format for the visually impaired, call the Water Quality Program at 360-407-6600. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.