INVESTIGATIONS

Geology and Ground Water Availability, Selah Area, Washington

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A report on the geology and ground-water availability in the Selah area in Yakima County. Prepared by Paul A. Eddy, Office of Technical Services, Department of Ecology, Olympia, Washington, December, 1970.

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INTRODUCTION

Purpose and Scope of Investigation

This study was initiated on December 23, 1970 in response to a letter received from the Senior Engineer, Water Resources, of Stevens, Thompson & Runyan, Inc., Engineers and Planners. The firm's specific objective was to pin-point the best drilling sites for wells which would produce water of high quality and of sufficient quantity for a municipal supply.

The scope of this study was initially set to include several determinations which are:

1. Ascertain availability of ground water in the Selah area.
2. Determine possible drilling locations.
3. Affix a quality on the water for the proposed use.

The study consisted of obtaining all data available within the Department of Ecology, data available from Stevens, Thompson & Runyan, Inc. and published information of importance. A field trip is to be conducted in the area in order to verify the findings of this report.

Location and Extent of the Area

The Selah area is designated to include approximately 9,000 acres which include the following land sections: Township 14 North, Range 18 East, Sections 22, 23, 24, 25, 26, 27, 34, 35 and 36; Township 14 North, Range 19 East, Sections 19 and 20; Township 13 North, Range 18 East, Sections 1, 2 and 3, which includes the city of Selah.

Selah lies geographically in the north, central part of Yakima County and is readily accessible via U. S. Route 97. The area is crossed by a network of paved and graveled roads which afford good accessibility to the study area.

The area is generally bounded on the north by Wenas Creek; on the south by Yakima Ridge; on the east by the Yakima River and on the west by Selah Heights.

The base map (Figure 1) used in this report was taken from the Selah (1958) and Pomona (1953) quadrangle, 7.5 minutes series published by the U. S. Geological Survey, Topographic Branch. The contour interval on the maps is 20 feet.

Acknowledgments and Previous Investigations

Several reports have important data with respect to the study area and they are as follows:

Geology and Ground-Water Resources of the Wenas Creek Valley, Yakima County, Washington by J. E. Sceva, F. A. Watkins, Jr., and W. N. Schlax, Jr.: U. S. Geological Survey unpublished records, 1949.

Geomorphology of South-Central Washington, Illustrated by the Yakima East Quadrangle by Aaron C. Waters: G.S.A. Bulletin Vol. 66, Pg. 663-684, June 1955.

Geology and Ground-Water Resources of the Ahtanum Valley, Yakima County, Washington by Bruce L. Foxworthy; U. S. Geological Survey Water-Supply Paper 1598, 1962.

Effects of Hydraulic and Geologic Factors on Stream Flow of the Yakima River Basin Washington by Hallard B. Kinnison and Jack E. Sceva: U. S. Geological Survey Water-Supply Paper 1595, 1963.

Ground Water in Washington its Chemical and Physical Quality by A. S. VanDenburgh and J. F. Santos: Washington State Water Supply Bulletin No. 24, 1965.

The Yakima-Ellensburg Unconformity, Central Washington by Dennis A. Holmgren: University of Washington Master of Science thesis unpublished, 1967.

Additional information was obtained through the firm of Stevens, Thompson and Runyan, Inc. and miscellaneous well data available from water-right applications filed with the Water Resources Branch of the Department of Ecology. The remaining well information used was received from other personnel within the Department of Ecology. Their cooperation is gratefully acknowledged.

Topography and Drainage

Topography of the Selah area is principally expressed by tectonic uplift, and erosion and deposition by the Yakima River. To the north the area is bounded by the Umtanum Ridge which reaches an altitude in excess of 3,000 feet. To the south the Yakima Ridge rises to an altitude of approximately 2,300 feet. To the east the Yakima River acts as a boundary and to the west a terrace flatland named Selah Heights. The town of Selah lies on an east facing slope which is between Selah Heights and the Yakima River. This slope is incised with several canyons.

Most drainage of this area is to the Yakima River, the exception is at the western edge of the study area where small amounts flow westward into the Naches River. No perennial streams, other than the Yakima River flow within the study area.

GEOLOGY AND GEOLOGIC HISTORY OF THE AREA

The physiographic features and rock units of the Selah area represent the end product of a complex geologic history which some feel is still in process. For this report the rock units and their relationships are as follows: (1)

Gravels (unconsolidated)

Ellensburg Formation

Pomona Flow (Wenas Basalt)

Beverly Member (Lower Ellensburg)

Yakima Basalt undifferentiated

Each of the units will be discussed as a geologic unit and as a potential aquifer (Fig. 2).

(1) After Schmincke (1964), Bingham & Grolier (1966) and Holmgren (1967).

Gravels

This unit consists of undifferentiated sands and gravels of recent alluvium made up of reworked material from existing rock units. The depth of this unit in the Yakima River Valley is unknown, probably in excess of 100 feet. The specific capacity of wells within this unit is in excess of 100 gallons per foot of drawdown. All wells of record in this office are shallow, none more than 17 feet deep. This aquifer is capable of high yields but the water quality may be questionable. Available quality data is inadequate to make that judgement.

If it is decided that drilling should take place within the gravels, it is recommended that the well be drilled to the underlying bedrock. Screens should be placed at the deepest possible intervals in order that the greatest amount of vertical filtering action is obtained.

The recommended drilling location within the gravels is indicated in Figure 3.

The river gravels to the north would be less desirable only in that they are probably not as thick thus giving less exposure to the screen.

The river gravels to the south would be less desirable because of the location of the sewage disposal plant.

Ellensburg Formation

> As described by Smith (1903)...is composed largely of volcanic sediments, which are of foreign origin. Pebbles or boulders derived from the underlying basalt are rarely seen, the conglomerate beds being composed of pebbles of light-gray and purple hornblend andesite and of white pumice of the same composition, while the sandstone zones and shales of the Ellensburg Formation consist of finely comminuted andesitic material which represents in part the volcanic dust from explosive eruptions.

Waters (1955) added:

> ....consists of andesitic debris, mostly water stratified pyroclastic material carried eastward by streams from the rapidly growing chain of explosive andesitic volcanoes to the west. Crossbedded layers of pure pumice lapilli alternate with fine-grained vitric tuffs and lenses of andesitic gravel in a bewildering assemblage of inter-lacing beds and channel lenses none of which can be traced far. Massive agglomerates and mud-flow breccias are locally interstratified with the prevailing torrentially bedded tuffaceous sediments.
>
> The whole assemblage is typical of the pumice-slurry floods that result when strong Vulcanian or Peleean explosions are followed by heavy rains that wash the light and loose coating of pyroclastic debris into adjacent streams.

All moderate to semi-deep wells in the area penetrate the Ellensburg Formation. This rock unit generally exhibits characteristics of poorer quality than water from the deeper basalts. This lower quality is a common feature of sedimentary rocks which have been deposited by catastropic means. The material was deposited before chemical weathering had a chance to complete reactions with the material; therefore allowing some chemical characteristics to adversely affect the present quality of water.

This rock unit has a relatively low specific capacity which ranges from 1 to 15 gallons per foot of drawdown (Fig. 4).

The generalized diagrammatic cross-section (Figure 5) shows the major aquifers which were traceable in the Ellensburg Formation above the Pomona Flow.

If it is decided that drilling should take place within the Ellensburg Formation it is recommended that the well be located as indicated on Figure 3. Most wells will need to be screened at least through the sandstone unit (Fig. 5) and again when water is obtained above the Pomona Flow.

Pomona Flow Member (Wenas Basalt)

This rock unit is a Yakima basalt type rock which is presently defined as being within the Ellensburg Formation. The rock consists of a fine-grained, coarsely columnar, platy, with phenocrysts clustered into sparse clots. Contains both scoriaceous zones and dense columnar zones which would act as an aquifer or a aquifuge. Most moderate to semi-deep wells penetrate the Ellensburg Formation until they encounter the Pomona Flow. This flow is not of great thickness, seldom over 100 feet. It is not a productive aquifer and it appears that water which is taken in close proximity is just above the contact of the Pomona Flow and the Ellensburg Formation. For deeper penetrating wells a screen in this locality might contribute water to the system.

Beverly Member (Lower Ellensburg)

This rock unit is the same as the aforementioned Ellensburg Formation. The characteristics are similar and the specific capacities should be the same. Only two wells penetrate into the Beverly Member and those are the City of Selah well number 6 and an irrigation well owned by Alva Tabor. Tabor's well penetrates only 5 feet into this lower unit and the log of the well does not indicate if water was obtained or not from this rock unit. The City of Selah well number 6 penetrated the complete thickness of this rock unit and had perforations at the following depths within the Beverly Member:

684-701
730-738
753-775
829-917

It is not known at this time if the rock units where the perforations occur are good aquifers or not.

Waters which are pumped from these depths are probably of the same quality as water taken from above the Pomona Member in the Ellensburg Formation.

If it is decided that drilling should take place within the Beverly Member of the Ellensburg Formation it is recommended that the well be drilled as indicated on Figure 3. Several aquifers will be encountered all (except poor quality water) should be screened or perforated in order to establish high yield wells without excessive drawdown.

Yakima Basalt

The Yakima Basalt is composed of a series of lava flows ranging in thickness from a few feet to more than 100 feet. The lava probably was extruded from numerous fissure-type openings rather than from craters. The dominant material of the individual flows is a dense dark generally fine-grained basalt which often displays prominent vertical jointing. The upper portions of many of the flows are porous and vesicular, having a scoriaceous crust indicating rapid cooling and movement of the inner fluid portion of the flow after the surface had solidified. Many of the flows have interbeds of sedimentary material and consist primarily of tuffaceous material, volcanic ash, sand and clay. The thickness of the interbeds are from a few inches to several tens of feet.

The permeable zones in the scoriaceous portion of the flows yield large quantities of water to wells elsewhere in the Columbia Basin. The dense middle and lower zones and occasional sedimentary interbeds usually yield little, if any, water to wells within the Columbia Basin.

Only one well within this study area has penetrated the Yakima Basalt and that is the city of Selah well number 6. This well was drilled approximately 100 feet into the basalt. It is not known if water was obtained from this rock unit or not. However, in wells drilled in other areas that penetrated the Yakima Basalt the yields of the wells increased with each scoriaceous zone passed through.

It would be impossible at this time to make a judgement as to where the best drilling locals for obtaining large quantities of high quality water might be from the Yakima Basalt.

CONCLUSIONS AND RECOMMENDATIONS

The Selah area obtains the major portion of its ground water from the various units within the Ellensburg Formation. The producing units vary in composition but mainly are composed of a pyroclastic sand and gravel of Mio-Pliocene Age. This aquifer unit has withstood pumping to date and should continue to be a productive aquifer in the future. The gravels of a much younger age have not been developed for water supplies and might also prove to be an acceptable future source of ground water. Care should be taken when developing shallow ground water sources that adequate depth is obtained in order to prevent surface contamination.

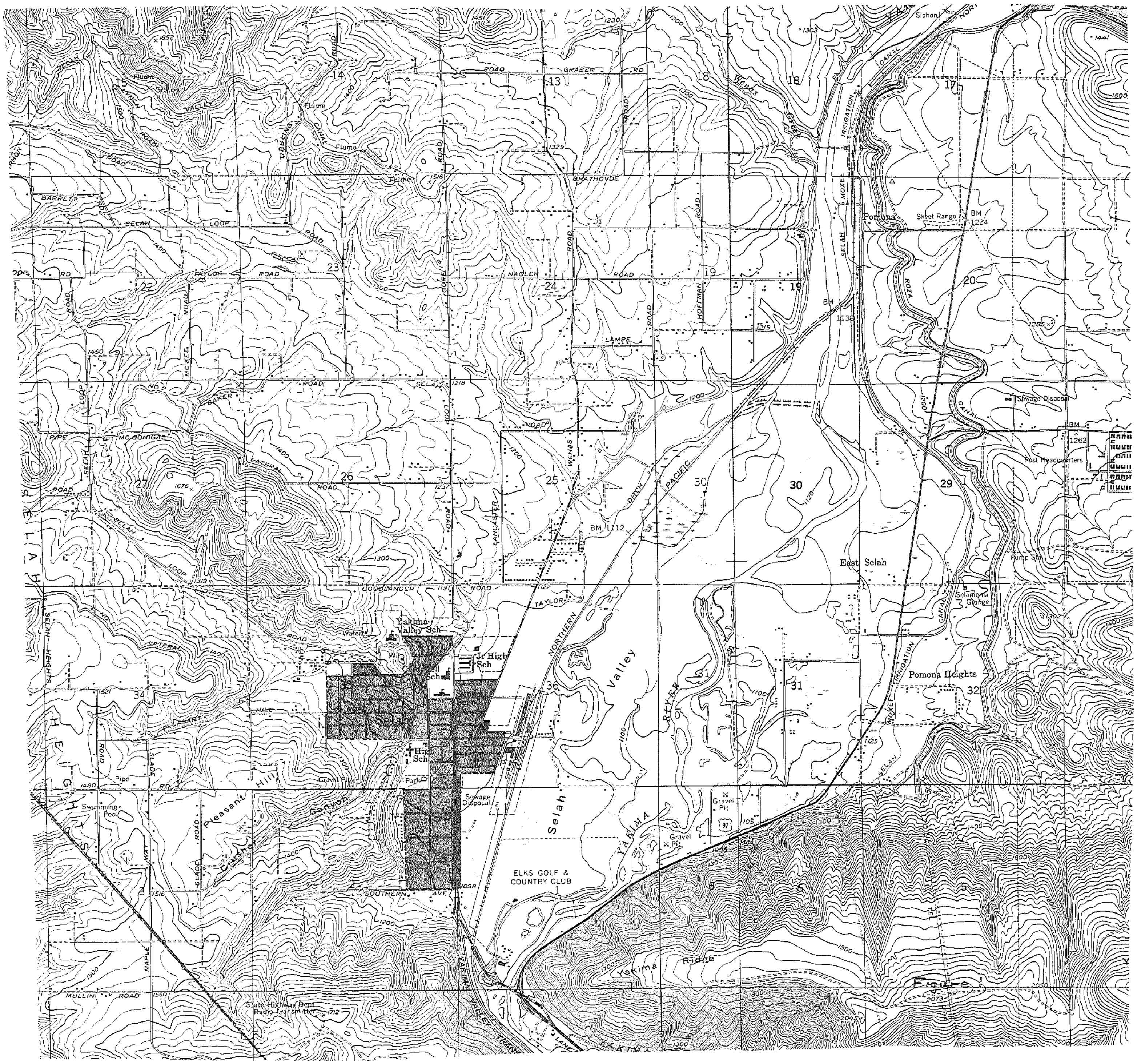
In studying the chemical tests which were run on the city of Selah wells numbers 5 and 6, it appears that the bacteria (liptothrix) is a result of contamination by man during the construction and development of these wells. This problem may be resolved by chlorination.

It is therefore recommended that the primary location for a well is within the indicated unit on Figure 3, with first testing of shallow ground water and if it proves unacceptable the well or wells should be continued to a greater depth and testing of the Ellensburg Formation conducted.

APPENDIX

FIGURES 1 - 5

PAGES 9 - 13



Selah
East Selah
Pomona
Pomona Heights
Selah Valley
Yakima Valley Sch
Jr High Sch
High Sch
Park
Sewage Disposal
ELKS GOLF & COUNTRY CLUB
Yakima Ridge
YAKIMA RIVER
NORTHERN PACIFIC
SELAH MOXEE IRRIGATION CANAL
ROZA CANAL
Skeet Range
Post Headquarters
Pump Sta
Selamona Grange
Gravel Pit
Swimming Pool
Pleasant Hill
Crusher Canyon
State Highway Dept Radio Transmitter
SOUTHERN AVE
MULLIN ROAD
GOODLANDER ROAD
TAYLOR ROAD
NAGLER ROAD
LAMBE
BRATHOVDE
GRABER RD
SELAH LOOP
BARRETT RD
BAKER ROAD
MC GONIGAL
PIPE RD
LATERAL
Wenas Creek
Flume
Siphon
BM 1234
BM 1138
BM 1112
BM 1262
Figure 1

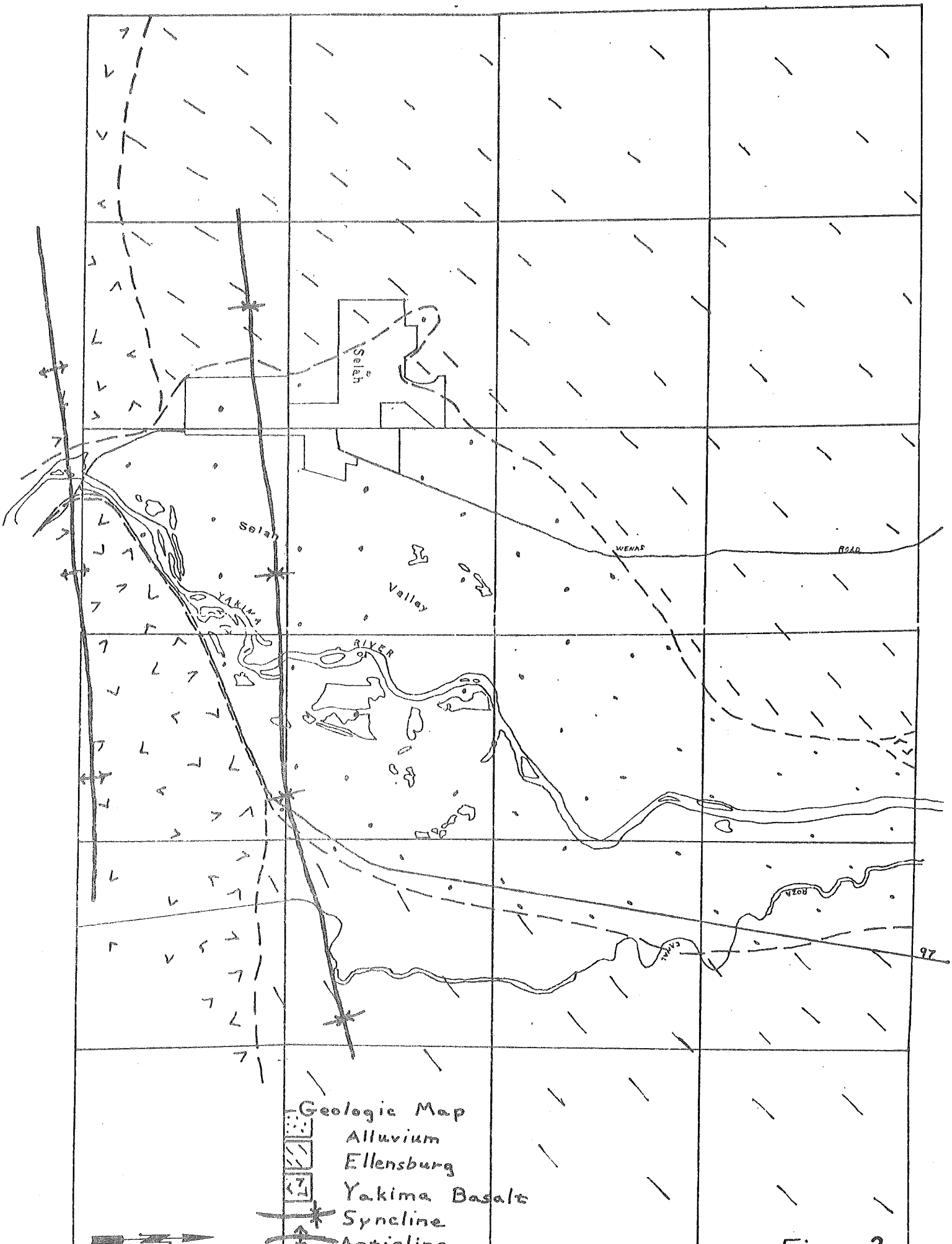

Selah
Selah
Valley
YAKIMA
RIVER
WENAS
ROAD
ROZA
CANAL
97
Geologic Map
Alluvium
Ellensburg
Yakima Basalt
Syncline
Anticline

Figure 2

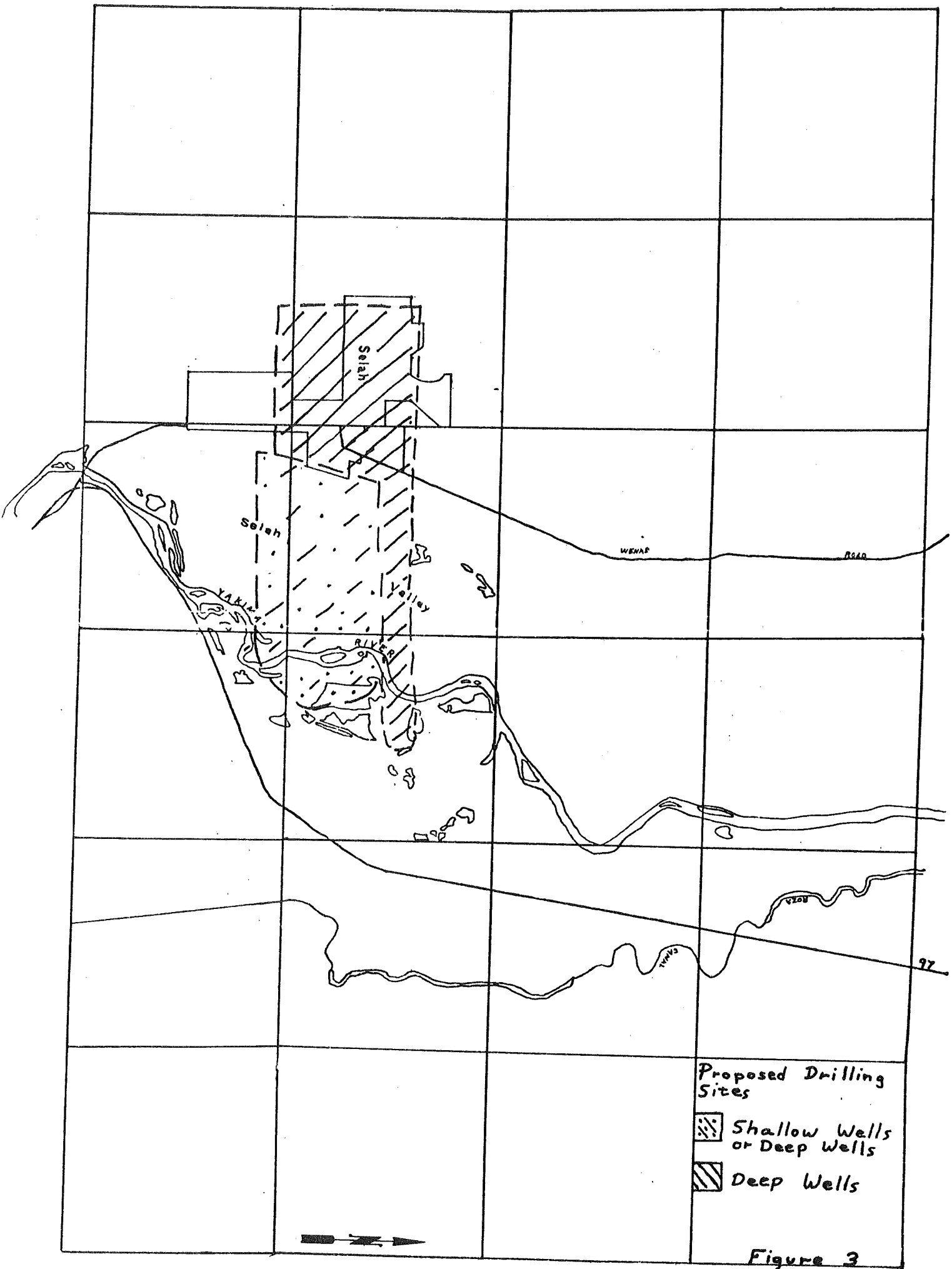
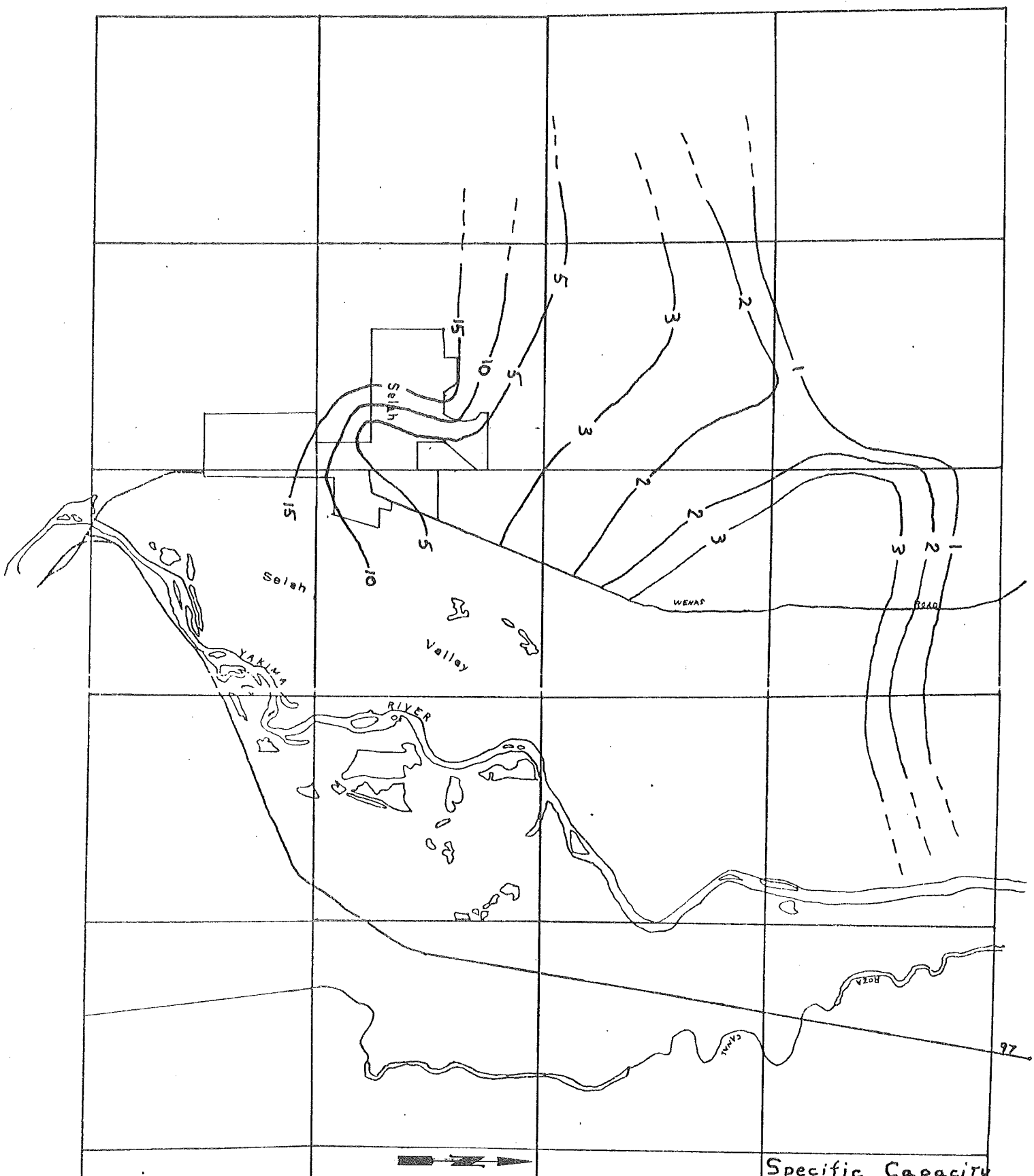

Selah
Selah
Valley
YAKIMA
RIVER
WENAS
ROAD
CANAL
ROZA
97
Proposed Drilling Sites
Shallow Wells or Deep Wells
Deep Wells

Figure 3



Specific Capacity in gallon / foot drawdown

Figure 4

Figure 5 Enlarged Diagrammatic Section