DRAFT

ECONOMIC AND ENGINEERING FEASIBILITY
OF WATER DEVELOPMENT AND
IMPORTATION TO CLARK COUNTY
for
THE LAS VEGAS
VALLEY WATER DISTRICT WATER-RIGHT APPLICATIONS

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prepared by

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ECONOMIC AND ENGINEERING FEASIBILITY OF WATER DEVELOPMENT AND IMPORTATION TO CLARK COUNTY

THE LAS VEGAS VALLEY WATER DISTRICT WATER-RIGHT APPLICATIONS

INTRODUCTION

A highly controversial action was taken in 1989 when the Las Vegas Valley Water District (LVVWD) filed with the State Engineer for over 800,000 acre-ft/yr of water rights in a region of Nevada equal to about one forth of the State (Figure 1, Appendix I). The applications represented all, and in some areas, more than, the remaining unappropriated water in the numerous ground-water management basins. The response was also unprecedented. Over 1,000 protests were filed with the State Engineer by a full spectrum of private individuals, business entities, citizen and conservation groups, federal agencies, Indian tribes, and local governments. The ground water is the lifeblood for local growth throughout the region, and the protestants perceived that Las Vegas (the economic giant/bad guy on the block) was moving to block regional development in favor of locking up the water for continued growth of Las Vegas. The general Las Vegas response to the outcry has been: We are the most rapidly growing community in the U.S.; we will be out of water for growth by early in the 21st Century; there is no other assured water source.

The original filings were made in the Western tradition of a scramble for control of the water resources (first in time, first in right). We think, at the time of filing, the applications had not been carefully planned from *any* perspective other than where there was unappropriated water within several hundred miles of Las Vegas. Subsequently, LVVWD scaled down the total pursued applications to about 190,800 acre-ft./yr. of ground-water rights over much of the same regional extent in a four phased development scenario (Figure 2, Appendix II).

The filings have raised many water-development issues into sharper focus. One of those issues is the engineering and economic feasibility of developing and transporting the water to Las Vegas from such a large region with widely separate basins. This study has been directed toward evaluating this question.

A fundamental question for both the residents of Clark County (the potential water users) and the residents of the affected rural counties (the potential water losers) is whether some or all of the water related to the currently pursued applications would prove too costly for use in the Las Vegas area. In an effort to address this question, Lincoln, Nye, and White Pine Counties, as a consortium, contracted with Mifflin and Associates, Inc. to establish a reconnaissance level engineering and economic feasibility study of the LVVWD water-right applications. This report is the preliminary findings.

RATIONALE

Two fundamental questions in water-supply development are the 1) the unit cost of new water source, and 2) the new source cost impact on the total water supply to the users. Imported water that is too costly for general use either must be subsidized, or conversely, the water importation scheme may fail to pay for itself because of reduced demand for high cost water. The widely distributed nature of the water-right applications, the uncertainty of resource availability, the great distances of necessary transport, and the total pumping lifts over a number of topographic barriers, combine to raise questions about economic and engineering feasibility. Institutional questions are also raised if permits were granted to the water-right applications, but the water eventually proved too costly to develop. With such a scenario, neither Clark County nor the affected counties would benefit from the use of the water resources for an uncertain period of time. Clearly, the cost of water, and the economic feasibility of paying for the water, should be understood before the water is reserved for LVVWD for the proposed period of phased

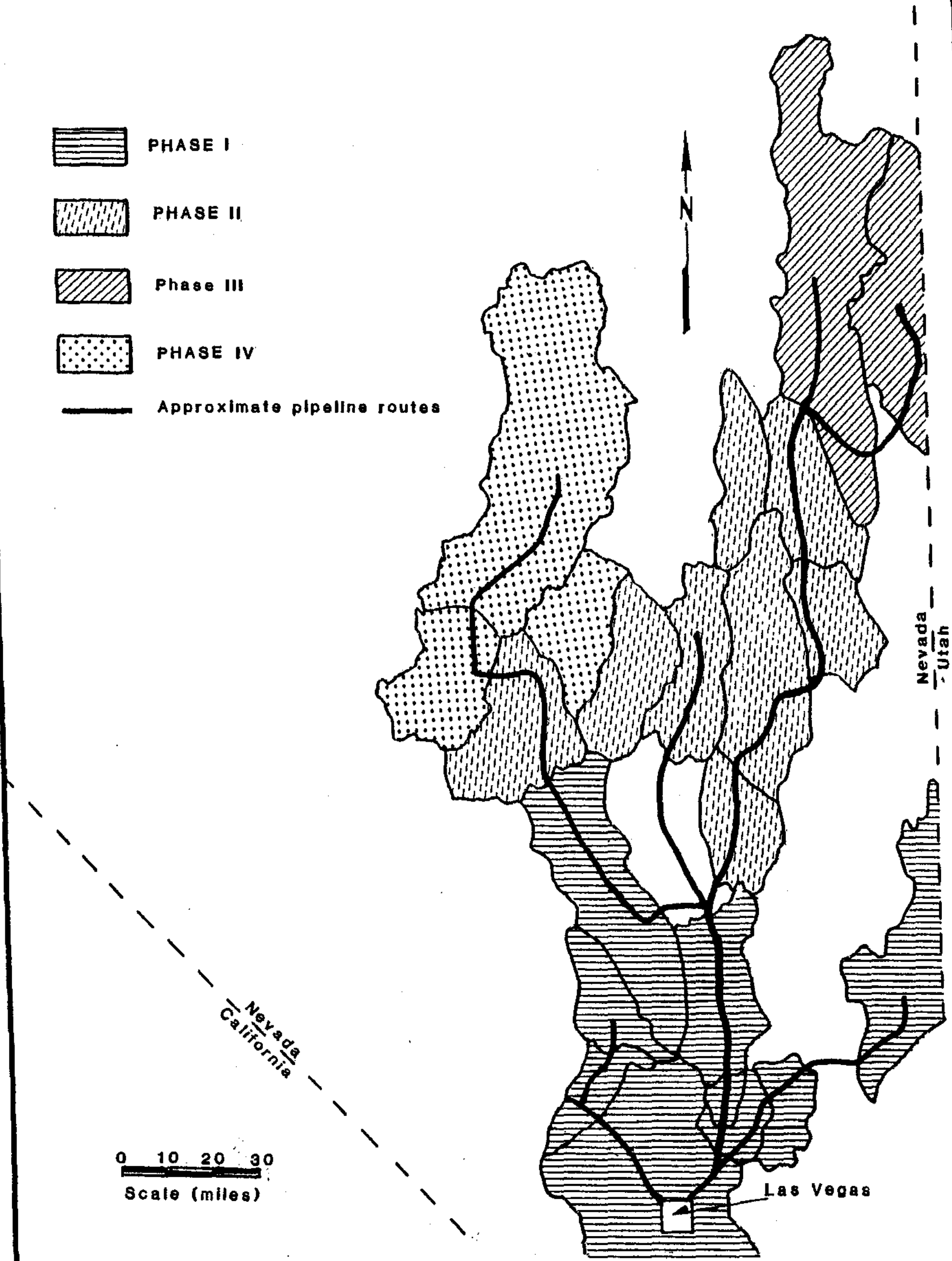

Figure 1. Proposed L.V.V.W.D. Ground-Water Development Phases I, II, III, IV and Approximate Pipeline Routes.

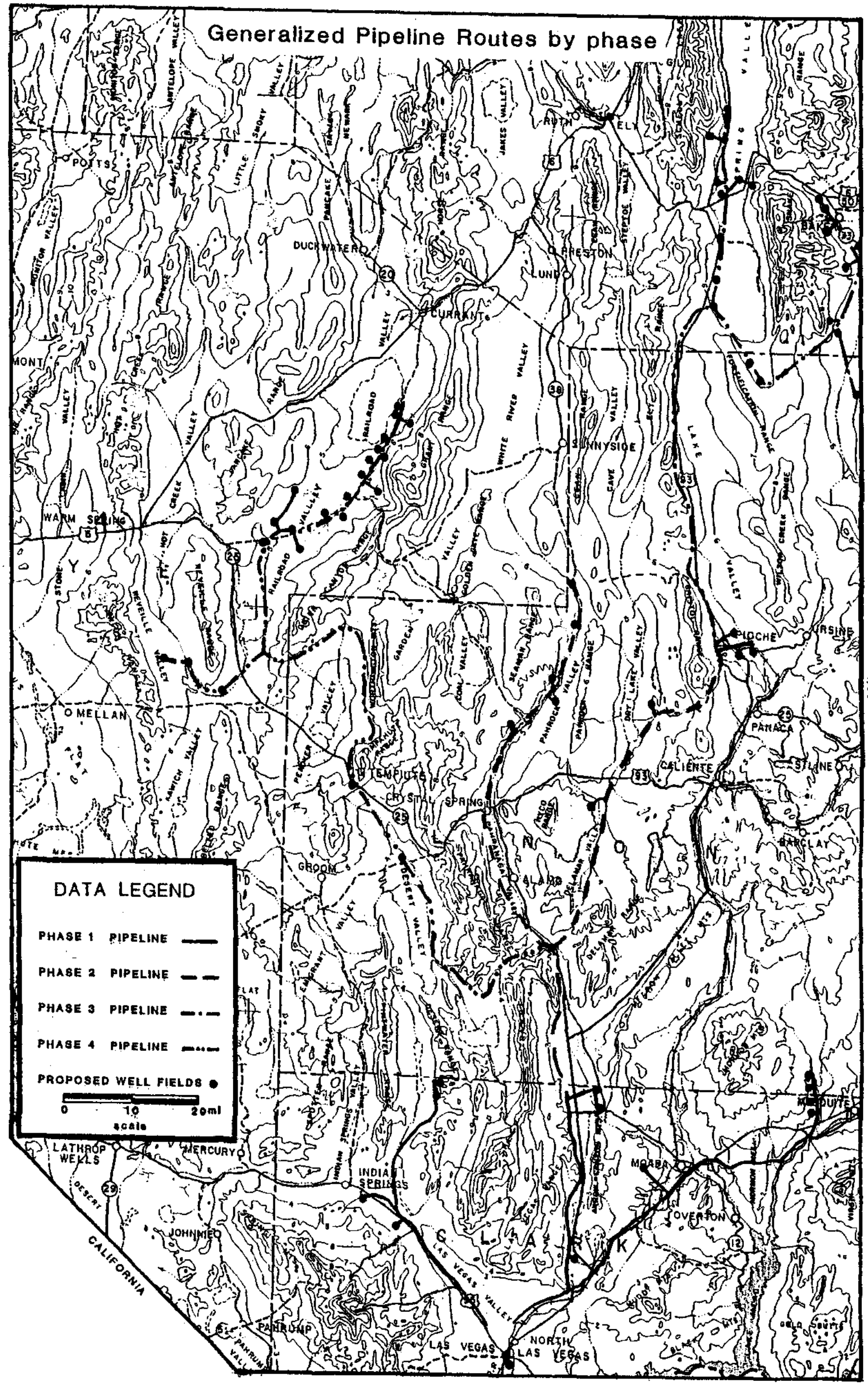
Generalized Pipeline Routes by phase
DATA LEGEND
PHASE 1 PIPELINE
PHASE 2 PIPELINE
PHASE 3 PIPELINE
PHASE 4 PIPELINE
PROPOSED WELL FIELDS
0 10 20mi
scale
POTTS
DUCKWATER
CURRANT
PRESTON
LUND
ELY
RUTH
SUNNYSIDE
WARM SPRING
PIOCHE
PANACA
CALIENTE
TEMPIUTE
CRYSTAL SPRING
ALAMO
GROOM
MELLAN
LATHROP WELLS
MERCURY
INDIAN SPRINGS
JOHNNIE
PAHRUMP
LAS VEGAS
NORTH LAS VEGAS
MOAPA
OVERTON
MESQUITE
BARCLAY
CALIFORNIA
CLARK
WHITE RIVER VALLEY
RAILROAD VALLEY
PAHRANAGAT VALLEY
DESERT VALLEY
LAS VEGAS VALLEY
LAKE VALLEY
CAVE VALLEY
DRY LAKE VALLEY
COAL VALLEY
GARDEN VALLEY
JAKES VALLEY
STEPTOE VALLEY

Figure 2

development. We believe that the *minimum cost analysis* established in this study gives a reconnaissance level perspective of what the minimum cost of water would be to the water users in Las Vegas if the program were to be attempted. It also establishes an independent evaluation of the investments necessary, total costs, and associated uncertainties with engineering feasibility.

We have attempted to establish a reconnaissance level engineering and economic feasibility study that is both timely and technically accurate. We document the analyses by attached Appendices that allow for in-depth review. The study is based on economic principles, current engineering construction costs, current energy costs, our judgment on feasibility and appropiate design, and the phased development based on projected population and water demands according to the LVVWD.

SCOPE OF ANALYSIS

The study objective is a reconnaissance level engineering and economic analysis of the Las Vegas Valley Water District's currently pursued water applications in Clark, Lincoln, Nye, and White Pine Counties. The study assumes, for evaluation purposes, that the currently pursued applications for water rights will receive permits and therefore be developed over the stated phased development period (Appendix II). The study assumes that all the future water demand will be located in the Las Vegas Valley urban area.

Water demands are assumed to be independent of the water cost. This assumption, which is not true when water costs greatly increase, was necessary to adopt to reach the objective of the study, i.e. the costs of the water delivered to Las Vegas Valley, at various stages of postulated future demands, and the approximate costs to the water users as well.

Locations of well fields, pipelines, pump stations, and power lines are established for each phase on the basis of cost effective design and existing information. The study attempts to establish the "least cost" water for the water development and transport infrastructure for each phase of development. Water quality and location of favorable aquifer characteristics in the ground-water basins with applications determine the location of the well fields, pumping lifts, cost of water exploration, and anticipated average production well yields. It has been assumed that private and public land holdings will not materially impact the overall costs of infrastructure development.

The analyses establish estimates of the engineering, construction, operational, maintenance, and financial costs for each phase to determine the approximate direct costs of the water delivered to Las Vegas Valley. However, indirect costs (opportunity costs) related to foregone local economic development (in recreation, wildlife, agriculture, mining, industrial and urban economic sectors) have not been evaluated.

In addition, the analysis has considered natural water quality and availability, terrain characteristics, ground-water basin boundaries, phased water demands, engineering design and operating criteria, and water project financing principles. Historical water demand trends have been projected into the future by the LVVWD to establish the phased water development to meet the increasing water demands in Las Vegas Valley. Our "least cost" approach analysis underpins the analysis in an attempt to minimize the cost of the imported water for all phases of development. This tends to group the LVVWD applications into geographic areas tied to each phase of development.

GENERAL APPROACH AND ASSOCIATED ASSUMPTIONS

A general problem in developing feasibility and costs for the conceptual water development and importation scheme is that the information base is limited. Therefore, a series of assumptions are required before evaluations can be quantified. As a general rule, we have adopted assumptions that tend to minimize the costs, or assume the availability of the water when data or information were lacking. Our philosophy has been to reach an analysis that would not overestimate costs on a systematic basis. We estimated costs as if we were in good control of design and execution, and the phases of construction would proceed on schedule. The project costs in current dollars is therefore a *minimum cost analysis.* Certain costs have not been included, and one anticipated water source, the Virgin River surface-water application of 60,000 acre-ft/yr., has been omitted. Right-of-way costs have been ignored, as have and environmental mitigation costs. Overall right-of-way costs would not be a significant cost factor, as more than 90% of the 817 miles of pipeline would be located on BLM land at a current BLM right-of-way cost of $3/acre/yr. rental fee. (Appendix VI)

Virgin River Surface-Water Applications

The Virgin River surface-water application of 60,000 acre ft/yr. has not been included in the water-cost analysis because of too great of uncertainty for feasibility of capture/cost:

I. The conventional approach to capture of this annual amount of water within Nevada is dependent upon a storage reservoir that, for all practical purposes, must have a useful storage of at least 50,000 acre-ft. A suitable site for such a reservoir is highly questionable in terms of engineering/cost feasibility, and

II. The other possible approaches for the water capture are 1) reservoir sites in other states, blocked by institutional constraints, 2) wheeling the water through Lake Mead and SNWP, blocked by an institution barrier, and 3) infiltration galleries, currently lacking engineering/cost feasibility information.

In our judgment, the currently proposed Halfway Wash reservoir site is too dangerous for conventional reservoir designs, and costly if made safe. The entire excess flow of the Virgin River occurs in three to four months of the year and requires a reservoir site of approximately 50,000 acre-ft of useful storage capacity. The dam-crest height would be approximately 180 feet at the Halfway Wash site, and the geology is unfavorable for such reservoir head fluctuation each year. The reservoir area is underlain by the Muddy Creek Formation where the lithologies are interbedded sands, silts, clays and limited gravel lenses. This formation is semi-consolidated and unconsolidated, and the sands dominate some sections of the sedimentary sequence. There is limited natural foundation or bank stability, and high seepage losses and piping danger would accompany most cost effective designs. There would be poor slope stability of the reservoir basin slopes. A second, and also costly problem, is the capture of the river flow using self-cleaning diversion structure(s) and pumps to lift the water to the reservoir. Appendix VIII illustrates a rough scoping analysis of the energy requirement and associated diversion channel and pumping capacity necessary to capture the flow. We believe this approach would yield a water source with a cost/acre-ft of water captured that would prove to be very high, perhaps about two times the cost of Phase I water.

Some or most of the 60,000 acre-ft/yr. of surface water might be captured by developing the shallow ground water that is in direct hydraulic connection with the river along the Nevada reach of the Virgin River. The concept would require a large number of infiltration galleries designed to capture the water in sands and gravels hydraulically connected to the river. Perhaps the entire 60,000 acre-ft/yr. could be captured, but feasibility studies are necessary to demonstrate both effective design and cost associated with this approach. In many areas of the world, infiltration galleries are successfully used on a smaller scale for river-water capture. If demonstrated technically successful on a large scale, the resulting water would probably cost considerably more than the conventional well produced water. The annual exchange of up to 60,000 acre-ft/yr. of river water with shallow floodplain river channel aquifers would tend to improve the ground-water quality now found under the entire floodplain area. We judge that this capture approach has a good potential to be technically successful, but at large infrastructure costs.

We concluded that there are two potentially cost effective approaches to capturing the 60,000 acre-ft/yr. of annual flow in the lower Virgin River: 1) the construction of dams upstream in Arizona or Utah, at safer, lower cost reservoir sites, or 2) wheeling the water through Lake Mead and then to Las Vegas Valley using the SNWP pipeline/treatment facilities. *Both of these possibilities are currently* *blocked by institutional problems.* We have therefore designed our analysis with a pipeline sized for the ground-water permits currently pursued. The most attractive scenario from a cost perspective is wheeling the Virgin River water through the SNWP at a cost that is comparable to existing water costs in Las Vegas Valley.

In the same area we have redistributed the points of ground-water diversion to areas north of the Virgin River floodplain to avoid the generally poor quality water that occurs along the river valley. This results in lower yield wells and slightly more pipeline, but we judge it a good tradeoff to avoid the 2,000-3,000 mg/l TDS ground water found where the applications were located.

At a June, 1992 Aquavision program, LVVWD Chief Engineer, David A. Donnelly, reported that there was a $2,000,000 feasibility study underway by the LVVWD and Bureau of Reclamation looking at the water-capture alternatives, and that a highly preliminary cost figure of $564,000,000 had been established for the Halfway Wash reservoir, associated pumping facilities, and a desalinization plant. If this preliminary cost estimate were to hold, the cost of Virgin River water would be at least double the cost of the rest of Phase I water. He briefly mentioned the water-capture alternative of Raney well collectors and infiltration galleries.

Pipeline and Powerline Routes:

The pipeline routes have been selected to minimize pumping lifts, and to avoid patented land and unfavorable terrain. We have followed the LVVWD assumption that the pipeline right-of-ways and access can be established on the Nellis Bombing Range/Desert National Wildlife Range area. There is also an area where the pipeline must pass through the Pahranagat National Wildlife Refuge. On the whole, however, the right-of-ways for power and pipelines would be located on BLM land, and for a project of this magnitude, right-of-way costs would not be likely to substantially change the order of magnitude of cost of the water. Figure 2 illustrates the phased pipeline routes that we have selected on the basis of the general location of the proposed well fields.

Availability of Phase I Water:

It is possible that most of the northwestern Las Vegas Valley pipeline water supply of Phase I would be frustrated by the failure to gain access to the Nellis Bombing Range/Desert National Wildlife Range, or that infrastructure costs might be increased by special requirements for access. In general, other Phase I water sources are also the most uncertain in terms of physical feasibility, cost of development and institutional barriers or constraints. In our opinion, some of the anticipated water sources may not be available, and what proves to be available would be more costly than our cost analysis indicates. This statement is based on the following:

I. The carbonate aquifer (the Arrow Canyon Range Aquifer) that is known to occur in Coyote Spring Valley, may extend southward through Hidden Valley, California Wash, and Garnet Valley ground-water management basins, and may, in part, or in all, be in very close hydraulic connection with the Muddy River Springs. Sparse data suggest a regional extent of exceedingly high aquifer transmissivity and uniform fluid potentials. This may prevent ground-water production in Coyote Spring Valley, and may limit the amount of exploitation that is possible in the contiguous basins to the south.

II. The applications in the Nellis Air Force Bombing Range/National Desert Game Range may be blocked by access problems as previously mentioned.

In summary, a high percentage of Phase I water supply is in question in terms of physical feasibility in development, and institutional constraints or barriers. For cost analysis we assumed that all but the Virgin River water would be developed as planned in Phase I. Water sources of Phases II, III, and IV are more certain overall in terms of physical feasibility in development; however, these northern sources remain uncertain from the institutional constraints requiring the State Engineer to act in the overall public interest in allocating water rights.

WATER COSTS

There are a number of cost components that have been developed to establish the cost/acre-ft of water for each phase of ground-water development. These cost components have been determined on the basis of the information and assumptions documented in the attached Appendices. The cost components are capital investments associated with necessary costs in infrastructure development, which must be amortized at an assumed interest rate, and term of payout, and operational costs, which are incurred over the operational period considered. It has been assumed that capital cost for each phase will be amortized over a 50 year life of the project, and the capital costs begin five years before each phase is to come on-line. The effects of two interest rates (6% and 8%) on the overall project costs and on the water costs are given in Tables 1 and 2, where all of the cost components are summarized.

Tables 1 and 2 breakdown the capital and operational costs by phase and by cost/acre-ft in each phase, by cost/acre-ft combined phase(s), and by the cost/acre-ft to the water user for the combined total water supply. All costs are in 1992 present value dollars. This means that the costs given in Tables 1 and 2 are what the cost would be if built and operated today, or, if no deflation or inflation were to occur, what the costs would be in the future. It's important to recognize that a 50 year term to retire debt is only realistic to assume if each phase of the water development were to be financed by the federal government. In maintaining *minimum cost analysis,* we have adopted these schedules of amortization for the necessary capital costs (Appendix VII).

Based on the overall objective to determine water costs to the users, in-valley distribution costs have been incorporated into the analysis for source water cost. These cost components are derived from LVVWD costs (Appendix VIII) and could be excluded to compare alternative source-water costs at some point of delivery (such as at Lake Mead, before water delivery through the SNWP, or after delivery, with $111/acre-ft added to the source water cost). Most alternative water sources would likely be from the Colorado River, or an in-valley source, such as captured surface water, or shallow ground water.

We have assumed cost relationships for the LVVWD operation are reasonably representative of the entire Las Vegas urban area, where in fact the City of North Las Vegas, City of Henderson, and Boulder City provide water to their respective jurisdictions. As these entities currently supply Colorado River water, or combinations of in-valley ground water and Colorado River water, cost structures are similar enough to assume that the LVVWD cost structures are representative, but in detail there are differences.

The cost components we have included as necessary costs to establish the minimum costs of the sources of water, and costs to the water user are briefly discussed. More information occurs in the Appendices.

Management And Operational Cost

This is the cost per acre-ft of water realized by LVVWD in operations (Appendix VIII). It needs to be added to each additional acre-foot of water delivered to Las Vegas Valley users..

Well Supervision and Maintenance Cost

This well supervision and maintenance cost is based on the cost/acre-ft that exists for well water developed by the LVVWD (Appendix VIII). This current LVVWD cost is assumed to be a minimal well supervision and maintenance cost for well fields widely distributed over a large area of Nevada.

Table I
Water Costs
at 6% 50 Year Amoritization
All Values in 1992 Dollars

I OPERATIONAL/MANAGEMENT COSTS ARE THE SAME FOR ALL PHASES..$112.00

II SUPERVISION AND MAINTENANCE COST PER ACRE FT. DELIVERED

Phase	Direct Phase	Total New Development	Total Water Supply
I	$29.00	$29.00	$3.12
II	29.00	29.00	5.43
III	29.00	29.00	9.33
IV	29.00	29.00	12.15

III PUMPING COST/ACRE FT

Phase	Direct Phase	Total New Development	Total Water Supply
I	$115.00	$114.89	$12.36
II	25.00	72.26	13.54
III	133.00	105.84	34.04
IV	163.00	121.78	51.02

IV ENVIRONMENT IMPACT STATEMENT COST (1% of combined construction costs)

Phase	Capital Costs PrsVal	Phase Only Amoritized /acre ft	All Phases Amoritized /acre ft	Total Water Supply /acre ft
all	$30,204,334.00	$9.80	$9.79	$4.10

V WELL CONSTRUCTION COST

Phase	Capital Costs PrsVal	Phase Only Amoritized /acre ft	All Phases Amoritized /acre ft	Total Water Supply /acre ft
I	$77,126,808.00	$149.63	$149.63	$18.11
II	44,806,083.00	95.40	123.78	28.53
III	89,821,646.00	72.60	95.29	32.60
IV	89,768,185.00	104.49	97.85	40.99

VI PIPELINE CONSTRUCTION COST

Phase	Capital Costs PrsVal	Phase Only Amoritized /acre ft	All Phases Amoritized /acre ft	Total Water Supply /acre ft
I	$378,533,000.00	$734.35	$141.22	$17.09
II	616,723,000.00	1,313.15	699.93	161.33
III	866,920,000.00	700.74	700.38	239.60
IV	620,777,000.00	722.57	706.57	295.98

VII TRANSMISSION LINE and SUBSTATION COSTS

Phase	Capital Costs PrsVal	Phase Only Amoritized /acre ft	All Phases Amoritized /acre ft	Total Water Supply /acre ft
I	$12,753,000.00	$24.74	$24.74	$2.99
II	33,861,000.00	72.10	47.32	10.91
III	20,093,250.00	16.24	30.02	10.27
IV	63,546,500.00	73.97	42.27	17.71

VIII IN-VALLEY INFRASTRUCTURE COST

Phase	Capital Costs PrsVal	Phase Only Amoritized /acre ft	All Phases Amoritized /acre ft	Total Water Supply /acre ft
I	$17,682,577.00	$34.30	$34.30	$4.15
II	16,110,961.00	34.30	34.30	7.91
III	42,439,053.00	34.30	34.30	11.74
IV	29,471,323.00	34.30	34.30	14.37

TOTAL FUNDS NECESSARY TO BORROW TO COMPLETE THIS PROJECT	$3,050,637,720.00
TOTAL 50 year PAYOUT	9,635,134,174.00
TOTAL MONTHLY PAYMENT	16,058,557.00

Phase	Amount of Capital Necessary	Phase Only Amortized /acre ft	All Phases Amortized /acre ft	Phase Impact onCost /acre ft	Current Cost	Average Acre Ft Cost
I	$491,249,910.00	$1,209.00	$1,209.00	$146.29	$334.48	$480.77
II	716,197,438.00	1,738.02	1,461.21	336.81	334.48	671.29
III	1,031,645,062.00	1,080.54	1,249.29	427.38	334.48	761.86
IV	812,153,988.00	1,207.92	1,237.75	518.49	334.48	852.97

The water district currently generates a 10% operating surplus.
The average income the district would receive

Phase Impact onCost /acre ft	Current Cost	Average Acre Ft Cost
$160.92	$334.48	$495.40
370.49	334.48	704.97
470.12	334.48	804.60
570.34	334.48	904.82

Table II
Water Costs
at 8% 50 Year Amoritization
All Values in 1992 Dollars

I OPERATIONAL/MANAGEMENT COSTS ARE THE SAME FOR ALL PHASES..$112.00

II SUPERVISION AND MAINTENANCE COST PER ACRE FT. DELIVERED

Phase	Direct Phase	Total New Development	Total Water Supply
I	$29.00	$29.00	$ 3.12
II	29.00	29.00	5.43
III	29.00	29.00	9.33
IV	29.00	29.00	12.15

III PUMPING COST/ACRE FT

Phase	Direct Phase	Total New Development	Total Water Supply
I	$115.00	$114.89	$12.36
II	25.00	72.26	13.54
III	133.00	105.84	34.04
IV	163.00	121.78	51.02

IV ENVIRONMENT IMPACT STATEMENT COST (1% of combined construction costs)

Phase	Capital Costs PrsVal	Phase Only Amoritized /acre ft	All Phases Amoritized /acre ft	Total Water Supply /acre ft
all	$30,204,333.86	$12.65	$12.63	$5.29

V WELL CONSTRUCTION COST

Phase	Capital Costs PrsVal	Phase Only Amoritized /acre ft	All Phases Amoritized /acre ft	Total Water Supply /acre ft
I	$77,126,808.00	$193.08	$49.63	$8.11
II	44,806,083.00	123.11	136.99	31.58
III	89,821,646.00	93.69	112.88	38.62
IV	89,768,185.00	134.83	119.00	49.85

VI. PIPELINE CONSTRUCTION COST

Phase	Capital Costs PrsVal	Phase Only Amoritized /acre ft	All Phases Amoritized /acre ft	Total Water Supply /acre ft
I	$378,533,000.00	$947.61	$141.22	$17.09
II	616,723,000.00	1,694.49	881.74	203.24
III	866,920,000.00	904.24	894.27	305.93
IV	620,777,000.00	932.41	904.90	379.06

$31.93

VII TRANSMISSION LINE and SUBSTATION COSTS

Phase	Capital Costs PrsVal	Phase Only Amoritized /acre ft	All Phases Amoritized /acre ft	Total Water Supply /acre ft
I	$12,753,000.00	$31.93	$31.93	$3.86
II	33,861,000.00	93.04	61.06	14.07
III	20,093,250.00	20.96	38.74	13.25
IV	63,546,500.00	95.45	54.55	22.85

VIII IN-VALLEY INFRASTRUCTURE COST

Phase	Capital Costs PrsVal	Phase Only Amoritized /acre ft	All Phases Amoritized /acre ft	Total Water Supply /acre ft
I	$17,682,577.00	$44.27	$34.30	$4.15
II	16,110,961.00	44.27	39.05	9.00
III	42,439,053.00	44.27	41.95	14.35
IV	29,471,323.00	44.27	42.60	17.84

TOTAL FUNDS NECESSARY TO BORROW TO COMPLETE THIS PROJECT	$3,050,637,720.00
TOTAL 50 year PAYOUT	12,433,240,104.00
TOTAL MONTHLY PAYMENT	20,376,033.00

Phase	Amount of Capital Necessary	Phase Only Amortized /acre ft	All Phases Amortized /acre ft	Phase Impact on Cost /acre ft	Current Cost	Average Acre Ft Cost
I	$491,249,910.00	$1,485.00	$1,485.00	$179.69	$334.48	$514.17
II	716,197,438.00	2,180.82	1,816.73	418.76	334.48	753.24
III	1,031,645,062.00	1,322.65	1,541.67	527.41	334.48	861.89
IV	812,153,988.00	1,482.39	1,525.14	638.88	334.48	973.36

The water district currently generates a 10% operating surplus.
The average income the district would receive

Phase Impact on Cost /acre ft	Current Cost	Average Acre Ft Cost
$197.65	$334.48	$532.13
460.63	334.48	795.11
580.15	334.48	914.63
702.77	334.48	1,037.25

Pumping Costs

These have been established on the basis of the engineering analysis of the pipeline design, the assumed pumping lifts based on the locations of the well fields and known or estimated water levels and aquifer characteristics, and the service area costs quotes (Appendix V). One vendor has already increased rates by 30%, but we have maintained the quoted prices at the rates provided in the first half of 1992.

Well Construction Costs

These are capital costs related to the exploration drilling for aquifers, the construction of production wells, the pumps and control equipment and other well-field infrastructure (Appendix IV). Such costs have the potential to vary over a very wide range, and we have used current well construction/well field infrastructure costs for LVVWD water wells in Las Vegas Valley as a guideline, and assumed excellent technical management and hydrogeologic support in the exploratory work necessary before the well fields can be located in detail, and production wells actually designed and constructed. These are clearly minimum costs for exploratory and development of the ground water in widely varying hydrogeologic settings. Some of the development is planned from carbonate-rock aquifers, a costly and technically complex objective with minimal experience in Nevada for guidance. We have been rather optimistic with respect to costs containment if we compare drilling program costs and results for drilling associated with DOE/REECO on the Yucca Mountain project, DOE/REECO on the Tonopah Test Range, and Bureau of Reclamation/USGS for the Nevada Carbonate Aquifer Program. Costs range up to approximately one order of magnitude greater in specific programs. Nevertheless, in order to avoid systematically overestimating these costs, we have used the minimum cost associated with programs that we would anticipate if we were to have total control on the design of the exploratory and production well drilling (which includes contracting in the private sector for drilling services).

Pipeline Construction Costs

Pipeline construction costs are the major capital costs associated with the proposed program, and also the most confidently estimated costs due to the reconnaissance design work that we established and current industry costs for such projects (Appendix III). These are closer to real costs than other categories where we stress minimum costs.

Transmission Line and Substation Costs

The capital costs for construction of the necessary new energy infrastructure are based on the well field designs, location, well pumping lifts, and pipeline pumping lifts (location and amount of energy demand), as estimated by the power suppliers in the various service areas. These are therefore confident cost estimates (Appendix V).

In-Valley Infrastructure Cost

This is a capital cost required to expand the in-valley water delivery system at the same time the water is added to the system. These capital costs are only related to the portion of the distribution system paid for by LVVWD, other assets are paid by developers. They have been estimated on the basis of information in Appendix VIII. In cost comparisons with other sources of water (unless the source is established by reducing water demand) the $34.30/acre-ft cost is also necessary to add to the source water cost per acre-ft. With a "source" created by reduced water demand, this cost would be lower by an unknown amount.

Environmental Impact Statement Cost

This is a significant capital cost and must be incurred before the construction phases. The 1% of combined construction costs is a normal estimate used in large scale projects (Appendix VII).

I II

In Tables 1 and 2 we also show a 10% charge by the LVVWD on delivered water to establish and maintain an operating fund. This is basically similar to a profit margin, and is used for a variety of purposes. It is uncertain to us if this would be included, and therefore we show the effect on the cost to the water user with and without the 10% override on total costs.

In summary, each cost component is summed to arrive at the source costs associated with the water developed by each phase, and the water cost to the users when added to the existing supply. Also the Tables 1 and 2 give the minimum capital costs necessary for the construction of all phases of the water development scheme ($3 billion) and the true cost, if each phase of capital costs are amortized over 50 years at 6% ($9.6 billion) and at 8% ($12.4 billion). Total monthly payment on these levels of debt average $16 million/month at 6% and $ 20/million/month at 8%.

GENERAL DISCUSSION OF RESULTS

Quantitative results of this analysis need to be put into context. The following discussion points to certain aspects that constrain how the *minimum cost analysis* should be interpreted and used.

Source-Water Costs and Water User Costs

Two fundamental cost considerations in new water-supply development for an urban area are: 1) cost of the new water supply that will be added to the existing supply, and 2) cost of the overall water supply to the water users as the result of the combined supply. We have established estimates of the costs from both perspectives. A brief discussion of these two different costs is necessary to put the LVVWD water applications into appropriate context with respect to costs to the water user, and the economic feasibility of the plan.

The minimum cost of a new water supply, or source, to add to an existing supply, has been evaluated for each phase planned in the development of the ground-water applications. When the new source is not a significant percentage of the total water supply, the change in the water cost to the user is not greatly increased (see Phase I total water-supply column in Tables 1 and 2). However, when the new source(s) become a significant part of the total supply (Phase I - IV becomes about 40% of the total supply) the per unit cost of the new source water strongly influences the overall cost of the water to the users.

New source-water cost is also a useful number (cost/unit of water) to compare with alternative sources of water. When carefully developed cost analyses are established for alternative water sources it becomes possible to make rational choices between water-supply alternatives. This seems fundamental common sense, but alternative water sources lack careful evaluations.

Water Cost Versus Water Demand

The water demand derived from the population projection and historic water demand is only a valid assumption if the overall costs of water to the users remain in the same general water cost/water demand range. We purposely used the projected water demands based on historic population growth/water demand because this projection is the LVVWD basis for the current water-right applications and the timing of the phases submitted to the State Engineer. However, at the minimum costs established in the analysis, the Las Vegas area water demands would not remain at the projected household per capita rate of 200 gallons per day per person or valley-wide demand of about 300 gallons per day per person.

The trend of data in Figure 3 suggests that household demands would drop by about one third to one half of the existing per capita demand if the *minimum water costs* to users were to be realized (Phases II, III and IV user water costs). Figure 3 also gives perspective as to the household per capita water demands that are reasonable to assume for high end water costs, which is where the costs to the user would be unless the waters were to be subsidized in some manner. The data of Figure 3 are by no means perfect, because there are several ways to calculate per capita water demand, and water cost data are also determined in varied manners. The basic message of the figure is clear, however: as water costs enter the high end cost zone (user costs similar to Phase II, III and IV) the household per capita water demands are about 100 gallons per day or less. Depending on which per capita water demand one would use for Las Vegas (see Appendix VIII) one should predict a water demand that is decreased by one half to one third of that currently present in the Las Vegas urban area if the water source costs were to be constrained to the *minimum cost*. One can also appreciate from Figure 3 that household water demands correlate better with costs in the higher range of water costs. It should also be noted that household demands are generally the *least* responsive to high water costs; other water use demands are generally more responsive to high water costs. The current Las Vegas per capita water demand has ample room to decrease if water prices were to rise into the high water cost range. The minimum costs established in this analysis assure that actual water costs would be well within the high water cost range where demands are the most strongly influenced by water cost.

An unplanned decrease in water demand has serious consequences in large, very costly water development projects. If there is less demand for the water at the water price required for payout of the project, there is no direct way to recover project costs based on the sale of water (raising the price of the water to correct for the lower water demand may lower the demand further). It is therefore of paramount importance that water-development projects based on population projections be designed on the basis of per capita water demand/price of water. This principle of water demand/water price is generally understood. The original ground-water applications (Appendix I) or the revised structure (Appendix II) are for quantities of water that are roughly ten times, or two times, respectively, greater than reasonable demand scenarios consonant with the minimum cost of the water and the generally favored population projection. Only if the population projection were to be grossly in error, and the total population at year 2014 were to be *about double* the REMI population projection, would all of Phase II water be sold.

Interest Rates/Payout Periods

Interest rates and payoff periods have an influence on water costs, and is an area of considerable uncertainty for the a large debt required for each phase of the water development. Typically, for large water-resource projects a 50 year period of payoff is desirable because it lowers the monthly, or annual payments (but increases the overall total cost) and the infrastructure has a comparable life. We have assumed 50 year payouts for both Table 1 at 6% interest, and Table 2 at 8% interest. Shorter term loans tend to *increase the cost of the water* during the term of the loan, but *reduce the total cost* of the project. Therefore, if it were possible for Las Vegas to finance the infrastructure with 25 or 30 year bonds, at the same interest rates, the water costs would be somewhat higher during the payout period, but the total project costs are lower.

Appropriate interest rate is open to serious question. In keeping with our *minimum cost analysis* we have prepared Table 1 at 6% interest financing, but we don't believe it is realistic. Average cost of LVVWD indebtedness at the present time is about 8%, and this overall cost of financing is questionable also in view of the magnitude of indebtedness required for the water-development scheme. After Phase I financing, each subsequent phase would be financed while still carrying all of the existing phase obligations (and Virgin River infrastructure?). Total payoff is almost \$10 billion with the 6% interest scenario and over \$12 billion with the 8% interest scenario! This total level of indebtedness is beyond what could be established in the private sector. Too many investors remember the Washington Public Power Supply System fiasco brought about by similar circumstances- building three nuclear power plants for energy demands that did not materialize.

Traditionally, many water resource development projects that require large capital investments have been sponsored by the federal government. The Bureau of Reclamation would be the probable agency, and the 50 year 8% amortization scenario would probably be appropriate. However, our assumptions of good control and timely progress in the *minimum cost analysis* are likely inappropriate for

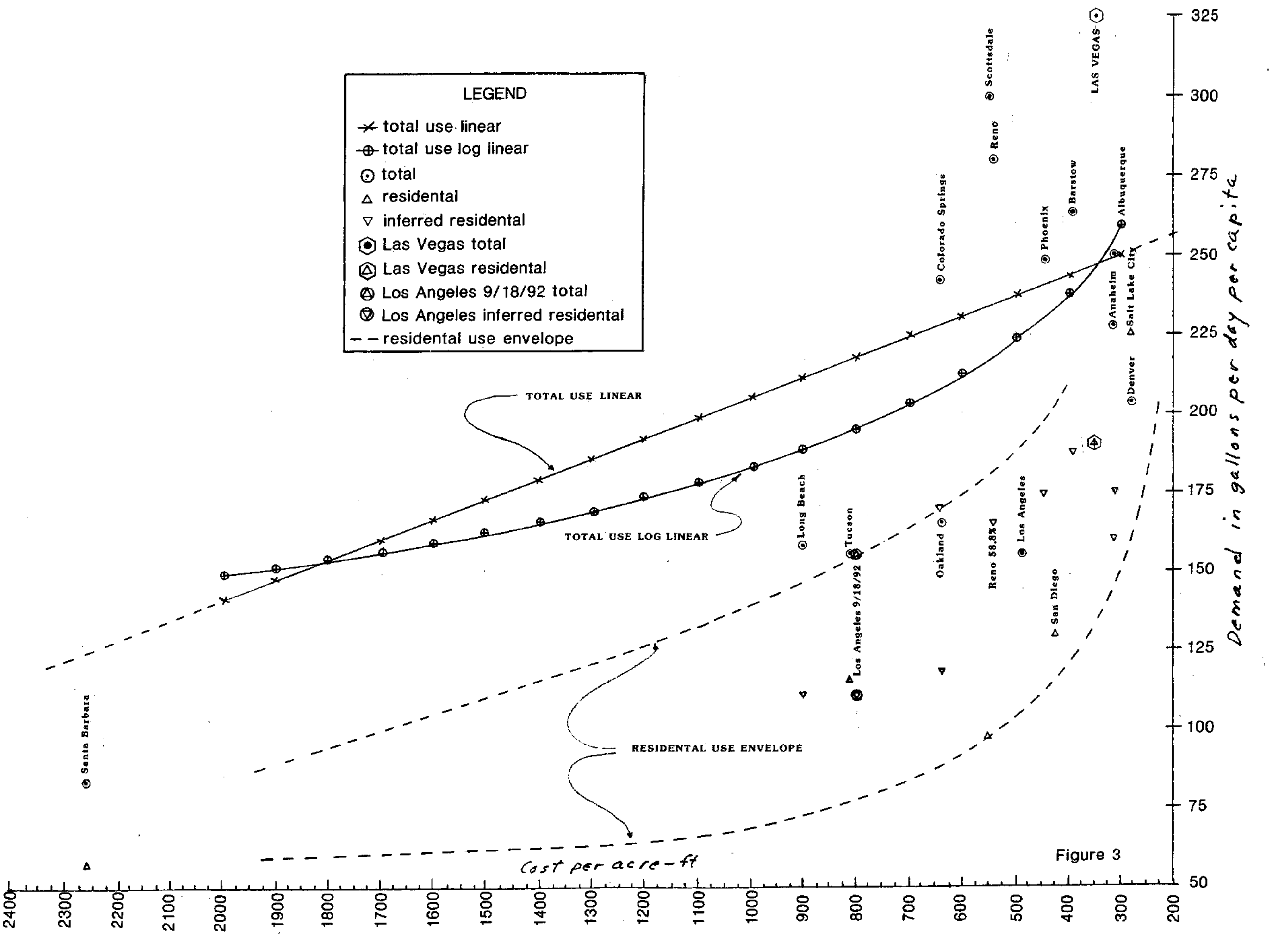
LEGEND
total use linear
total use log linear
total
residental
inferred residental
Las Vegas total
Las Vegas residental
Los Angeles 9/18/92 total
Los Angeles inferred residental
residental use envelope
TOTAL USE LINEAR
TOTAL USE LOG LINEAR
RESIDENTAL USE ENVELOPE
Demand in gallons per day per capita
Cost per acre-ft
325
300
275
250
225
200
175
150
125
100
75
50
2400
2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
LAS VEGAS
Scottsdale
Reno
Barstow
Albuquerque
Phoenix
Colorado Springs
Anaheim
Salt Lake City
Denver
Long Beach
Tucson
Los Angeles 9/18/92
Oakland
Reno 58.8%
Los Angeles
San Diego
Santa Barbara

Figure 3

one component of the cost analysis - the exploratory drilling and well construction element. Experience in Nevada indicates that a cost multiplier of up to 10 (by comparing DOE and Bureau of Reclamation drilling program costs and results) is conceivable for costs in the well construction component. With a multiplier of ten, for example, the *source water costs approximately double* for each phase! Costs to the water user approximately triple instead of double by Phase II. There is no way to ascertain how this cost component, which is viable in a cost sense only if it has very good technical management and design, would be structured. The drilling cost range gives an idea of why we stress this is a *minimum cost analysis*; we have assumed private sector efficiency in the drilling necessary for finding and developing the ground water.

The very large capital expenditures may argue strongly for federal underwriting, but timing and political realities argue just as strongly against a federal project: If the water-development plan were to go forward (if permits were granted by the State Engineer within the next five years) there is considerable uncertainty as to when, or if, the project, or phases, would be authorized and funded by Congress. A very smooth and timely pathway is necessary for authorization, feasibility and design studies, Environmental Impact Statement preparation, and funding to have Phase I come on line by 2007. A four to five year period (private sector efficiency) is the minimum time required to find favorable aquifers and develop the well fields for each phase. To give an example, it has required 17 years for the Bureau of Reclamation's Yuma desalinization facility on the lower Colorado River to come on-line to treat 70,000 acre-ft/yr of brackish water *after* Congressional authorization.

Minimum Costs/Granted Permits

In the *minimum cost analysis* there is another important cost relationship between permits granted by the State Engineer and water costs. It is briefly discussed here to give awareness of the relationship.

We have assumed that *all* of the ground water in the Appendix II plan would be granted permits and that the permitted water development could be moved around within the management basins to maximize the development of good quality ground water at the lowest cost. We also assumed that a small amount could be shifted from one basin to another to make the scheme more cost effective. If the State Engineer were to allow permits for *significantly* less than these amounts in some, or all, of the management basins, *the impact on water cost may be substantial and would tend to higher cost water.* The most costly elements of the water-development scheme would be the long pipeline and powerline infrastructures to the various basins. The less water developed along and at the end of these pipelines, the higher the source water costs become because of higher infrastructure cost/unit of water developed. Two permits in Cave Valley make the least cost effective water development due to the million dollar infrastructure necessary to capture only a small total flow. In our cost analysis, for example, to minimize cost of such situations we shifted the same quantity of water development to applications in basins that were on or near the main pipeline routes. If fewer permits were to be granted (in view of the large number of protests and the unrealistic predicted water demand at the resulting water cost) there would be less total water for development but it may still be distributed over much of the same region of Nevada. This would require pipelines and powerlines of approximately the same total length (there is 817 miles of pipeline in our analysis) to develop, say, one half of the water used in the cost analysis. Any such scenario of less water for development in the widely distributed basins would result in higher source water cost/acre-ft than those established in this analysis. The savings from smaller diameter pipelines, and fewer well installations do not offset the higher cost per unit of water captured due to the long pipelines and power transmission lines. Conversely, any scenario that significantly shortens the pipeline /transmission line infrastructure will tend to lower the infrastructure cost/unit of water developed.

CONCLUSIONS

The majority of the currently pursued ground-water applications, as structured in a four phased water development plan beginning the year 2007, are not economically feasible, even through there is engineering feasibility to develop and transport much of the water to Las Vegas. The *minimum cost analysis* indicates water costs to the user would reduce the per capita water demand by at least one third of the projected water demand beginning in Phase II. After Phase I, Las Vegans would not accomplish anything other than an additional *two billion dollar debt* that could not be retired as planned because of the impact of high user water prices on the water demand. Las Vegans could instead structure water prices (without investing another dollar to bring additional water from the north) to about the same water prices as required by the Phase II water, and through the resulting decreases in water demands, accomplish approximately the *same population growth*, during the same period, at a similar cost to the water user! This, to us, argues strongly against Phase II, III, and IV of the Appendix II plan from the public interest perspective.

The minimum cost of adding the new water sources (inclusive of in-valley infrastructure costs) to the existing water supply would range from around ten times the Colorado River water cost (SNWP water cost before distribution) for Phases I, III, and IV water, and sixteen times for Phase II water. The Colorado River water is the most costly water source in use today at $111/acre-ft delivered to the LVVWD distribution system. We also believe that the 60,000 acre-ft/yr. of surface water from the Virgin River would be, if eventually captured from the Virgin River in Nevada, more costly than Phase I water (probably similar to Phase II cost *without* desalinization, and over 20 times Colorado River cost with desalinization). Part, or the majority of Phase I water may prove unavailable because of access problems (Nellis Bombing Range) and potential pumping impact on the Muddy River Springs (the Arrow Canyon Range Carbonate Aquifer). If the Phase I water proved to be less available than assumed, Phase II water, as an early source, would be quite pricey at over $1700/acre-ft. A scenario of Virgin River Water first, Phase II water second (both pricey sources) would establish user water costs that would strongly impact water demands, and establish several billion dollars of bad debt in the process. As currently pursued, the staged development appears economically viable only through Phase I (without Virgin River water) or Virgin River water (without Phase I water).

It should be noted that other "possible" sources, apart from those derived from our suggested water strategy, appear to be of approximately equal or lower cost than the minimum water costs associated with the ground-water development strategy, and heavy debt could probably be avoided. As an example, $860/acre-ft sea water desalinization/Colorado River trade with the City of Santa Barbara has the potential to put water in Las Vegas for less than $1,000/acre-ft and distributed for less than the minimum Phase I water cost. It should be also noted that the multibillion dollar debt load required by the first phase of ground water and Virgin River water development is highly undesirable *if* it proves feasible to establish.

In summary, there is economic feasibility for Phase I or Virgin River water, but not both together due to the resulting high user water costs reducing the water demand. Considerable uncertainty is associated with Phase I and Virgin River water development because of water availability (Phase I) or engineering feasibility/cost problems (Virgin River). Phase II, III, IV have overall engineering feasibility, but are not economically feasible beginning with Phase II if they follow either Phase I or Virgin River water development programs due to the high user water cost lowering the water demand by approximately the amount of phase water developed. Infrastructure capital investments are large enough (multibillion dollar debt load by the second step of development) that a federally sponsored water development program is the only plausible financial scenario. However, uncertain timing, political acceptability, and cost containment problems argue against federal sponsorship.

The LVVWD 1989 filings for the water rights establish a turning point in the Southern Nevada approach to future growth and water supply. The bold move for the ground-water rights has focused necessary attention on the need for a *new* Southern Nevada water strategy. Engineering feasibility or locking up the water rights are not the only key elements of establishing an expanded water supply for the continued growth of Las Vegas and other Southern Nevada communities. Economic feasibility, and careful consideration of water costs in terms of water-use requirements, are equally as important elements if the traditional quality development is to continue with population growth. Water development strategy must be predicated on all key elements if Las Vegas and other Southern Nevada communities wish to continue long term quality growth.

The alternative water development strategy provides 1) long term lower total water costs, 2) continued low cost water supply for irrigation and other nonpotable uses, 3) an equal or greater total water supply, 4) greater flexibility and independence with a secure supply, and (5) no multibillion dollar debt load.

ALTERNATIVE STRATEGY

The *minimum cost analysis* and other relationships established in the study point to an alternative water strategy that offers continued growth of population in Southern Nevada and a maximized total water supply at the lowest overall cost.

I. Increase Water Prices to Reduce Potable Water Demand /Established Secondary Low Cost Water Supply

An effective policy to reduce the potable water demand is necessary to make long term population/economic growth feasible. It is also clear from this water cost analysis that *markedly increased future water prices would be the result of the current water strategy for Las Vegans.* The real water cost to Las Vegas users would at least double if Phase II water came on line, and a multibillion dollar debt load would exist. A change in water-supply strategy is necessary to obtain *economic growth* with traditional community water-use standards in conjunction with the *population growth.* The most appropriate time to change the water-development strategy is now, before the very large capital investments are made in the Virgin River or Phase I supplies. The best strategy is to reduce the potable water demand, and put capital investments into frastructure needed to maximize use of in-valley secondary water, in order to minimize the overall water costs, avoid the risks of multibillion dollar debt, and maximize the total long term water supply for Southern Nevada.

The very high per capita water demand in Las Vegas strongly suggests that water pricing may reduce the potable water demand by as much as 50% without impacting population growth. If an alternative secondary water supply is made available during the demand reduction transition, traditional landscape oriented water uses can be maintained. If we were to design the structured potable water price increases, they would be stepped into rapid increases during a ten plus year period, and linked to the development of service from an in-valley distribution system of secondary (nonpotable renovated wastewater) low cost water supply. By around 2005 it would be established as to what the demand would be for new, more costly, potable water sources and how large the demand for the in-valley derived secondary water supply was proving to be. The increase in potable water prices would be raised until the potable water demand was reduced to about the 50% of the current per capita demand. This would be accomplished as the in-valley renovated water source comes on line in distribution systems. This is a strategy that allows for delaying the need for any future large water source at significantly higher costs for 40 to 50 years, and permits the excess potable water revenues to be used for the implemented in-valley water collection, renovation and distribution program. While this alternative may seem strong medicine, it is believed to be better to commit to a program which has the potential to 1) more than double the total water supply for new users, and 2) ensure that a least cost overall water supply strategy has been implemented. This water pricing strategy would give real substance to an *economic growth policy* for the foreseeable future by forcing the high per capita potable water use into lower demand use patterns, and provide a funding base to establish a parallel supply of in-valley secondary water at continued low water costs.

II. Return Flow Credit Versus Wastewater Reclamation (In-Valley), Surface-Water and Shallow Ground-Water Harvesting

The concept of "return flow credit" of wastewater for Colorado River water has led Las Vegas down a narrow pathway to the present, and the *minimum cost analysis* clearly demonstrates it not to be the optimum pathway for maximizing water supply for continued growth at the lowest, long term water costs. The "return flow credit" strategy has always had the appearances of being the most cost effective way to maximize water supply with "return flow credit" water of up to 150,000 acre-ft/yr., or equal to as much as 50% of Nevada's Colorado River allotment. However, 1) this theoretical amount will only be available if there is sufficient Colorado River flow to meet the lower Colorado River basin allocations, plus the return flow credit amount, 2) the credit water is based on the stipulation that return flow wastewater meets certain water-quality standards, and 3) only that "credit" is given to water interpreted to be return flow from Colorado River water use. This is not a flexible or secure way to maximize water supply. To date the "return flow credit" strategy has more or less trapped Las Vegas into a mindset of a totally potable water supply (at very high future water prices *if* this water strategy is continued).

An important relationship is that at least 50% of water use does not require potable water, and most of this use is for irrigation. Las Vegas, to keep its water-use life-style, would benefit from a water strategy that continues to provide water that is affordable for landscaping/outdoor uses. Another important number is something like 70% of delivered water historically returned as water flow in Las Vegas Wash (this percentage decreases as the urban area continues to spread throughout the valley). In rough numbers, if about 300,000 acre-ft/yr. of water are being used in the Las Vegas Valley today, probably a minimum of 150,000 acre-ft/yr. becomes some form of return flow water. Simple arithmetic indicates there is 450,000 acre- ft at the minimum for use (if nonpotable uses are separated) at the present time. However, when Las Vegas needs the full 450,000 acre-ft and uses it, there is then 50% of total water use for recovery, or a total of 675,000 acre-ft available with 50% recovery, and so on. This is the principle of recycling. Surface-water runoff in the valley measures in the of thousands of acre-ft from some storms and is an additional source to add to the return flow from water that is used. Past return flow has created a large volume of new shallow ground water of varied (but useful) quality in storage, that continues to cause waterlogging problems in many areas and which should be developed and used. Roughly estimated, there will be at least 50% of the total water used in the valley to capture and to reuse as well as the surface water and shallow ground water in storage. In terms of maximizing supply, this recycling approach has a large edge on "return flow credit" because there is no institutional cap on the total amount; it can be recovered on the basis of total wastewater return flow plus the other water sources which occur in the valley. There is a very low relative cost to capture and treat/blend this water. The secondary water-supply delivery infrastructure cost *is very substantial* according to our rough estimates, perhaps as much as Phase I of the ground-water importation scheme. The difference is that, with the suggested strategy, it could be paid off in about 15 or 20 years, and creates at least 50 more years of water supply at low water costs.

If the alternative strategy began in 1995, the following would result by the year 2030 using the REMI population projection: A total water demand of 480,000 acre-ft/yr composed of 160,000 acre-ft/yr of potable demand (60,000 acre-ft/yr of in-valley ground water and 100,000 acre-ft/yr of Colorado River water yielding an average water quality of about 590 mg/l) and 320,000 acre-ft/yr of secondary water demand (220,000 acre-ft/yr of captured wastewater and

100,000 acre-ft/yr of Colorado River water blended to give a water quality of about 1050 mg/l). This leaves about 100,000 acre-ft/yr of Nevada Colorado River allotment for Laughlin area use and the balance in reserve, and at least 20,000 acre-ft/yr of wastewater in reserve as well. Total use of this reserve water could not occur till the last half of the century according to the projection of the REMI curve, but when used, it would create another 50,000 acre-ft/yr of wastewater, resulting in a total useful water supply for Southern Nevada of about 630,000 acre-ft/yr, at an overall cost to the user of 125% of present cost of water! This is quite a different result when Phase I adds only 32,561 acre-ft/yr to the existing supply and raises water cost to about 150% of current user cost!

All in-valley sources of water can be effectively captured and used if potable water and nonpotable use water are *separated* and delivered. Such an approach encourages long term policy designed to capture and use *all* in-valley water sources: 1) systematic location, design, and construction of new wastewater-treatment facilities for *water reclamation*; 2) systematic location, design, and construction of surface-water capture structures for secondary (or primary) systems; 3) systematic design, and construction of shallow ground-water development infrastructure; and 4) the most important infrastructure system of all, the construction of the distribution network for secondary water delivery. Reclaimed wastewater and the other in-valley water sources is the best low cost, long-term water source that has the potential to keep Las Vegas green with both golf courses and greenbacks. Of the "new" required infrastructure, only two are "new" systems that would not, with the existing water strategy, be built out in some configuration: 1) the distribution system for secondary water, and 2) a part of the capture system (wells for shallow ground water). The surface water, and water-treatment systems must be expanded with continued growth regardless of water strategy. In the new areas of development, the secondary distribution system can be put in at relatively lower costs when development occurs, as well.

Such a policy and program does not preclude the use of "return flow credit" Colorado River water in the immediate and distant future when and if it proves to be available and cost effective. However, the secondary water system combined with a price structured decrease in potable water demand would give the community the *flexibility* and *independence* to capture, treat, blend, and use all in-valley water sources, including water that may be used for return flow credit, when desirable. Full implementation of the combined water strategy over the next 20 to 30 years yields a "new" water supply available for growth that is at least equal to the 240,000 acre-ft/yr of application water at small fraction of the cost . It has the potential to more than double the total water supply of the valley.

A common objection to the wastewater capture, and recycling strategy is the perceived salinity buildup problem. Briefly, the problem is real, but overstated. It is dealt with in two ways: 1) water blending, with larger volumes of low TDS water mixed with smaller volumes of higher TDS water to keep nonpotable water at acceptable quality for irrigation purposes, 2) desalinization, if eventually necessary (determined by the waters available for blending and the rates at which the salts actually concentrate in the recaptured wastewater). Nature tends to help out more than is commonly recognized with most of the salt in the consumptively used water going into long term *storage* in the vadose zone during the ET process. Salt cycling with the wastewater in the shallow ground water is not dominated by salt concentrated by current consumptive use, but rather it is previously concentrated salt being leached out of long term storage in the vadose zone by the induced shallow saturation (note that for over 20 years the Las Vegas Wash effluent has been around 1200 TDS). Desalinization of brackish water is lower cost than for sea water, and Las Vegans are already talking about (paying for) desalinization of sea water for Colorado River water trades. The question needs to be posed: Why look to Santa Barbara, or any other distant faucet on the Colorado River pipeline? The mindset on "return flow credit" has deflected water-supply strategy to very high cost future water source alternatives. Even the poorest quality recycled water desalinized in Las Vegas Valley should prove to be less than one half the cost of (traded) sea water desalinization.

III. Test Institutional Barriers to Additional Colorado River Use from Upper or Lower Basin Sources.

The minimum cost analysis gives insight into the savings that might be accomplished for additional water rights or long term leased water from a Colorado River basin source. *Institutional structures on the Colorado River need a strong challenge.* This alternative is companion to the water-supply strategy we believe will be successful, but the actual demand for this water may not become real until well after 2030.

Additional Strategy

With a Las Vegas water-supply strategy based on a combination of potable water-demand reduction/wastewater reclamation and use, Las Vegas has at least 40 years to put to use the water resources that are "in hand" with continued rapid growth. Southern Nevada's population may almost double with the in-hand water resources if the potable water demand is maintained at or below the 100 gallons/day/capita level, and the secondary supply water price is structured similar to current water costs. Because of the alternative lower cost water supply, the potable water demand can be lowered markedly if necessary (the 100 gpd/capita is a demand level that includes all water use in many communities). Eventually, Alternative III might bear fruit in the form of Upper Colorado River basin water. It's important to note, however, that such water may not be needed in large quantities for many years. The long hiatus in actual need for new water sources is appropriate for institutional changes of this nature.

Considerable interest has recently been reported in the possibility of trading for California Colorado River allotment water by paying for desalinization of sea water in California. The Bureau of Reclamation treatment costs for the Yuma Desalinization Plant (brackish water) are being reported at about $425/acre-ft. Santa Barbara, California, reports that their sea water desalinization derived supply, after the facility is amortized during the first five years of operation, will cost about $860/acre-ft. The higher cost is perhaps realistic for sea water desalinization, and a "trade" for Colorado River water at this cost *is competitive with the minimum cost for all phases of the northern ground-water applications after adding the SNWP and in-valley distribution costs.* What may make sense however, is in-valley desalinization of brackish shallow ground water (at the $425/acre-ft cost?) before a sea water/Colorado River swap. The approach has the apparent cost advantage of reclaiming the poorest quality water recovered in the valley (water where the salts have been concentrated) to reserve the SNWP pumping capacity for future "other" Colorado River sources (and save about $111/acre-ft, the cost of putting desalinization exchange water through the SNWP, and another $300 plus /acre-ft in the difference between brackish and sea water desalinization costs). Eventually, when all the wastewater is needed to meet the demands, this may prove to be the least cost source to add to the supply.

We view the "return flow credit" Colorado River water with some reservation as a reliable long term source. The immediate future is the most opportune period to capture and use in-valley wastewater in order to keep long term water costs down and maximize reliable water supply. The need for return flow credit water rapidly ceases as wastewater reuse comes on line and total Southern Nevada water ultimately use expands to 450,000-500,000 acre-ft/yr. We speculate that there could be considerable pumping capacity in the SNWP in the future, particularly if return flow credit water is limited or eliminated in the future. Any water sources which come from the Colorado River water at competitive water costs might be delivered through the SNWP if the return flow credit water does not take up the pumping capacity. The existing SNWP pumping capacity has been suggested to be up to 150,000 acre-ft/yr above the Nevada allotment, or ample capacity to handle "new" Colorado River sources.

It is beyond the scope of this study for in-depth evaluation of the alternative water management strategy that has been outlined and briefly discussed. However, the only costly new infrastructure is the secondary water distribution system, and, ultimately, desalinization facilities. The "alternative" water strategy for Las Vegas appears to offer the longest period of population growth, while maintaining a) a large total water supply to meet continued rapid population growth, b) lowest overall water costs, c) a large supply of low cost water, and d) considerable flexibility (capability of controlling potable water demands) and independence (no "surprises" if return flow credit water is not available for some reason).

Appendix I

A. Abstract of 1989 Filings of Las Vegas Valley Water District

B. State Engineer Letter of February 14, 1992
(with list of withdrawn LVVWD applications)

ABSTRACT OF FILINGS OF
LAS VEGAS VALLEY WATER DISTRICT

(All filings are for water from an underground source except Application 54077 which is from the Virgin River)

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
53947	10-169	Tikapoo Valley (North)	NW¼ SW¼ Sec. 31, T.6S., R.58E.	6 cfs	Lincoln
53948	10-169	Tikapoo Valley (North)	SW¼ NW¼ Sec. 24, T.6S., R.58E.	10 cfs	Lincoln
53949	10-169	Tikapoo Valley (North)	NE¼ NE¼ Sec. 36, T.4S., R.56E.	10 cfs	Lincoln
53950	10-169	Tikapoo Valley (South)	NE¼ NW¼ Sec. 30, T.12S., R.61E.	6 cfs	Lincoln
53951	10-169	Tikapoo Valley (South)	NW¼ SE¼ Sec. 29, T.11S., R.61E.	10 cfs	Lincoln
53952	10-169	Tikapoo Valley (South)	SW¼ NE¼ Sec. 26, T.10S., R.60E.	10 cfs	Lincoln
53953	10-170	Penoyer Valley	NW¼ SE¼ Sec. 27, T.2S., R.55E.	6 cfs	Lincoln
53954	10-170	Penoyer Valley	NE¼ SE¼ Sec. 11, T.1S., R.56E.	10 cfs	Lincoln
53955	10-170	Penoyer Valley	NE¼ NE¼ Sec. 23, T.1N., R.55E.	10 cfs	Lincoln
53956	10-171	Coal Valley	NE¼ NW¼ Sec. 36, T.3N., R.60E.	6 cfs	Nye
53957	10-171	Coal Valley	SW¼ SE¼ Sec. 14, T.2S., R.59E.	6 cfs	Lincoln

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
53958	10-171	Coal Valley	SE¼ NW¼ Sec. 10, T.3N., R.60E.	10 cfs	Nye
53959	10-171	Coal Valley	SE¼ SW¼ Sec. 6, T.3S., R.60E.	10 cfs	Lincoln
53960	10-172	Garden Valley	NW¼ NE¼ Sec. 30, T.1S., R.58E.	6 cfs	Lincoln
53961	10-172	Garden Valley	NW¼ SE¼ Sec. 24, T.3N., R.58E.	6 cfs	Nye
53962	10-172	Garden Valley	NE¼ SE¼ Sec. 31, T.5N., R.59E.	6 cfs	Nye
53963	10-172	Garden Valley	NW¼ SE¼ Sec. 24, T.2S., R.57E.	10 cfs	Lincoln
53964	10-172	Garden Valley	SE¼ SW¼ Sec. 22, T.5N., R.58E.	10 cfs	Nye
53965	10-173B	Railroad Valley (North)	SE¼ NE¼ Sec. 5, T.6N., R.57E.	6 cfs	Nye
53966	10-173B	Railroad Valley (North)	SE¼ NE¼ Sec. 13, T.6N., R.56E.	6 cfs	Nye
53967	10-173B	Railroad Valley (North)	SE¼ SW¼ Sec. 26, T.6N., R.56E.	6 cfs	Nye
53968	10-173B	Railroad Valley (North)	NE¼ SW¼ Sec. 3, T.5N., R.56E.	6 cfs	Nye
53969	10-173B	Railroad Valley (North)	NE¼ SW¼ Sec. 20, T.5N., R.56E.	6 cfs	Nye
53970	10-173B	Railroad Valley (North)	NE¼ SW¼ Sec. 13, T.4N., R.54E.	6 cfs	Nye

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
53971	10-173B	Railroad Valley (North)	SE¼ SW¼ Sec. 35, T.4N., R.53E.	6 cfs	Nye
53972	10-173B	Railroad Valley (North)	SW¼ SW¼ Sec. 29, T.7N., R.55E.	6 cfs	Nye
53973	10-173B	Railroad Valley (North)	SE¼ SW¼ Sec. 27, T.6N., R.54E.	6 cfs	Nye
53974	10-173B	Railroad Valley (North)	SE¼ NW¼ Sec. 8, T.4N., R.54E.	6 cfs	Nye
53975	10-173B	Railroad Valley (North)	NW¼ SW¼ Sec. 24, T.7N., R.57E.	10 cfs	Nye
53976	10-173B	Railroad Valley (North)	SE¼ SW¼ Sec. 19, T.6N., R.57E.	10 cfs	Nye
53977	10-173B	Railroad Valley (North)	NW¼ NE¼ Sec. 19, T.5N., R.57E.	10 cfs	Nye
53978	10-173B	Railroad Valley (North)	NE¼ SW¼ Sec. 6, T.4N., R.56E.	10 cfs	Nye
53979	10-173B	Railroad Valley (North)	NE¼ SE¼ Sec. 3, T.4N., R.55E.	10 cfs	Nye
53980	10-173B	Railroad Valley (North)	SE¼ SE¼ Sec. 13, T.3N., R.54E.	10 cfs	Nye
53981	10-173A	Railroad Valley (South)	SE¼ SE¼ Sec. 10, T.2S., R.52E.	6 cfs	Nye
53982	10-173A	Railroad Valley (South)	SW¼ SW¼ Sec. 19, T.1S., R.51½E.	6 cfs	Nye
53983	10-173A	Railroad Valley (South)	NE¼ SW¼ Sec. 20 T.1S., R.51E.	10 cfs	Nye

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
53984	10-156	Hot Creek Valley	NW¼ NE¼ Sec. 25, T.1N., R.50E.	10 cfs	Nye
53985	10-173B	Railroad Valley (North)	SE¼ NE¼ Sec. 3, T.7N., R.57E.	6 cfs	Nye
53986	10-173B	Railroad Valley (North)	SE¼ NW¼ Sec. 15, T.7N., R.57E.	6 cfs	Nye
53987	10-180	Cave Valley	SE¼ NW¼ Sec. 22, T.6N., R.63E.	6 cfs	Lincoln
53988	10-180	Cave Valley	SE¼ SE¼ Sec. 21, T.7N., R.63E.	10 cfs	Lincoln
53989	10-181	Dry Lake Valley	SE¼ SW¼ Sec. 30, T.2S., R.64E.	6 cfs	Lincoln
53990	10-181	Dry Lake Valley	NE¼ SE¼ Sec. 8, T.2S., R.65E.	10 cfs	Lincoln
53991	10-182	Delamar Valley	NE¼ NE¼ Sec. 4, T.5S., R.63E.	6 cfs	Lincoln
53992	10-182	Delamar Valley	NE¼ NE¼ Sec. 15, T.6S., R.64E.	10 cfs	Lincoln
53993	10-183	Lake Valley	NE¼ SE¼ Sec. 30, T.6N., R.66E.	6 cfs	Lincoln
53994	10-183	Lake Valley	SW¼ SE¼ Sec. 36, T7N., R.65E.	6 cfs	Lincoln
53995	10-183	Lake Valley	NW¼ SE¼ Sec. 1, T.7N., R.65E.	6 cfs	Lincoln
53996	10-183	Lake Valley	NW¼ SE¼ Sec. 26, T.6N., R.67E.	10 cfs	Lincoln

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
53997	10-183	Lake Valley	SE¼ NE¼ Sec. 2, T.8N., R.66E.	10 cfs	Lincoln
53998	10-174	Jakes Valley	NW¼ NW¼ Sec. 14, T.15N., R.60E.	6 cfs	White Pine
53999	10-174	Jakes Valley	SE¼ SE¼ Sec. 36, T.16N., R.59E.	6 cfs	White Pine
54000	10-174	Jakes Valley	SE¼ NE¼ Sec. 34, T.16N., R.60E.	6 cfs	White Pine
54001	10-174	Jakes Valley	SE¼ NW¼ Sec. 19, T.16N., R.61E.	10 cfs	White Pine
54002	10-174	Jakes Valley	NE¼ NE¼ Sec. 10, T.15N., R.60E.	10 cfs	White Pine
54003	10-184	Spring Valley	NW¼ NW¼ Sec. 20, T.8N., R.68E.	6 cfs	Lincoln
54004	10-184	Spring Valley	SE¼ SE¼ Sec. 25, T.9N., R.67E.	6 cfs	Lincoln
54005	10-184	Spring Valley	NE¼ NE¼ Sec. 14, T.9N., R.67E.	6 cfs	Lincoln
54006	10-184	Spring Valley	SE¼ SW¼ Sec. 22, T.10N., R.67E.	6 cfs	White Pine
54007	10-184	Spring Valley	NE¼ NW¼ Sec. 34, T.11N., R.66E.	6 cfs	White Pine
54008	10-184	Spring Valley	SW¼ SW¼ Sec. 1, T.11N., R.66E.	6 cfs	White Pine
54009	10-184	Spring Valley	NW¼ NE¼ Sec. 36, T.13N., R.66E.	6 cfs	White Pine

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
54010	10-184	Spring Valley	SE¼ SE¼ Sec. 25, T.14N., R.66E.	6 cfs	White Pine
54011	10-184	Spring Valley	NE¼ SE¼ Sec. 14, T.14N., R.66E.	6 cfs	White Pine
54012	10-184	Spring Valley	SE¼ NE¼ Sec. 16, T.14N., R.67E.	6 cfs	White Pine
54013	10-184	Spring Valley	SW¼ SW¼ Sec. 25, T.15N., R.66E.	6 cfs	White Pine
54014	10-184	Spring Valley	SW¼ SW¼ Sec. 15, T.15N., R.67E.	6 cfs	White Pine
54015	10-184	Spring Valley	NW¼ SW¼ Sec. 14, T.15N., R.67E.	6 cfs	White Pine
54016	10-184	Spring Valley	NE¼ SW¼ Sec. 7, T.15N., R.67E.	6 cfs	White Pine
54017	10-184	Spring Valley	NW¼ SE¼ Sec. 25, T.16N., R.66E.	6 cfs	White Pine
54018	10-184	Spring Valley	SE¼ NE¼ Sec. 24, T.16N., R.66E.	6 cfs	White Pine
54019	10-184	Spring Valley	SW¼ NE¼ Sec. 32, T.12N., R.68E.	10 cfs	White Pine
54020	10-184	Spring Valley	SE¼ SE¼ Sec. 14, T.14N., R.67E.	10 cfs	White Pine
54021	10-184	Spring Valley	SW¼ NE¼ Sec. 33, T.16N., R.66E.	10 cfs	White Pine
54022	11-195	Snake Valley	NE¼ NE¼ Sec. 8, T. 13N., R.70E.	6 cfs	White Pine

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
54023	11-195	Snake Valley	NW¼ SE¼ Sec. 36, T.13N., R.70E.	6 cfs	White Pine
54024	11-195	Snake Valley	SW¼ NE¼ Sec. 13, T.11N., R.70E.	6 cfs	White Pine
54025	11-195	Snake Valley	SE¼ SE¼ Sec. 27, T.10N., R.70E.	6 cfs	White Pine
54026	11-195	Snake Valley	NE¼ SE¼ Sec. 26, T.14N., R.69E.	10 cfs	White Pine
54027	11-195	Snake Valley	NE¼ NW¼ Sec. 30, T.13N., R.70E.	10 cfs	White Pine
54028	11-195	Snake Valley	SE¼ SE¼ Sec. 22, T.12N., R.70E.	10 cfs	White Pine
54029	11-195	Snake Valley	SW¼ NE¼ Sec. 20, T.11N., R.70E.	10 cfs	White Pine
54030	11-195	Snake Valley	NW¼ SE¼ Sec. 4, T.10N., R.70E.	6 cfs	White Pine
54031	13-202	Patterson Valley	SE¼ SE¼ Sec. 17, T.2N., R.67E.	6 cfs	Lincoln
54032	13-202	Patterson Valley	NW¼ NE¼ Sec. 13, T.1N., R.67E.	6 cfs	Lincoln
54033	13-202	Patterson Valley	SE¼ NW¼ Sec. 20, T.3N., R.68E.	10 cfs	Lincoln
54034	13-202	Patterson Valley	SW¼ NW¼ Sec. 6, T.1N., R.69E.	10 cfs	Lincoln
54035	13-205	Lower Meadow Valley	NE¼ SE¼ Sec. 8, T.14S., R.66E.	6 cfs	Clark

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
54036	13-205	Lower Meadow Valley	NW¼ NW¼ Sec. 9, T.13S., R.67E.	10 cfs	Clark
54037 WRONG LOCATION - WITHDRAWN AND REFILED SEE APPLICATION 54105	13-205	Lower Meadow Valley	SW¼ NE¼ Sec. 9, T.18S., R.68E.	10 cfs	Clark
54038	13-207	White River Valley	SW¼ NE¼ Sec. 7, T.7N., R.62E.	6 cfs	Nye
54039	13-207	White River Valley	SE¼ NW¼ Sec. 21, T.5N., R.61E.	6 cfs	Nye
54040	13-207	White River Valley	SW¼ SE¼ Sec. 18, T.6N., R.62E.	6 cfs	Nye
54041	13-207	White River Valley	NW¼ NE¼ Sec. 5, T.5N., R.62E.	10 cfs	Nye
54042	13-207	White River Valley	NE¼ NE¼ Sec. 9, T.6N., R.62E.	10 cfs	Nye
54043	13-208	Pahroc Valley	NE¼ SE¼ Sec. 35, T.3N., R.62E.	6 cfs	Lincoln
54044	13-208	Pahroc Valley	SW¼ NE¼ Sec. 19, T.2N., R.63E.	6 cfs	Lincoln
54045	13-208	Pahroc Valley	NE¼ NW¼ Sec. 14, T.1N., R.62E.	10 cfs	Lincoln
54046	13-208	Pahroc Valley	SE¼ NW¼ Sec. 29, T.1S., R.62E.	10 cfs	Lincoln
54047	13-208	Pahroc Valley	NW¼ SW¼ Sec. 33, T.2S., R.61E.	10 cfs	Lincoln
54048	13-208	Pahroc Valley	SE¼ NE¼ Sec. 15, T.2N., R.62E.	10 cfs	Lincoln

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
54049	13-208	Pahroc Valley	SE¼ SE¼ Sec. 5, T.2S., R.62E.	10 cfs	Lincoln
54050	13-209	Pahranagat Valley	NW¼ SE¼ Sec. 13, T.6S., R.60E.	6 cfs	Lincoln
54051	13-209	Pahranagat Valley	SE¼ NE¼ Sec. 20, T.7S., R.61E.	6 cfs	Lincoln
54052	13-209	Pahranagat Valley	SE¼ SW¼ Sec. 3, T.8S., R.61E.	6 cfs	Lincoln
54053	13-209	Pahranagat Valley	SE¼ SE¼ Sec. 36, T.8S., R.61E.	10 cfs	Lincoln
54054	13-209	Pahranagat Valley	NE¼ SW¼ Sec. 33, T.8S., R.62E.	10 cfs	Lincoln
54055	13-210	Coyote Springs Valley	SE¼ SW¼ Sec. 5, T.13S., R.63E.	6 cfs	Clark
54056	13-210	Coyote Springs Valley	SE¼ SE¼ Sec. 32, T.13S., R.63E.	6 cfs	Clark
54057	13-210	Coyote Springs Valley	SE¼ NW¼ Sec. 21, T.14S., R.63E.	6 cfs	Clark
54058	13-210	Coyote Springs Valley	NE¼ NE¼ Sec. 1, T.13S., R.63E.	10 cfs	Clark
54059	13-210	Coyote Springs Valley	NE¼ NW¼ Sec. 19, T.13S., R.64E.	10 cfs	Clark
54060	10-168	Three Lakes Valley (North)	NE¼ NE¼ Sec. 17, T.13S., R.59E.	6 cfs	Clark
54061	10-168	Three Lakes Valley (North)	NE¼ SE¼ Sec. 17, T.12S., R.59E.	10 cfs	Lincoln

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
54062	13-211	Three Lakes Valley (South)	NE¼ NW¼ Sec. 7, T.17S., R.58E.	6 cfs	Clark
54063	13-211	Three Lakes Valley (South)	NE¼ NE¼ Sec. 23, T.16S., R.57E.	6 cfs	Clark
54064	13-211	Three Lakes Valley (South)	SE¼ SE¼ Sec. 14, T.16S., R.56E.	10 cfs	Clark
54065	13-211	Three Lakes Valley (South)	SE¼ NW¼ Sec. 36, T.14S., R.58E.	10 cfs	Clark
54066	13-211	Three Lakes Valley (South)	SW¼ SW¼ Sec. 19, T.14S., R.59E.	10 cfs	Clark
54067 WRONG LOCATION - WITHDRAWN AND REFILED SEE APPLICATION 54106	13-211	Three Lakes Valley (South)	SE¼ SW¼ Sec. 6, T.15N., R.57E.	10 cfs	White Pine
54068	10-168	Three Lakes Valley (North)	SE¼ NW¼ Sec. 26, T.13S., R.59E.	6 cfs	Clark
54069	10-168	Three Lakes Valley (North)	NE¼ SE¼ Sec. 36, T.13S., R.59E.	10 cfs	Clark
54070	13-212	Las Vegas Valley	SE¼ NE¼ Sec. 18, T.16S., R.59E.	10 cfs	Clark
54071	13-212	Las Vegas Valley	NE¼ NE¼ Sec. 29, T.16S., R.59E.	10 cfs	Clark
54072	13-212	Las Vegas Valley	SE¼ SE¼ Sec. 16, T.15S., R.59E.	10 cfs	Clark
54073	13-216	Dry Lake Valley (GARNET VALLEY)	SW¼ SW¼ Sec. 32, T.17S., R.63E.	10 cfs	Clark
54074	13-217	Hidden Valley	SW¼ SW¼ Sec. 25, T.16S., R.62E.	10 cfs	Clark

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
54075	13-218	California Wash	NE¼ NE¼ Sec. 8, T.16S., R.66E.	10 cfs	Clark
54076	13-218	California Wash	SE¼ NW¼ Sec. 17, T.15S., R.64E.	10 cfs	Clark
54077	13-222	The Virgin River	NE¼ NW¼ Sec. 13, T.14S., R.69E.	60,000 AC-FT	Clark
54078	13-222	Virgin River Valley	NE¼ SE¼ Sec. 11, T.14S., R.69E.	6 cfs	Clark
54079	13-222	Virgin River Valley	NE¼ NE¼ Sec. 14, T.14S., R.69E.	6 cfs	Clark
54080	13-222	Virgin River Valley	NW¼ NW¼ Sec. 14, T.14S., R.69E.	6 cfs	Clark
54081	13-222	Virgin River Valley	NE¼ SE¼ Sec. 15, T.14S., R.69E.	6 cfs	Clark
54082	13-222	Virgin River Valley	SE¼ SW¼ Sec. 15, T.14S., R.69E.	6 cfs	Clark
54083	13-222	Virgin River Valley	SW¼ SE¼ Sec. 16, T.14S., R.69E.	6 cfs	Clark
54084	13-222	Virgin River Valley	SE¼ NE¼ Sec. 21, T.14S., R.69E.,	6 cfs	Clark
54085	13-222	Virgin River Valley	SE¼ NW¼ Sec. 21, T.14S., R.69E.	6 cfs	Clark
54086	13-222	Virgin River Valley	SW¼ SE¼ Sec. 21, T.14S., R.69E.	6 cfs	Clark
54087	13-222	Virgin River Valley	SW¼ NW¼ Sec. 28, T.14S., R.69E.	6 cfs	Clark

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
54088	13-222	Virgin River Valley	NE¼ NE¼ Sec. 29, T.14S., R.69E.	6 cfs	Clark
54089	13-222	Virgin River Valley	SE¼ SE¼ Sec. 29, T.14S., R.69E.	6 cfs	Clark
54090	13-222	Virgin River Valley	NW¼ NW¼ Sec. 32 T.14S., R.69E.	6 cfs	Clark
54091	13-222	Virgin River Valley	SW¼ SW¼ Sec. 31, T.14S., R.69E.	6 cfs	Clark
54092	13-222	Virgin River Valley	SE¼ SE¼ Sec. 31, T.14S., R.69E.	6 cfs	Clark
54105	13-205	Lower Meadow Valley	SW¼ NE¼ Sec. 9, T.8S., R.68E.	10 cfs	Lincoln
54106	13-211	Three Lakes Valley (South)	NE¼ SW¼ Sec. 12 T.15S., R.57E.	10 cfs	Clark

BOB MILLER
Governor

STATE OF NEVADA

PETER G. MORROS
Director

R. MICHAEL TURNIPSEED, P.E.
State Engineer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

DIVISION OF WATER RESOURCES

Capitol Complex
123 W. Nye Lane
Carson City, Nevada 89710
(702) 687-4380

IN THE MATTER OF APPLICATIONS

53947 through 53952, inclusive; 53956 through 53983, inclusive; 53985 through 53993, inclusive; 53996, 54003 through 54034, inclusive; 54043 through 54049, inclusive; 54055 through 54066, inclusive; 54068 through 54092, inclusive; and 54106

February 14, 1992

NOTICE OF STATUS CONFERENCE

TO WHOM IT MAY CONCERN:

Please take notice that the State Engineer has scheduled a status conference in the matter of the above referenced protested applications filed in this office by the Las Vegas Valley Water District.

The conference will begin promptly at 9:00 A.M., on Wednesday March 18, 1992, in the Sparks City Council Chambers, Legislative Building, 745 Fourth Street, Sparks, Nevada.

The purpose of the status conference will be to determine the progress that has been made relating to:

1. Work progress on the Environmental Report;

2. Exchange of information to date between the parties, sufficiency of such information, whether or not the process used in the exchange is working or needs to be improved. This pertains to Las Vegas Valley Water District, the Federal Government and any other parties preparing information to be used in their case;

3. The problem or lack of problem of access to the various proposed points of diversion and whether or not applications to change point of diversion will be filed and when;

4. The matter of Bureau of Indian Affairs intervention;

5. Anything necessary relating to the discovery process;

6. Whether or not any additional preliminary rulings will be needed; and

7. Any other relevant and timely matter.

By this notice all parties are hereby advised that the applicant has withdrawn the following applications:

APPLICATION	BASIN	COUNTY
54035	Lower Meadow	Clark
54105		Lincoln
54036	Lower Moapa	Clark
53953	Penoyer	Lincoln
53954		
53955		
54050	Pahranagat	Lincoln
54051		
54052		
54053		
54054		
53984	Hot Creek	Nye
53994	Lake	Lincoln
53995		
53997		
54038	White River	Nye
54039		
54040		
54041		
54042		
53998	Jakes	White Pine
53999		
54000		
54001		
54002		

No further consideration will be given these withdrawn applications; accordingly, all persons that have protested only the withdrawn applications will no longer be noticed in these proceedings.

The applicant and the formal protestants to the remaining applications referenced hereinabove, on page one or their representative/spokesperson are invited to be in attendance so that their positions can be heard and explored.

Cost of the transcript of the status conference will be borne on a pro-rata basis by the parties making presentations.

If you have any questions please contact Larry C. Reynolds, Chief Hearing Officer for the State Engineer at (702) 687-4381.

Sincerely,

R. Michael Turnipseed, P.E.
State Engineer

RMT/LCR/pm

cc: Copy of mailing list available on request to this office.

Appendix II

March 18, 1992 letter to R. Michael Turnipseed from Ross E. de Lipkau with four phase plan of water development, Las Vegas Valley Water District Coörporative Water Project

HILL CASSAS & de LIPKAU
LAWYERS

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March 18, 1992

R. Michael Turnipseed, P.E.
Nevada State Engineer
Division of Water Resources
123 West Nye Lane
Carson City, Nevada 89710

Re: Las Vegas Valley Water District
Cooperative Water Project

Dear Mr. Turnipseed:

This letter is intended to set forth the current status of the above matter. It is also intended to answer or reply to those issues raised in your letter of February 14, 1992. Copies of this letter will be hand-delivered to those attorneys of record and individuals who so request them. The Las Vegas Valley Water District (District) wishes to offer the following:

I. ENVIRONMENTAL REPORT

The environmental report, as set forth in NRS 533.368 and ordered by your office, is progressing. Field work, by reason of February snows, has been delayed for several weeks. It is anticipated that the final report will be available about May 15, 1992. Copies will be distributed in accordance with the above statute.

II. EXCHANGE OF INFORMATION

The District has previously exchanged draft hydrologic data with one protestant. Hydrologists for both the District and the protestant have been meeting for the purpose of better understanding each other's hydrologic position.

A. It was originally contemplated that the District would present drafts, in various forms of completion, to protestants. It is now believed, based upon actual experience (#2 above) that draft documents, when reviewed, are counter-productive, expensive and extremely time-consuming to the District and protestants. Accordingly, the District offers as follows:

1. Six months prior to any particular hearing, the District shall distribute final reports, together with appropriate computer disks, to those protestants who have access to computers or have engaged hydrologists. Thus, the District believes that the data should be readily available, but only to those individuals who have actual use for the material.

2. The District further offers to have a workshop after distribution of all reports to answer questions and discuss hydrology. Request is made that the consultants and attorneys arrange an agreed upon time, and the District will provide space and expertise for such meeting. Inasmuch as the documentation is contained in District's Las Vegas office, the meeting will be held at that office.

III. ADDITIONAL EVIDENCE

Within thirty (30) days of any particular hearing, the District agrees to submit any additional documentary evidence (except for large illustrative charts), list all witnesses to be called, and summarize the proposed testimony.

IV. ACCESS

The District will, in the near future, be filing approximately 28 applications to change the points of diversion. Other than problems with the desert game range and the Air Force bombing site, the District believes that access will not be a problem.

V. INTERVENTION

The District has no objections to the proposed intervention of the Bureau of Indians Affairs. However, the District objects to any other "intervening parties". The water law does not allow "protestants" to intervene after the statutory protest period has expired. As is customary, the State Engineer may allow any interested party to speak at the end of each particular hearing.

VI. DISCOVERY

It is believed discovery is not necessary for the following reasons:

A. Reports, of a hydrologic nature, will be delivered to protestants at least six (6) months in advance of any particular hearing.

B. Attached hereto is a schedule of water to be diverted from each ground water basin.

C. As has previously been stated, the District intends to appropriate all unappropriated water in each basin.

D. With the above information, it is not difficult for protestants to calculate the effects of the District's pumping, if any.

E. Discovery will not assist protestants in presentation of their case. This is especially true in that the District has agreed (II.A.2., above) to present a workshop or "question and answer" session.

F. In the interest of economy, all parties can be adequately prepared without the excessive costs added by discovery.

VII. PRELIMINARY RULINGS

The undersigned is most confused with the actual attorneys of record and the clients represented by them. It is requested the State Engineer inquire from all attorneys the following information:

A. Attorney's name and mailing address.

B. Name of attorney's clients.

C. List of applications protested and corresponding client name.

D. Precise water rights, together with legal descriptions thereof, claimed by the several indian tribes.

The above information is requested for mailing purposes. As is readily apparent, it is certainly counter-productive for all attorneys to receive information pertaining to applications not protested by their clients.

VIII. OTHER

A. Scheduling. It is respectfully requested the Virgin River applications be scheduled in the first week of November, 1992. All "one-time witnesses" will be called by the District at this time. It is believed that the procedure, outlined above, will save time and consequently funds for all parties. An example would be that individual employed by the District who would discuss the current conservation program.

B. Order of Hearings. It is the request of the District that the hearings take place in the following order:

1. Virgin River.

2. Spring, Snake and Patterson Valleys.

3. Cave, Pahroc, Dry, Lake, Delamar, Garden, Coal, Coyote Springs, Hidden, Garnet and California Wash.

4. Tikapoo (North and South) and Three Lakes (North and South).

5. Railroad (North and South).

As mentioned above, the volume of water to be developed from each basin is as set forth on the attached sheet.

IX. PROCEDURE

It is requested that, at the first hearing involving mainly ground water hydrology (which is Spring, Snake and Patterson), the District will present the regional ground water flow for all basins, as set forth in VIII.B.2-5, above. In a similar fashion as the "one-time witnesses", this regional flow information will be utilized in conjunction with all subsequent hearings. Again, such procedure is suggested as a means of saving time and funds.

X. LOCATION OF HEARINGS

Where possible, it is requested that the majority of the hearings be held in Las Vegas, Nevada. The District has no objections should a portion of the hearings be scheduled in White Pine County, Nye County or Carson City. Due to the lack of facilities, it is believed that hearings should not be held in Lincoln County.

Very truly yours,

HILL CASSAS & de LIPKAU

Ross E. de Lipkau

Ross E. de Lipkau

REd/lbe
02206.010

Table 5.--Cooperative Water Project Proposed Ground-Water Pumpage.

BASIN:	216	217	218	210	211	168	169	182	181	171	172	208	180	173	202	184	195	TOTAL	
2007	2000	2000	2500	5000	5000	5000	3000											24500}	
2008	2000	2000	2500	5000	5000	5000	3000											24500}	
2009	2000	2000	2500	5000	5000	5000	3000											24500}	
2010	2000	2000	2500	5000	5000	5000	3000											24500}	PHASE 1
2011	2000	2000	2500	5000	5000	5000	3000											24500}	
2012	2000	2000	2500	5000	5000	5000	3000											24500}	
2013	2000	2000	2500	5000	5000	5000	3000											24500}	
2014	2000	2000	2500	5000	5000	5000	3000	3000	2500	6000		5000	2000		4000			44500}	
2015	2000	2000	2500	5000	5000	5000	3000	3000	2500	6000		5000	2000		4000			44500}	PHASE 2
2016	2000	2000	2500	5000	5000	5000	3000	3000	2500	6000		5000	2000		4000			44500}	
2017	2000	2000	2500	5000	5000	5000	3000	3000	2500	6000		5000	2000		4000			44500}	
2018			2500	5000	5000	5000	3000	3000	2500	6000		5000	2000		4000	50000	25000	118000}	
2019			2500	5000	5000	5000	3000	3000	2500	6000		5000	2000		4000	50000	25000	118000}	
2020			2500	5000	5000	5000	3000	3000	2500	6000		5000	2000		4000	50000	25000	118000}	
2021			2500	5000	5000	5000	3000	3000	2500	6000		5000	2000		4000	50000	25000	118000}	PHASE 3
2022			2500	5000	5000	5000	3000	3000	2500	6000		5000	2000		4000	50000	25000	118000}	
2023			2500	5000	5000	5000	3000	3000	2500	6000		5000	2000		4000	50000	25000	118000}	
2024			2500	5000	5000	5000	3000	3000	2500	6000		5000	2000		4000	50000	25000	118000}	
2025			2500	5000	5000	5000	3000	3000	2500	6000	10000	5000	2000	52800	4000	50000	25000	180800}	
2026			2500	5000	5000	5000	3000	3000	2500	6000	10000	5000	2000	52800	4000	50000	25000	180800}	PHASE 4

Does not include development of 70,000 ac-ft/year (60,000 ac-ft of surface water rights from the Virgin River and 10,000 acre-ft of ground water)

Appendix III

Pipeline Design and Construction Costs

LAS VEGAS WATER STUDY
(PIPELINE PORTION)

SOURCES OF WATER

The sources of water are assumed to be at the points of diversion as listed on the 146 applications filed by the Las Vegas Valley Water District (LVVWD) on October 17, 1989. Based on the description contained in the applications, locations of the points of diversion are identified on Plate 1. The locations and diversion rates of these points of diversion are further detailed in Appendix A.

On February 14, 1992, the State Engineer issued a statement (attached in Appendix A) indicating that 25 applications throughout Clark, Lincoln, Nye, and White Pine Counties were withdrawn by LVVWD.

Recently, however, LVVWD proposed a summary of groundwater pumpage for the 17 basins where the points of diversion are located (see Appendix A). Since the proposed groundwater pumping rates are much less than the sum of diversion rates in each basin, the number of points of diversion in each basin is further reduced to 65 in this study. Those points of diversion that are located in relatively remote areas are eliminated from the system.

PIPING SYSTEM LAYOUT

The quality of groundwater from various points of diversion normally meet the requirements for potable water uses. No treatment would be needed in addition to disinfection with chlorination. Therefore, only closed systems (i.e., pipelines) are considered as transport facilities in this study.

A tree branch type of pipeline network is developed to transfer water from various points of diversion to the metropolitan area of Las Vegas. The alignments of the pipelines are determined using the USGS 1:250,000 scale topographic maps. The contour interval of the map is 200 feet. The following criteria are considered in the determination of the pipeline alignments:

1. To minimize the pipe lengths.

2. To minimize the need for pumping or pressure reducing facilities in the system.

3. To minimize the acquisition of rights-of-way through private properties.

4. To keep the piping alignments as closely to existing roadways as possible.

Based on geographic distributions and topographic constraints, the entire pipeline network is divided into the following five systems.

<u>Las Vegas Valley System</u>

The Las Vegas Valley System is located northwest of Las Vegas. It covers the basins of Three Lakes Valley North (168) and Three Lakes Valley South (211). The main trunk line of this system generally follows U.S. Highway 95.

<u>Virgin River System</u>

The Virgin River System is located northeast of Las Vegas. It covers the basins of Virgin River Valley (222) and California Wash (218). The main trunk line of this system generally follows Interstate Highway 15.

White River System

The White River System covers the basins of Garnet Valley (216), Coyote Springs Valley (210), and Pahroc Valley (208). The main trunk line of this system generally follows U.S. Highway 93.

Meadow Valley System

The Meadow Valley System is located on the east of the White River System. It covers the basins of Delamar Valley (182), Dry Lake Valley (181), Patterson Valley (202), Spring Valley (184), and Snake Valley (195). The Meadow Valley System joins the White River System near U.S. Highway 93 and Maynard Lake.

Railroad Valley System

The Railroad Valley System is located on the west of the White River System. It covers the basins of Tikapoo Valley (169), Railroad Valley South (173A), and Railroad Valley North (173B). The Railroad Valley System joins the White River System near U.S. Highway 93 and Lower Pahranagat Lake.

The piping system layout is also shown on Plate 1. The points of diversion within each system are summarized in Table 1.

TABLE 1

POINTS OF DIVERSION WITHIN EACH SYSTEM

Application No.	Basin No.	Basin Name	County	Filing Rate	Assumed Pumpage
Las Vegas Valley System					
54060	168	Three Lakes Valley North	Clark	6 cfs	4 cfs
54062	211	Three Lakes Valley South	Clark	6 cfs	3 cfs
54064	211	Three Lakes Valley South	Clark	10 cfs	4 cfs
54068	168	Three Lakes Valley North	Clark	6 cfs	3 cfs
Virgin River System					
54076	218	California Wash	Clark	10 cfs	7 cfs
54078	222	Virgin River Valley	Clark	6 cfs	6 cfs
54079	222	Virgin River Valley	Clark	6 cfs	6 cfs
54080	222	Virgin River Valley	Clark	6 cfs	2 cfs
Meadow Valley System					
53990	181	Dry Lake Valley	Lincoln	10 cfs	4 cfs
53991	182	Delamar Valley	Lincoln	6 cfs	4 cfs
54004	184	Spring Valley	Lincoln	6 cfs	6 cfs
54005	184	Spring Valley	Lincoln	6 cfs	6 cfs
54006	184	Spring Valley	White Pine	6 cfs	6 cfs
54007	184	Spring Valley	White Pine	6 cfs	3 cfs
54008	184	Spring Valley	White Pine	6 cfs	3 cfs
54009	184	Spring Valley	White Pine	6 cfs	3 cfs
54010	184	Spring Valley	White Pine	6 cfs	3 cfs
54011	184	Spring Valley	White Pine	6 cfs	6 cfs
54012	184	Spring Valley	White Pine	6 cfs	3 cfs
54013	184	Spring Valley	White Pine	6 cfs	6 cfs
54016	184	Spring Valley	White Pine	6 cfs	6 cfs
54017	184	Spring Valley	White Pine	6 cfs	6 cfs
54018	184	Spring Valley	White Pine	6 cfs	6 cfs
54020	184	Spring Valley	White Pine	10 cfs	5 cfs
54021	184	Spring Valley	White Pine	10 cfs	5 cfs
54022	195	Snake Valley	White Pine	6 cfs	3 cfs
54023	195	Snake Valley	White Pine	6 cfs	3 cfs
54025	195	Snake Valley	White Pine	6 cfs	3 cfs
54026	195	Snake Valley	White Pine	10 cfs	5 cfs
54027	195	Snake Valley	White Pine	10 cfs	5 cfs
54028	195	Snake Valley	White Pine	10 cfs	5 cfs
54029	195	Snake Valley	White Pine	10 cfs	5 cfs
54030	195	Snake Valley	White Pine	6 cfs	6 cfs
54031	202	Patterson Valley	Lincoln	6 cfs	3 cfs
54032	202	Patterson Valley	Lincoln	6 cfs	6 cfs

TABLE 1 (cont'd)
POINTS OF DIVERSION WITHIN EACH SYSTEM

Application No.	Basin No.	Basin Name	County	Filing Rate	Assumed Pumpage
Railroad Valley System					
53947	169	Tikapoo Valley	Lincoln	6 cfs	2 cfs
53949	169	Tikapoo Valley	Lincoln	10 cfs	2 cfs
53965	173B	Railroad Valley North	Nye	6 cfs	3 cfs
53966	173B	Railroad Valley North	Nye	6 cfs	3 cfs
53967	173B	Railroad Valley North	Nye	6 cfs	3 cfs
53968	173B	Railroad Valley North	Nye	6 cfs	3 cfs
53969	173B	Railroad Valley North	Nye	6 cfs	3 cfs
53970	173B	Railroad Valley North	Nye	6 cfs	3 cfs
53971	173B	Railroad Valley North	Nye	6 cfs	3 cfs
53973	173B	Railroad Valley North	Nye	6 cfs	3 cfs
53974	173B	Railroad Valley North	Nye	6 cfs	3 cfs
53975	173B	Railroad Valley North	Nye	10 cfs	5 cfs
53976	173B	Railroad Valley North	Nye	10 cfs	5 cfs
53977	173B	Railroad Valley North	Nye	10 cfs	5 cfs
53978	173B	Railroad Valley North	Nye	10 cfs	5 cfs
53979	173B	Railroad Valley North	Nye	10 cfs	5 cfs
53980	173B	Railroad Valley North	Nye	10 cfs	5 cfs
53981	173A	Railroad Valley South	Nye	6 cfs	3 cfs
53982	173A	Railroad Valley South	Nye	6 cfs	3 cfs
53983	173A	Railroad Valley South	Nye	10 cfs	5 cfs
53985	173B	Railroad Valley North	Nye	6 cfs	3 cfs
53986	173B	Railroad Valley North	Nye	6 cfs	3 cfs
White River System					
54043	208	Pahroc Valley	Lincoln	6 cfs	4 cfs
54044	208	Pahroc Valley	Lincoln	6 cfs	4 cfs
54046	208	Pahroc Valley	Lincoln	10 cfs	10 cfs
54047	208	Pahroc Valley	Lincoln	10 cfs	6 cfs
54049	208	Pahroc Valley	Lincoln	10 cfs	6 cfs
54058	210	Coyote Springs Valley	Clark	10 cfs	4 cfs
54059	210	Coyote Springs Valley	Clark	10 cfs	3 cfs
54073	216	Garnet Valley	Clark	10 cfs	3 cfs

FLOW RATES IN PIPES

Current Water Consumption

According to the data published by LVVWD, the 1991 annual water consumption within the LVVWD service area is 73,027,430,000 gallons, which is equivalent to 224,200 Ac-ft/yr. If dividing this figure by 12 months, the average monthly water consumption in 1991 is approximately 18,680 Ac-ft/month.

From the same published data, the maximum monthly consumption for 1991 (which occurred in July) is 8,897,514,000 gallons, or 27,320 Ac-ft/month. Therefore, the peaking factor, which is the ratio between the maximum monthly consumption and the average monthly consumption, is equal to the following:

$$\text{Peaking Factor} = \frac{27{,}320 \text{ Ac-ft/Month}}{18{,}680 \text{ Ac-ft/Month}} = 1.46$$

Future Water Demand

According to LVVWD, with conservation measures implemented, the future average water demand within the LVVWD service area is projected to be 461,000 Ac-ft/year or 38,400 Ac-ft/month. Assuming that the peaking factor remains unchanged, the future maximum monthly demand is projected to be:

$$38{,}400 \text{ Ac-ft/month} \times 1.46 = 56{,}100 \text{ Ac-ft/month} \quad \text{(rounded)}$$

Available Sources of Water Supply

The overall sources of water supply that are or will be available for the LVVWD service area are summarized below:

Surface Water Sources:

300,000 Ac-ft/year or 25,000 Ac-ft/month

Groundwater Sources:

50,000 Ac-ft/year from wells within LVVWD service area

180,000 Ac-ft/year from other counties

230,000 Ac-ft/year or 19,200 Ac-ft/month (average)

Since the future maximum monthly demand is projected to be 56,100 Ac-ft/month and the sources of surface water supply provide 25,000 Ac-ft/month, the need for groundwater supply in the maximum demand month of July is equal to:

56,100 Ac-ft/month - 25,000 Ac-ft/month = 31,100 Ac-ft/month

The ratio between the maximum monthly groundwater supply and the average monthly groundwater supply is thus estimated to be

$$\frac{31{,}100 \text{ Ac-ft/month}}{19{,}200 \text{ Ac-ft/month}} = 1.62$$

Since the existing wells within the LVVWD service area can be pumped at a higher rate in July to offset the peak water demand, the rest of the well fields in other rural counties need to have an approximate ratio of 1.5 between the maximum monthly supply and the average monthly supply.

Design Flows for Pipes

The piping systems are sized to convey the maximum monthly supply, which is equal to 1.5 times the assumed average well field pumpage at each point of diversion as shown in Table 1.

HYDRAULIC CONSIDERATIONS

Profile and Pipe Length

The approximate profiles of existing ground along the proposed pipeline alignments are shown on Figure 1. These profiles were obtained by digitizing from the 1:250,000 scale USGS topographic maps (with contour interval of 200 feet). The lengths of pipelines are also obtained from the digitized information. For all practical purposes, pipe lengths are rounded to the nearest 100 feet.

Pipe Size

The pipelines are sized on the basis of two factors: flow velocity and head loss. The velocity in pipes is generally kept below 5 feet per second, with a majority below 4 feet per second. The friction loss in pipes is estimated using Hazen-Williams formula with an assumed coefficient, C, of 120. Minor losses in pipelines as a result of changes in pipe sizes, bends, valves, and fittings are omitted in this study.

Pressure Reducing Facilities

Pressure reducing facilities are needed at some locations in pipeline systems to reduce a higher upstream pressure to a steady lower downstream pressure regardless of changing flow rates. In this study, the pressure reducing process is assumed to be achieved using an array of large pressure reducing valves.

Normally, pressures in a closed system could also be reduced through a small hydroelectric power plant. However, this transbasin system is planned for delivering potable water to the metropolitan area of Las Vegas. Therefore, the alternative of using a small hydroelectric power plant for pressure reduction is not considered as a viable means in this study.

Booster Pumping Facilities

Because of the high-head conditions, it is assumed that vertical turbine pumps will be used for the booster pump stations. These vertical turbine pumps are used in conjunction with storage tanks at various required locations in the system.

Hydraulic Profile

Based on the aforementioned conditions and assumptions, the hydraulic profile for each pipeline is approximately estimated and graphically illustrated on Figure 1.

IMPLEMENTATION PHASES

According to LVVWD, the entire project of transbasin pumpage and delivery will be implemented in four phases:

Phase 1 (Year 2007)

- Entire Las Vegas Valley System
- Entire Virgin River System
- Lower portion of White River System

Phase 2 (Year 2014)

- Lower portion of Meadow Valley System
- Remaining potion of White River System

Phase 3 (Year 2018)

- Remaining portion of Meadow Valley System

Phase 4 (Year 2025)

- Entire Railroad Valley System

The information on design flow, pipe size, velocity, pipe length, and head loss for each segment of pipeline at different implementation phases is shown in a tabular form in Appendix B.

CONSTRUCTION COST ESTIMATES

The construction cost of each pipeline is estimated by applying a unit cost to the required quantity of that particular pipeline. Unit costs for various pipe sizes are derived from previous construction bid prices on similar projects, McMahon Heavy Construction Guide, Means Heavy Construction Cost Data, and pipe manufacturers. The cost data from different sources are evaluated and adjusted to the 1992 price level. The cost of pipe fittings, valves, and other accessories is assumed to be at 10% of the pipe costs to accommodate the extra expenditure for installation in remote areas.

Costs for pressure reducing stations include costs for pressure reducing valves, buildings, isolation valves, manifolds, and site work. As is done for pipeline costs, costs for pressure reducing stations are estimated based on the 1992 price level.

As for booster stations, costs for pumps are estimated according to previous bids obtained from local contractors. The costs for pump controls, piping manifolds, buildings, and other site work are assumed to be 100% of pump costs. The costs for booster stations also include costs for storage tanks at booster station sites. Costs for booster stations are also estimated based on the 1992 price level.

The estimated construction cost for each implementation phase is summarized in Table 2. Detailed estimates of construction costs are presented in Appendix B.

TABLE 2

SUMMARY OF ESTIMATED CONSTRUCTION COSTS

Implementation Phase	Pipeline Cost	Pressure Reducing Station Cost	Booster Station Cost	Cost Per Implementation Phase
PHASE I (YEAR 2007)				
1. Entire Las Vegas Valley System	$ 68,467,000	$ 310,000	$ 0	
2. Entire Virgin River System	105,418,000	0	2,600,000	
3. Lower portion of White River System (Node W1 to Node W6)	209,688,000	180,000	870,000	
Subtotal	**$ 383,573,000**	**$ 490,000**	**$ 3,470,000**	**$ 387,533,000**
PHASE 2 (YEAR 2014)				
1. Lower portion of Meadow Valley System (Node M1 to Node M7)	$ 355,633,000	$ 1,080,000	$ 1,030,000	
2. Remaining portion of White River System	257,322,000	1,088,000	570,000	
Subtotal	**$ 612,955,000**	**$ 2,168,000**	**$ 1,600,000**	**$ 616,723,000**
PHASE 3 (YEAR 2018)				
1. Remaining portion of Meadow Valley	$ 531,658,000	$ 2,736,000	$ 10,170,000	
2. The 2nd 84-inch pipe in White River System (between Nodes W1 and W7)	321,356,000	1,000,000	0	
Subtotal	**$ 853,014,000**	**$ 3,736,000**	**$ 10,170,000**	**$ 866,920,000**
PHASE 4 (YEAR 2025)				
1. Railroad Valley System	$ 609,849,000	$ 2,358,000	$ 8,120,000	
2. White River System Modification	0	450,000	0	
Subtotal	**$ 609,849,000**	**$ 2,808,000**	**$ 8,120,000**	**$ 620,777,000**
TOTAL ESTIMATED CONSTRUCTION COST				**$ 2,491,953,000**

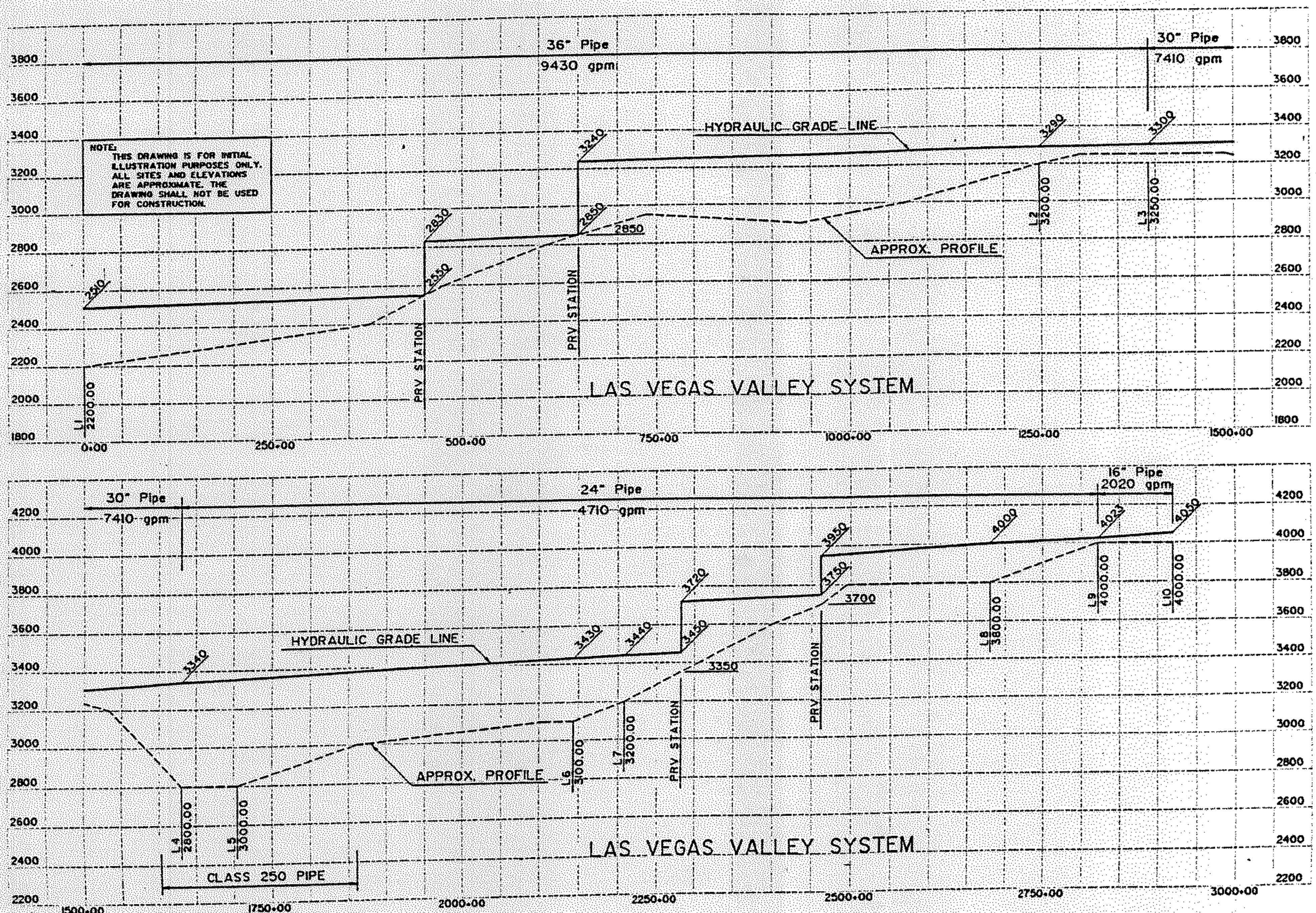
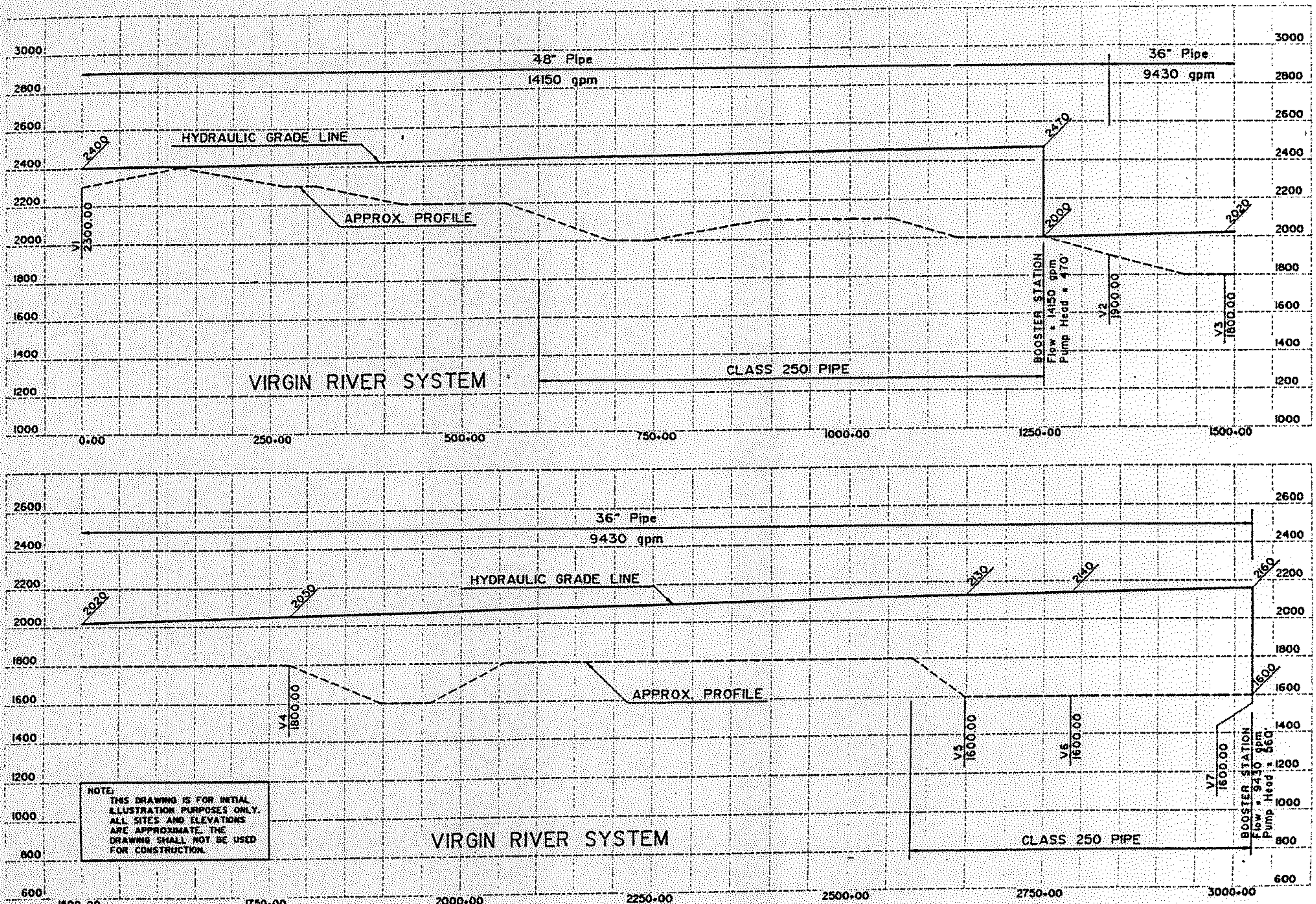


FIGURE 1 (Page 1 of 12)



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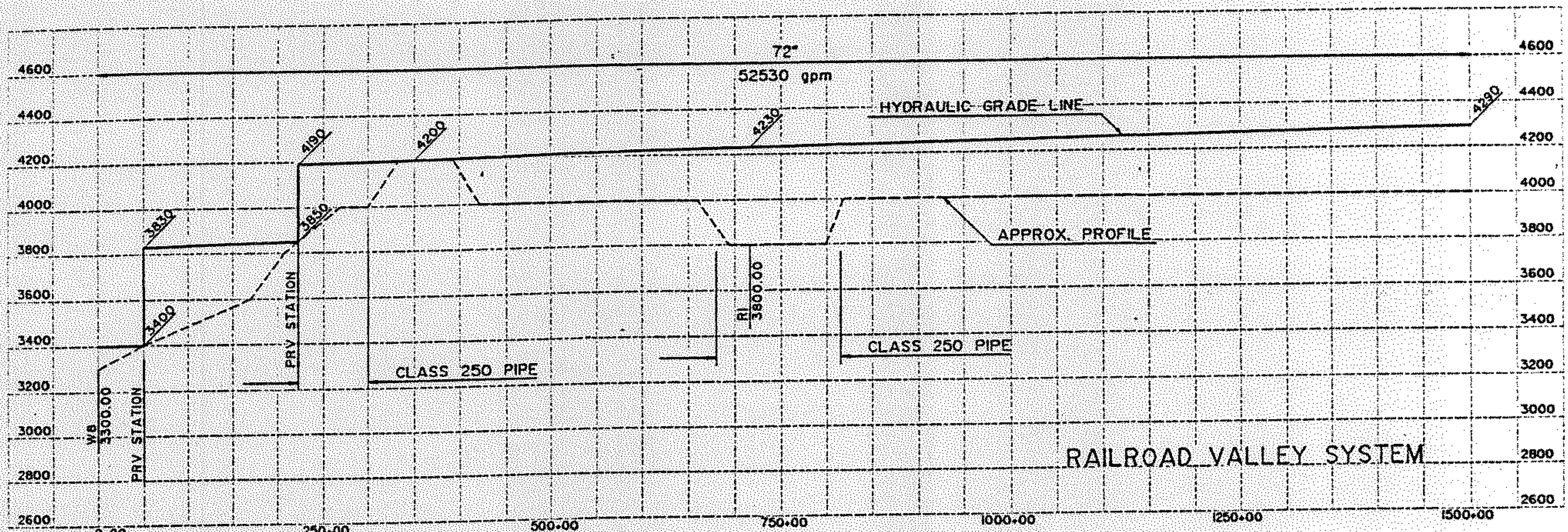

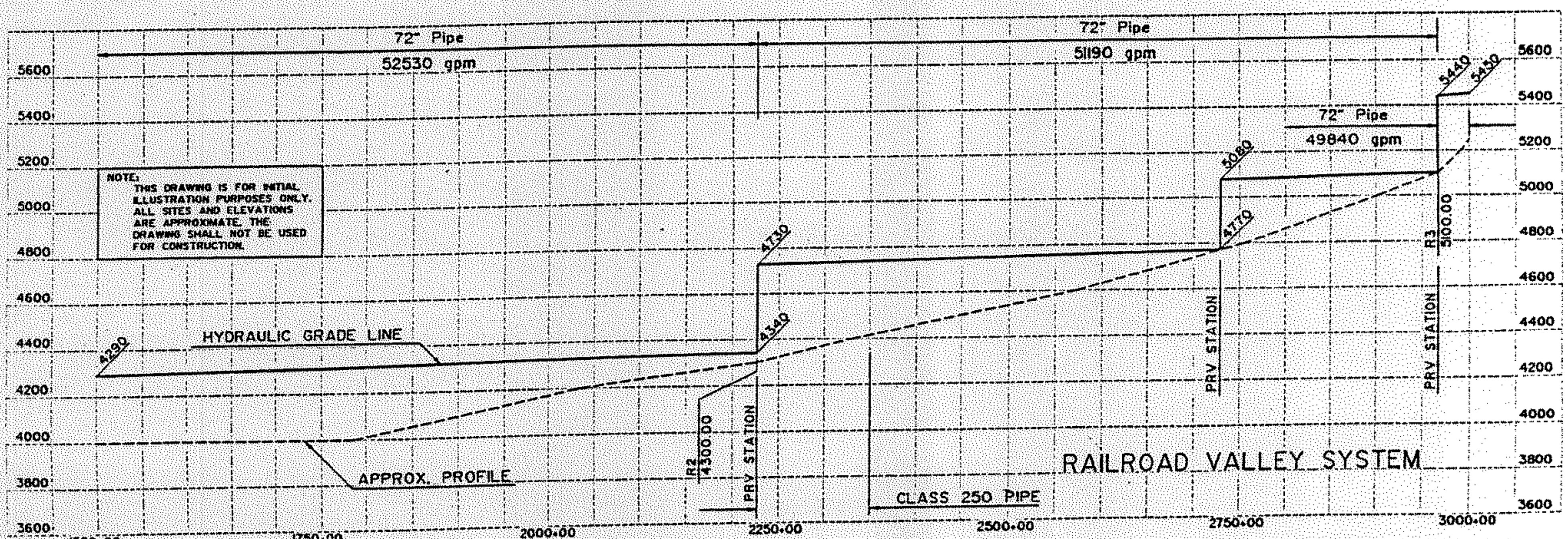

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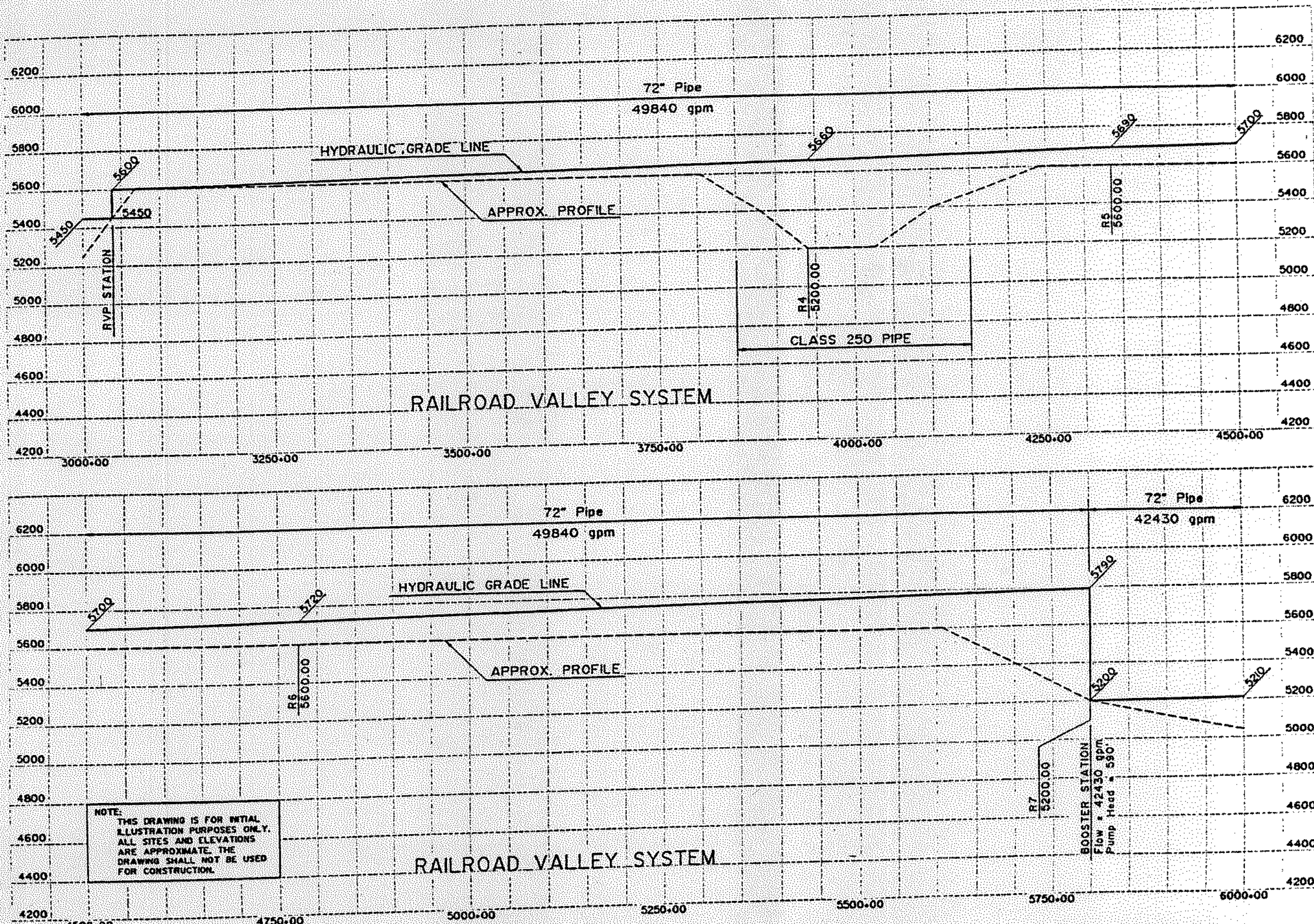

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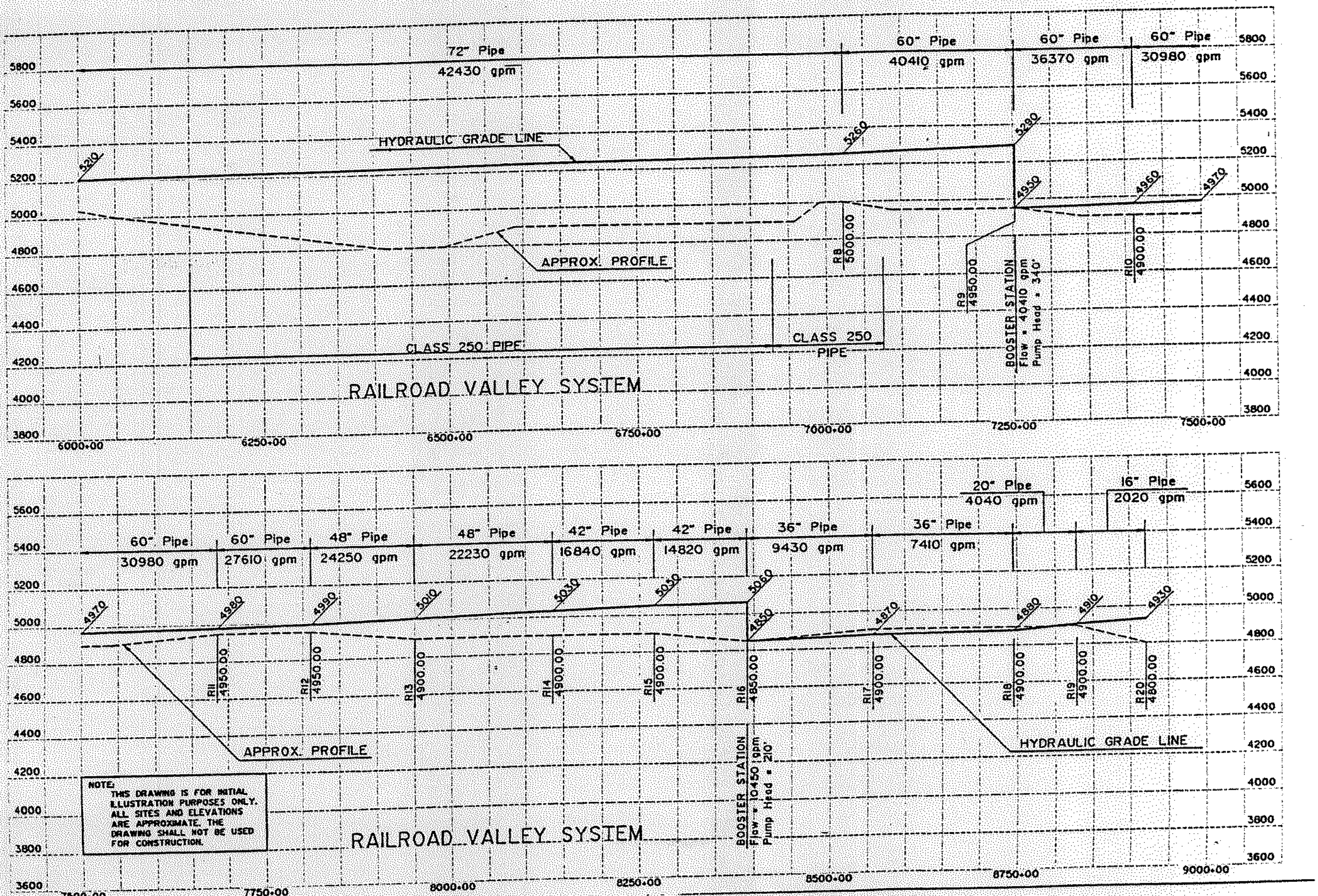

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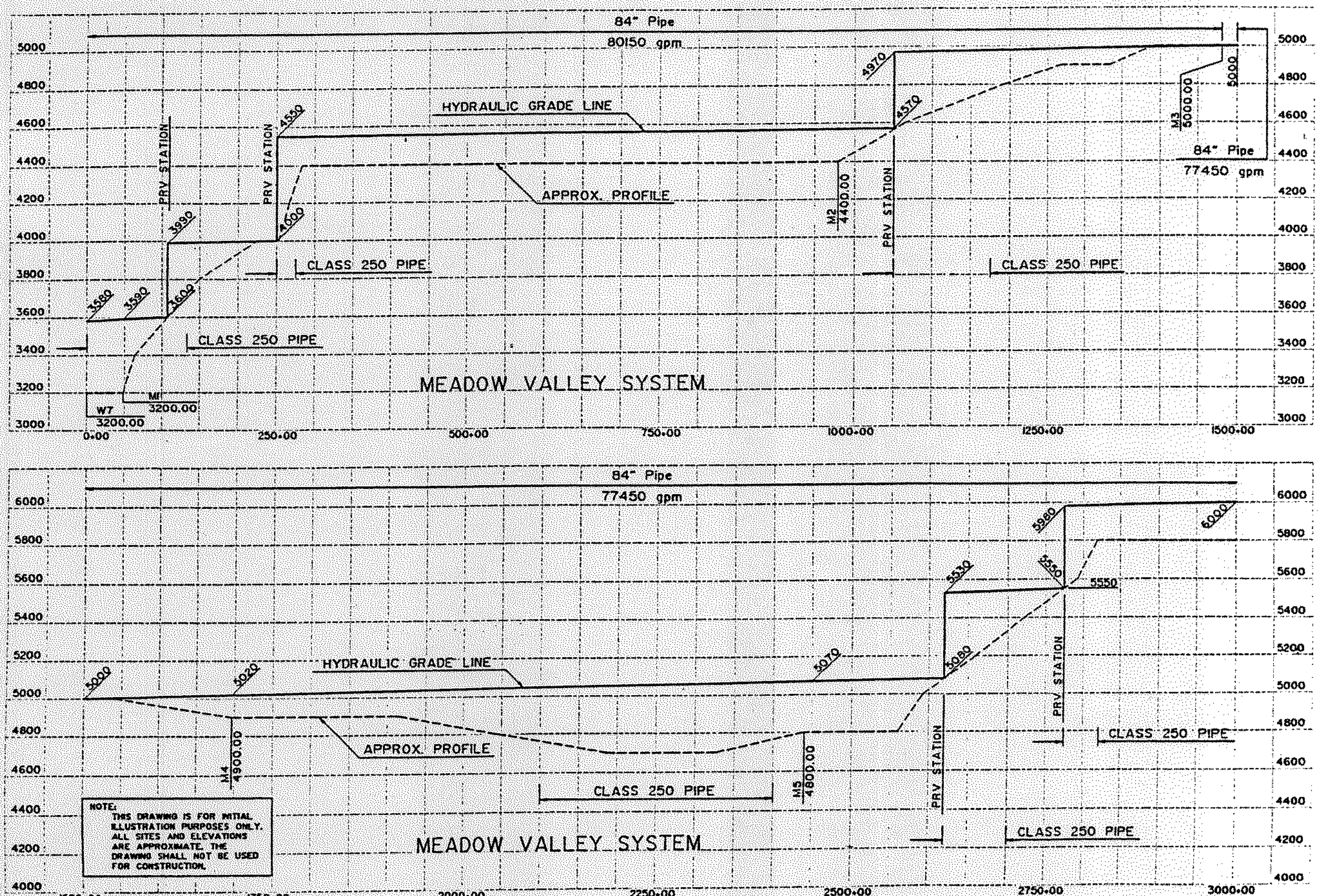

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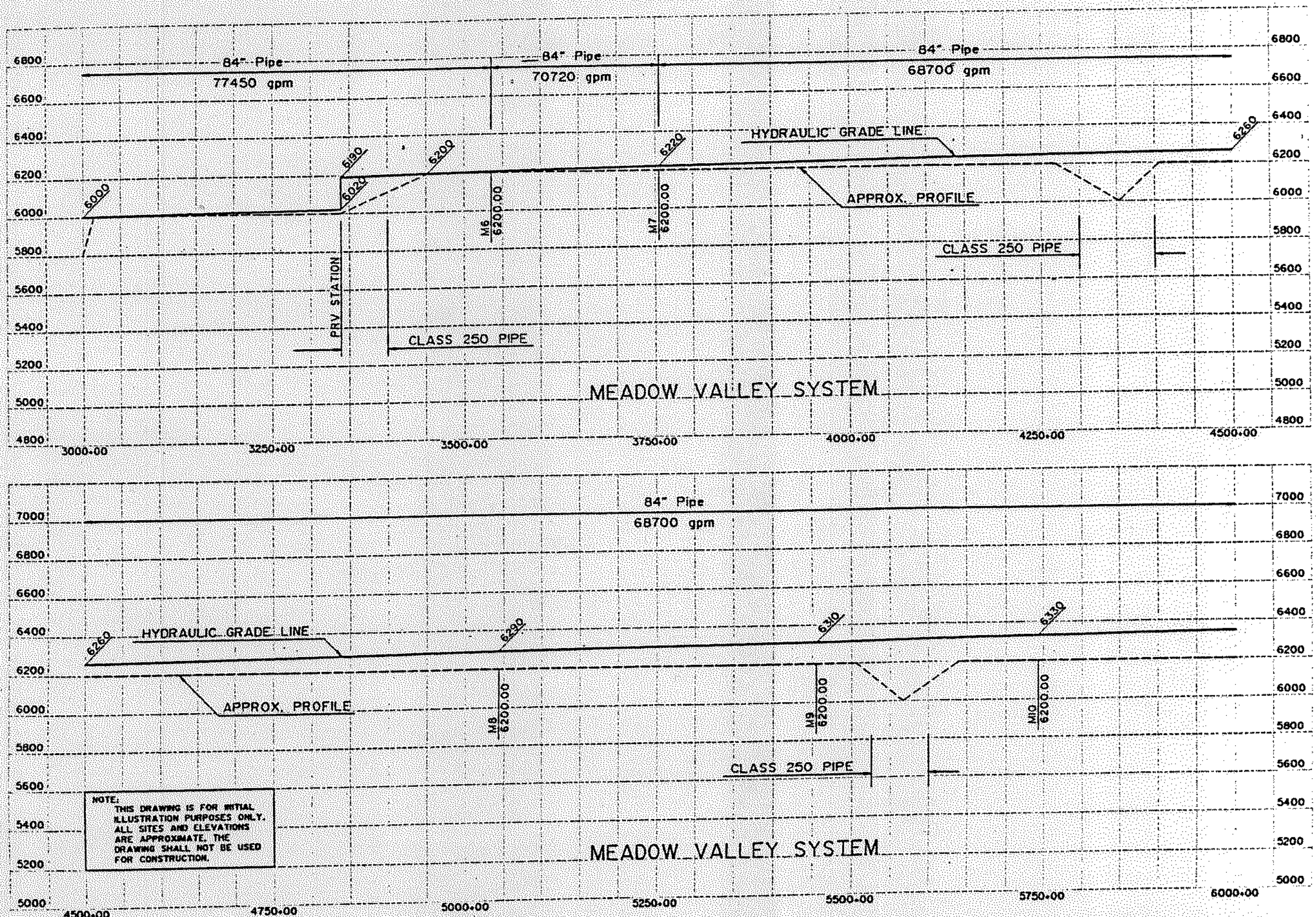

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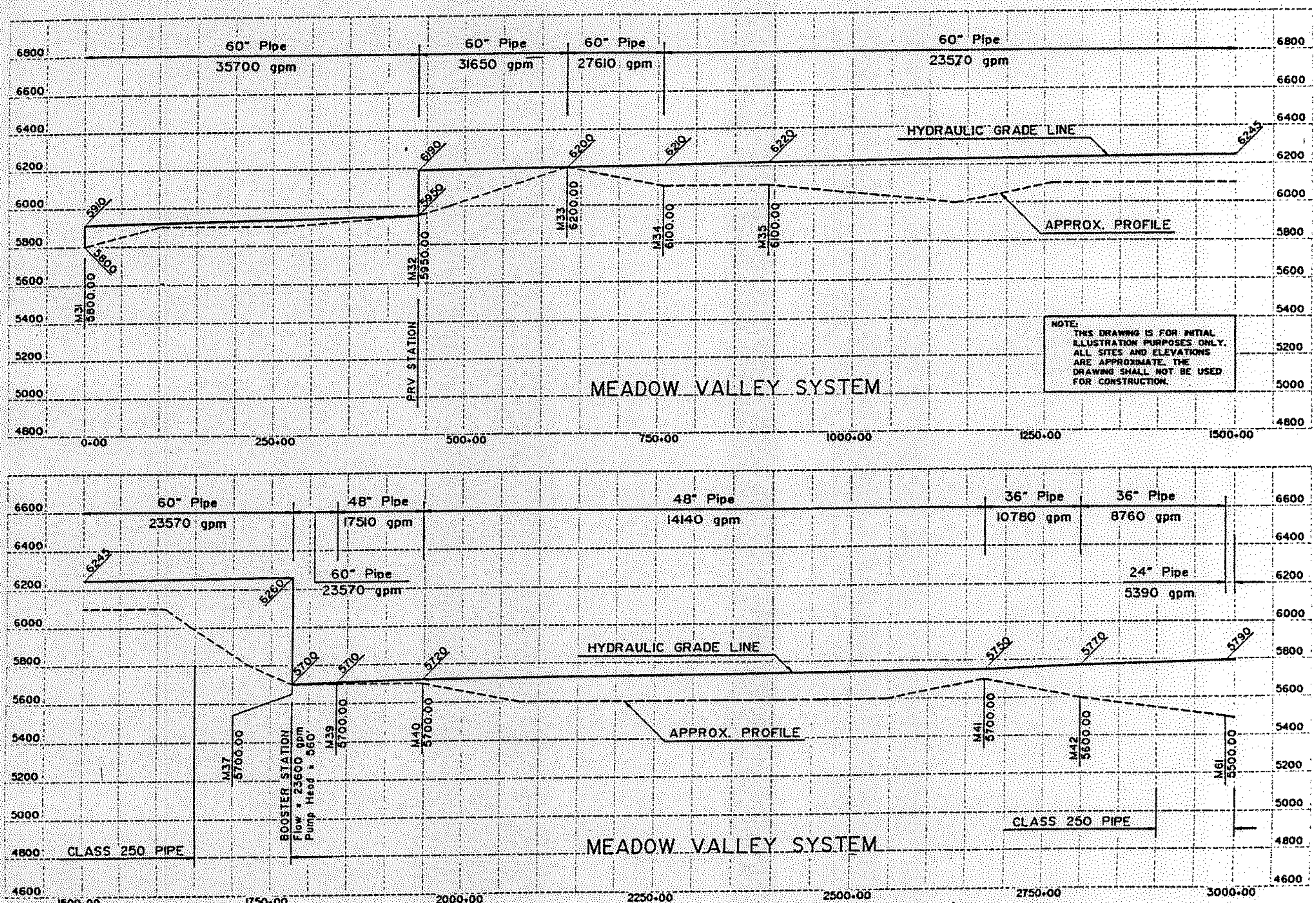

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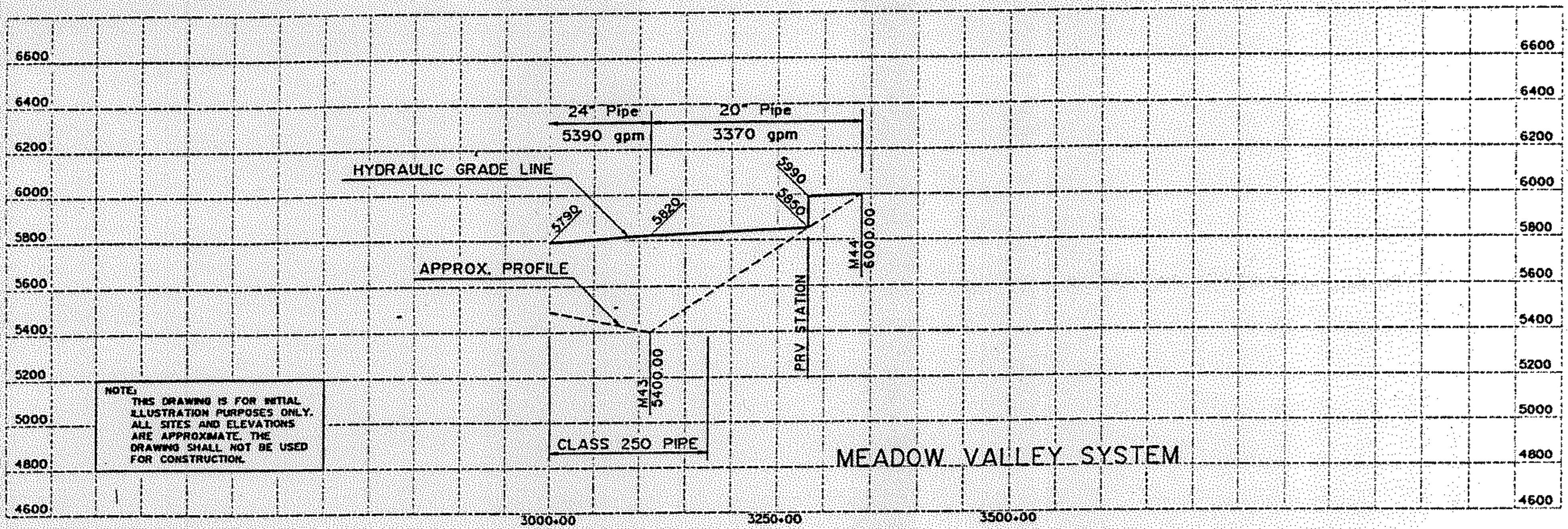
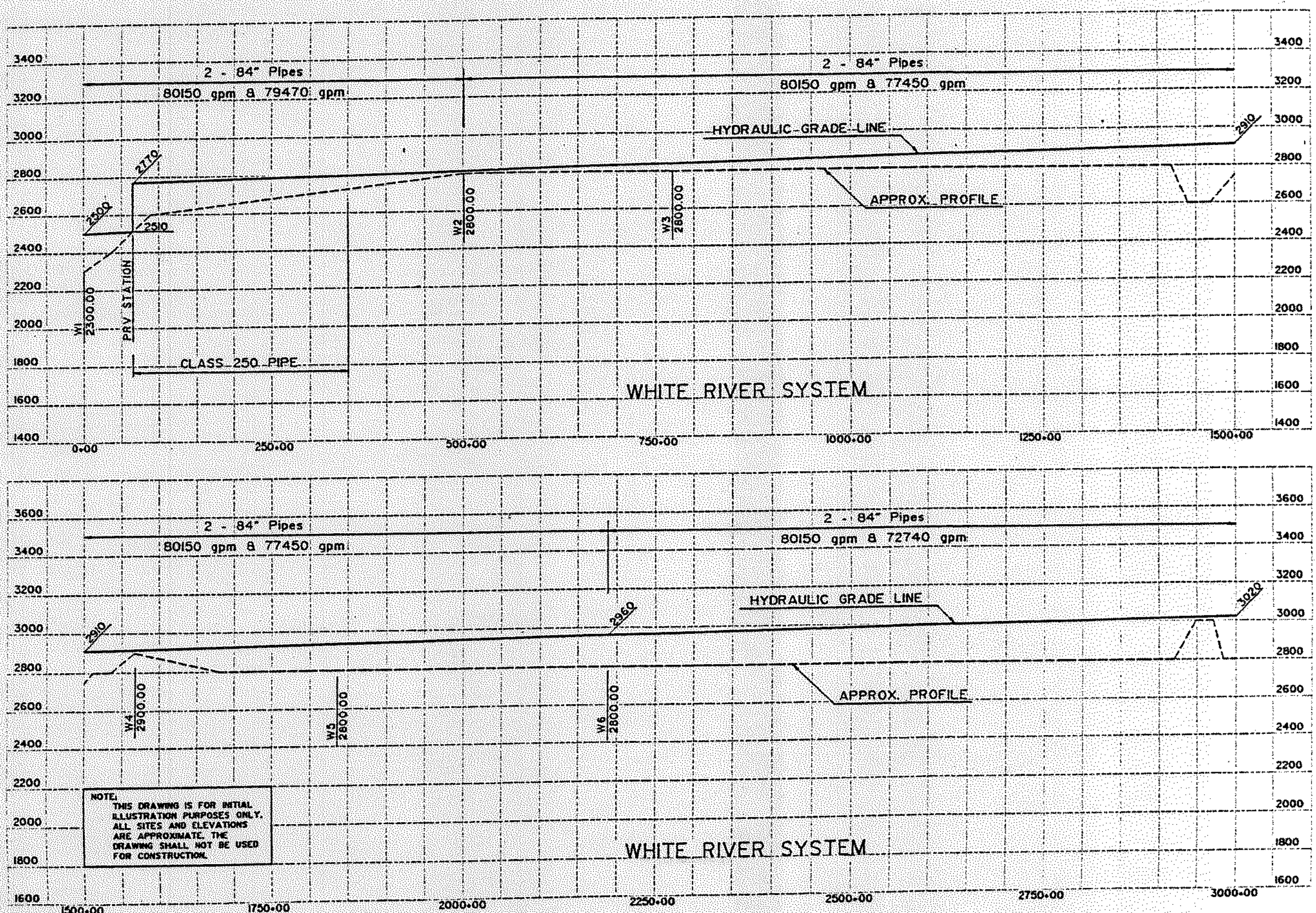


FIGURE 1 (Page 9 of 12)



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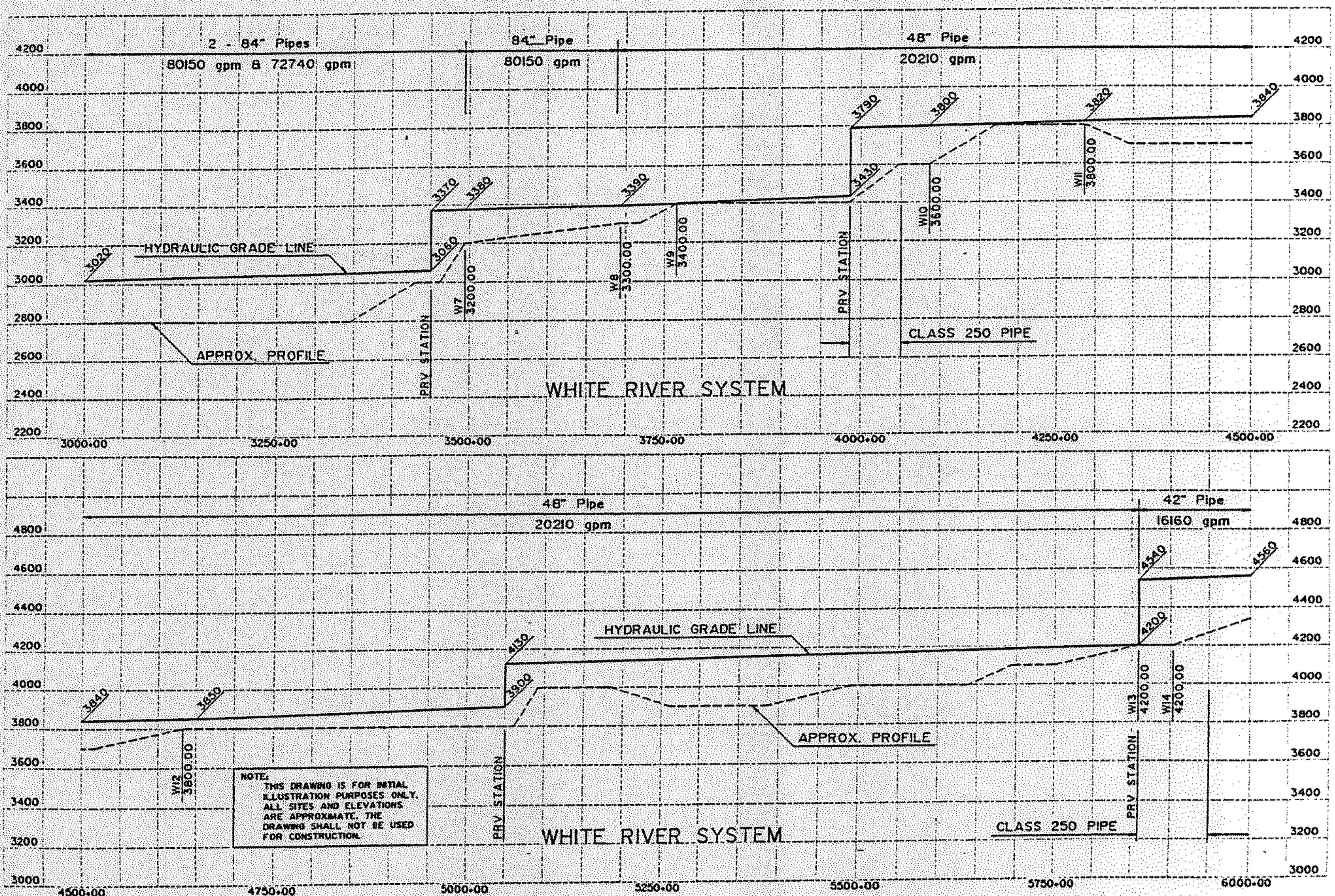

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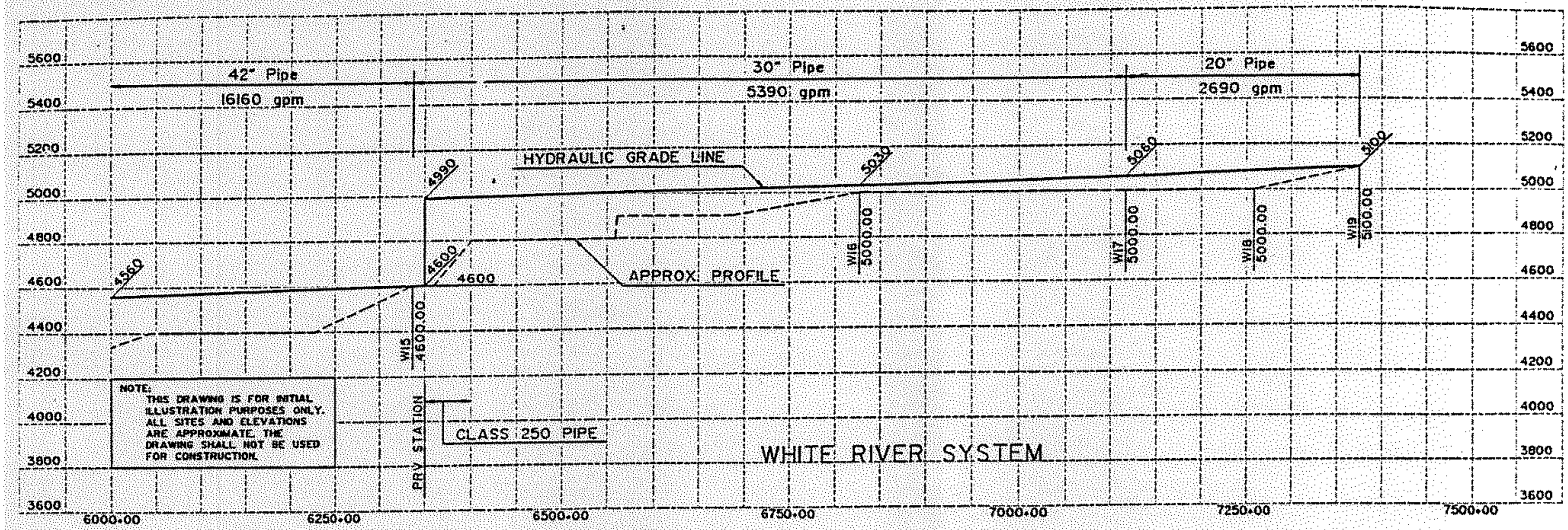


FIGURE 1 (Page 12 of 12)

APPENDIX A

ABSTRACT OF FILINGS OF
LAS VEGAS VALLEY WATER DISTRICT

(All filings are for water from an underground source except Application 54077 which is from the Virgin River)

	APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
✓	53947	10-169	Tikapoo Valley (North)	NW¼ SW¼ Sec. 31, T.6S., R.58E.	6 cfs	Lincoln
	53948	10-169	Tikapoo Valley (North)	SW¼ NW¼ Sec. 24, T.6S., R.58E.	10 cfs	Lincoln
✓	53949	10-169	Tikapoo Valley (North)	NE¼ NE¼ Sec. 36, T.4S., R.56E.	10 cfs	Lincoln
	53950	10-169	Tikapoo Valley (South)	NE¼ NW¼ Sec. 30, T.12S., R.61E.	6 cfs	Lincoln
	53951	10-169	Tikapoo Valley (South)	NW¼ SE¼ Sec. 29, T.11S., R.61E.	10 cfs	Lincoln
	53952	10-169	Tikapoo Valley (South)	SW¼ NE¼ Sec. 26, T.10S., R.60E.	10 cfs	Lincoln
	53953	10-170	Penoyer Valley	NW¼ SE¼ Sec. 27, T.2S., R.55E.	6 cfs	Lincoln
	53954	10-170	Penoyer Valley	NE¼ SE¼ Sec. 11, T.1S., R.56E.	10 cfs	Lincoln
	53955	10-170	Penoyer Valley	NE¼ NE¼ Sec. 23, T.1N., R.55E.	10 cfs	Lincoln
	53956	10-171	Coal Valley	NE¼ NW¼ Sec. 36, T.3N., R.60E.	6 cfs	Nye
	53957	10-171	Coal Valley	SW¼ SE¼ Sec. 14, T.2S., R.59E.	6 cfs	Lincoln

NOTE: ✓ denotes points of diversion selected in this study.

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
53958	10-171	Coal Valley	SE¼ NW¼ Sec. 10, T.3N., R.60E.	10 cfs	Nye
53959	10-171	Coal Valley	SE¼ SW¼ Sec. 6, T.3S., R.60E.	10 cfs	Lincoln
53960	10-172	Garden Valley	NW¼ NE¼ Sec. 30, T.1S., R.58E.	6 cfs	Lincoln
53961	10-172	Garden Valley	NW¼ SE¼ Sec. 24, T.3N., R.58E.	6 cfs	Nye
53962	10-172	Garden Valley	NE¼ SE¼ Sec. 31, T.5N., R.59E.	6 cfs	Nye
53963	10-172	Garden Valley	NW¼ SE¼ Sec. 24, T.2S., R.57E.	10 cfs	Lincoln
53964	10-172	Garden Valley	SE¼ SW¼ Sec. 22, T.5N., R.58E.	10 cfs	Nye
✓ 53965	10-173B	Railroad Valley (North)	SE¼ NE¼ Sec. 5, T.6N., R.57E.	6 cfs	Nye
✓ 53966	10-173B	Railroad Valley (North)	SE¼ NE¼ Sec. 13, T.6N., R.56E.	6 cfs	Nye
✓ 53967	10-173B	Railroad Valley (North)	SE¼ SW¼ Sec. 26, T.6N., R.56E.	6 cfs	Nye
✓ 53968	10-173B	Railroad Valley (North)	NE¼ SW¼ Sec. 3, T.5N., R.56E.	6 cfs	Nye
✓ 53969	10-173B	Railroad Valley (North)	NE¼ SW¼ Sec. 20, T.5N., R.56E.	6 cfs	Nye
✓ 53970	10-173B	Railroad Valley (North)	NE¼ SW¼ Sec. 13, T.4N., R.54E.	6 cfs	Nye

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
✓ 53971	10-173B	Railroad Valley (North)	SE¼ SW¼ Sec. 35, T.4N., R.53E.	6 cfs	Nye
53972	10-173B	Railroad Valley (North)	SW¼ SW¼ Sec. 29, T.7N., R.55E.	6 cfs	Nye
✓ 53973	10-173B	Railroad Valley (North)	SE¼ SW¼ Sec. 27, T.6N., R.54E.	6 cfs	Nye
✓ 53974	10-173B	Railroad Valley (North)	SE¼ NW¼ Sec. 8, T.4N., R.54E.	6 cfs	Nye
✓ 53975	10-173B	Railroad Valley (North)	NW¼ SW¼ Sec. 24, T.7N., R.57E.	10 cfs	Nye
✓ 53976	10-173B	Railroad Valley (North)	SE¼ SW¼ Sec. 19, T.6N., R.57E.	10 cfs	Nye
✓ 53977	10-173B	Railroad Valley (North)	NW¼ NE¼ Sec. 19, T.5N., R.57E.	10 cfs	Nye
✓ 53978	10-173B	Railroad Valley (North)	NE¼ SW¼ Sec. 6, T.4N., R.56E.	10 cfs	Nye
✓ 53979	10-173B	Railroad Valley (North)	NE¼ SE¼ Sec. 3, T.4N., R.55E.	10 cfs	Nye
✓ 53980	10-173B	Railroad Valley (North)	SE¼ SE¼ Sec. 13, T.3N., R.54E.	10 cfs	Nye
✓ 53981	10-173A	Railroad Valley (South)	SE¼ SE¼ Sec. 10, T.2S., R.52E.	6 cfs	Nye
✓ 53982	10-173A	Railroad Valley (South)	SW¼ SW¼ Sec. 19, T.1S., R.51½E.	6 cfs	Nye
✓ 53983	10-173A	Railroad Valley (South)	NE¼ SW¼ Sec. 20 T.1S., R.51E.	10 cfs	Nye

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
53984	10-156	Hot Creek Valley	NW¼ NE¼ Sec. 25, T.1N., R.50E.	10 cfs	Nye
✓ 53985	10-173B	Railroad Valley (North)	SE¼ NE¼ Sec. 3, T.7N., R.57E.	6 cfs	Nye
✓ 53986	10-173B	Railroad Valley (North)	SE¼ NW¼ Sec. 15, T.7N., R.57E.	6 cfs	Nye
53987	10-180	Cave Valley	SE¼ NW¼ Sec. 22, T.6N., R.63E.	6 cfs	Lincoln
53988	10-180	Cave Valley	SE¼ SE¼ Sec. 21, T.7N., R.63E.	10 cfs	Lincoln
53989	10-181	Dry Lake Valley	SE¼ SW¼ Sec. 30, T.2S., R.64E.	6 cfs	Lincoln
✓ 53990	10-181	Dry Lake Valley	NE¼ SE¼ Sec. 8, T.2S., R.65E.	10 cfs	Lincoln
✓ 53991	10-182	Delamar Valley	NE¼ NE¼ Sec. 4, T.5S., R.63E.	6 cfs	Lincoln
53992	10-182	Delamar Valley	NE¼ NE¼ Sec. 15, T.6S., R.64E.	10 cfs	Lincoln
53993	10-183	Lake Valley	NE¼ SE¼ Sec. 30, T.6N., R.66E.	6 cfs	Lincoln
53994	10-183	Lake Valley	SW¼ SE¼ Sec. 36, T7N., R.65E.	6 cfs	Lincoln
53995	10-183	Lake Valley	NW¼ SE¼ Sec. 1, T.7N., R.65E.	6 cfs	Lincoln
53996	10-183	Lake Valley	NW¼ SE¼ Sec. 26, T.6N., R.67E.	10 cfs	Lincoln

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
53997	10-183	Lake Valley	SE¼ NE¼ Sec. 2, T.8N., R.66E.	10 cfs	Lincoln
53998	10-174	Jakes Valley	NW¼ NW¼ Sec. 14, T.15N., R.60E.	6 cfs	White Pine
53999	10-174	Jakes Valley	SE¼ SE¼ Sec. 36, T.16N., R.59E.	6 cfs	White Pine
54000	10-174	Jakes Valley	SE¼ NE¼ Sec. 34, T.16N., R.60E.	6 cfs	White Pine
54001	10-174	Jakes Valley	SE¼ NW¼ Sec. 19, T.16N., R.61E.	10 cfs	White Pine
54002	10-174	Jakes Valley	NE¼ NE¼ Sec. 10, T.15N., R.60E.	10 cfs	White Pine
54003	10-184	Spring Valley	NW¼ NW¼ Sec. 20, T.8N., R.68E.	6 cfs	Lincoln
✓ 54004	10-184	Spring Valley	SE¼ SE¼ Sec. 25, T.9N., R.67E.	6 cfs	Lincoln
✓ 54005	10-184	Spring Valley	NE¼ NE¼ Sec. 14, T.9N., R.67E.	6 cfs	Lincoln
✓ 54006	10-184	Spring Valley	SE¼ SW¼ Sec. 22, T.10N., R.67E.	6 cfs	White Pine
✓ 54007	10-184	Spring Valley	NE¼ NW¼ Sec. 34, T.11N., R.66E.	6 cfs	White Pine
✓ 54008	10-184	Spring Valley	SW¼ SW¼ Sec. 1, T.11N., R.66E.	6 cfs	White Pine
✓ 54009	10-184	Spring Valley	NW¼ NE¼ Sec. 36, T.13N., R.66E.	6 cfs	White Pine

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
✓ 54010	10-184	Spring Valley	SE¼ SE¼ Sec. 25, T.14N., R.66E.	6 cfs	White Pine
✓ 54011	10-184	Spring Valley	NE¼ SE¼ Sec. 14, T.14N., R.66E.	6 cfs	White Pine
✓ 54012	10-184	Spring Valley	SE¼ NE¼ Sec. 16, T.14N., R.67E.	6 cfs	White Pine
✓ 54013	10-184	Spring Valley	SW¼ SW¼ Sec. 25, T.15N., R.66E.	6 cfs	White Pine
54014	10-184	Spring Valley	SW¼ SW¼ Sec. 15, T.15N., R.67E.	6 cfs	White Pine
54015	10-184	Spring Valley	NW¼ SW¼ Sec. 14, T.15N., R.67E.	6 cfs	White Pine
✓ 54016	10-184	Spring Valley	NE¼ SW¼ Sec. 7, T.15N., R.67E.	6 cfs	White Pine
✓ 54017	10-184	Spring Valley	NW¼ SE¼ Sec. 25, T.16N., R.66E.	6 cfs	White Pine
✓ 54018	10-184	Spring Valley	SE¼ NE¼ Sec. 24, T.16N., R.66E.	6 cfs	White Pine
54019	10-184	Spring Valley	SW¼ NE¼ Sec. 32, T.12N., R.68E.	10 cfs	White Pine
✓ 54020	10-184	Spring Valley	SE¼ SE¼ Sec. 14, T.14N., R.67E.	10 cfs	White Pine
✓ 54021	10-184	Spring Valley	SW¼ NE¼ Sec. 33, T.16N., R.66E.	10 cfs	White Pine
✓ 54022	11-195	Snake Valley	NE¼ NE¼ Sec. 8, T. 13N., R.70E.	6 cfs	White Pine

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
✓ 54023	11-195	Snake Valley	NW¼ SE¼ Sec. 36, T.13N., R.70E.	6 cfs	White Pine
54024	11-195	Snake Valley	SW¼ NE¼ Sec. 13, T.11N., R.70E.	6 cfs	White Pine
✓ 54025	11-195	Snake Valley	SE¼ SE¼ Sec. 27, T.10N., R.70E.	6 cfs	White Pine
✓ 54026	11-195	Snake Valley	NE¼ SE¼ Sec. 26, T.14N., R.69E.	10 cfs	White Pine
✓ 54027	11-195	Snake Valley	NE¼ NW¼ Sec. 30, T.13N., R.70E.	10 cfs	White Pine
✓ 54028	11-195	Snake Valley	SE¼ SE¼ Sec. 22, T.12N., R.70E.	10 cfs	White Pine
✓ 54029	11-195	Snake Valley	SW¼ NE¼ Sec. 20, T.11N., R.70E.	10 cfs	White Pine
✓ 54030	11-195	Snake Valley	NW¼ SE¼ Sec. 4, T.10N., R.70E.	6 cfs	White Pine
✓ 54031	13-202	Patterson Valley	SE¼ SE¼ Sec. 17, T.2N., R.67E.	6 cfs	Lincoln
✓ 54032	13-202	Patterson Valley	NW¼ NE¼ Sec. 13, T.1N., R.67E.	6 cfs	Lincoln
54033	13-202	Patterson Valley	SE¼ NW¼ Sec. 20, T.3N., R.68E.	10 cfs	Lincoln
54034	13-202	Patterson Valley	SW¼ NW¼ Sec. 6, T.1N., R.69E.	10 cfs	Lincoln
54035	13-205	Lower Meadow Valley	NE¼ SE¼ Sec. 8, T.14S., R.66E.	6 cfs	Clark

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
54036	13-205	Lower Meadow Valley	NW¼ NW¼ Sec. 9, T.13S., R.67E.	10 cfs	Clark
54037 WRONG LOCATION - WITHDRAWN AND REFILED SEE APPLICATION 54105	13-205	Lower Meadow Valley	SW¼ NE¼ Sec. 9, T.18S., R.68E.	10 cfs	Clark
54038	13-207	White River Valley	SW¼ NE¼ Sec. 7, T.7N., R.62E.	6 cfs	Nye
54039	13-207	White River Valley	SE¼ NW¼ Sec. 21, T.5N., R.61E.	6 cfs	Nye
54040	13-207	White River Valley	SW¼ SE¼ Sec. 18, T.6N., R.62E.	6 cfs	Nye
54041	13-207	White River Valley	NW¼ NE¼ Sec. 5, T.5N., R.62E.	10 cfs	Nye
54042	13-207	White River Valley	NE¼ NE¼ Sec. 9, T.6N., R.62E.	10 cfs	Nye
√ 54043	13-208	Pahroc Valley	NE¼ SE¼ Sec. 35, T.3N., R.62E.	6 cfs	Lincoln
√ 54044	13-208	Pahroc Valley	SW¼ NE¼ Sec. 19, T.2N., R.63E.	6 cfs	Lincoln
54045	13-208	Pahroc Valley	NE¼ NW¼ Sec. 14, T.1N., R.62E.	10 cfs	Lincoln
√ 54046	13-208	Pahroc Valley	SE¼ NW¼ Sec. 29, T.1S., R.62E.	10 cfs	Lincoln
√ 54047	13-208	Pahroc Valley	NW¼ SW¼ Sec. 33, T.2S., R.61E.	10 cfs	Lincoln
54048	13-208	Pahroc Valley	SE¼ NE¼ Sec. 15, T.2N., R.62E.	10 cfs	Lincoln

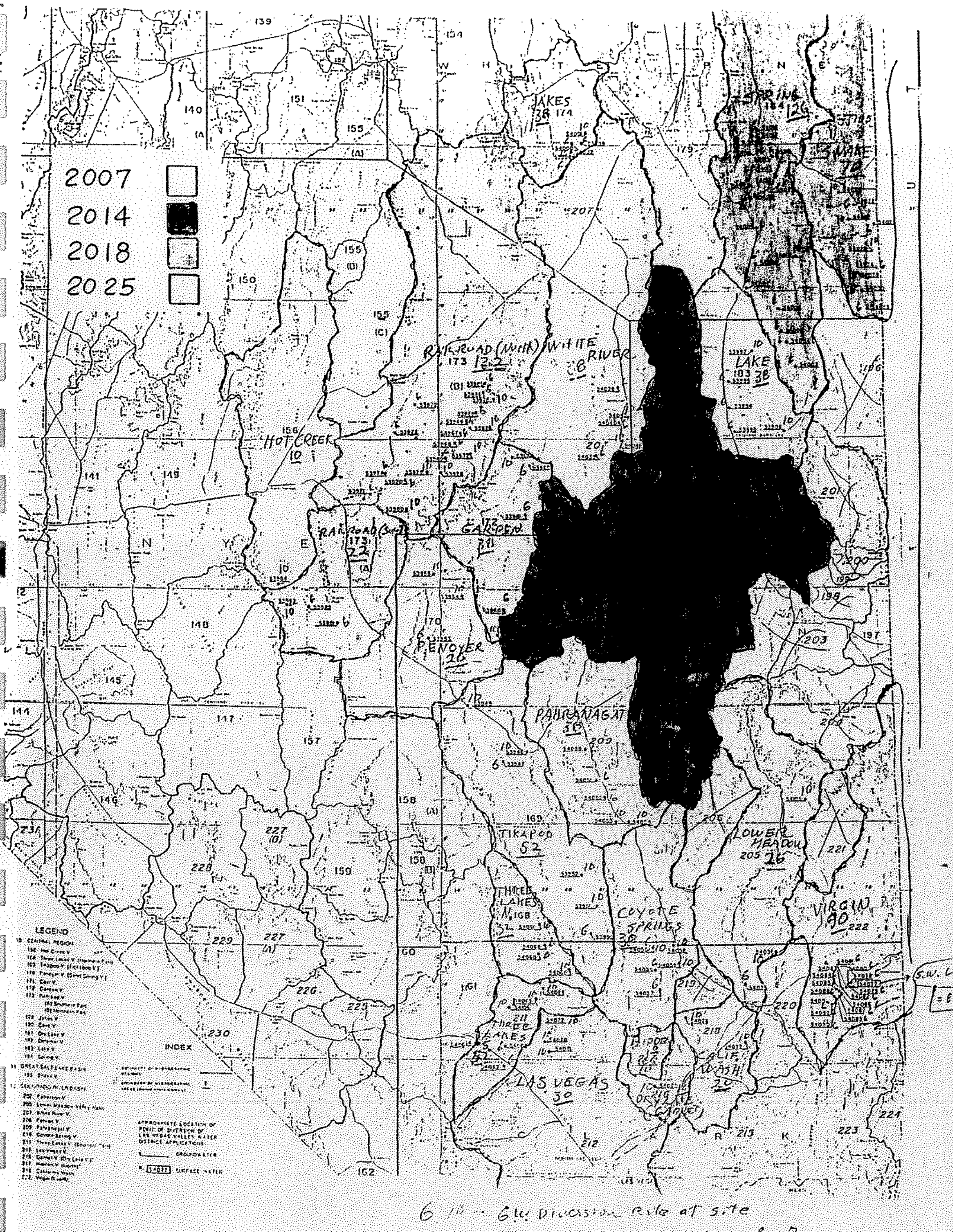
APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
✓ 54049	13-208	Pahroc Valley	SE¼ SE¼ Sec. 5, T.2S., R.62E.	10 cfs	Lincoln
54050	13-209	Pahranagat Valley	NW¼ SE¼ Sec. 13, T.6S., R.60E.	6 cfs	Lincoln
54051	13-209	Pahranagat Valley	SE¼ NE¼ Sec. 20, T.7S., R.61E.	6 cfs	Lincoln
54052	13-209	Pahranagat Valley	SE¼ SW¼ Sec. 3, T.8S., R.61E.	6 cfs	Lincoln
54053	13-209	Pahranagat Valley	SE¼ SE¼ Sec. 36, T.8S., R.61E.	10 cfs	Lincoln
54054	13-209	Pahranagat Valley	NE¼ SW¼ Sec. 33, T.8S., R.62E.	10 cfs	Lincoln
54055	13-210	Coyote Springs Valley	SE¼ SW¼ Sec. 5, T.13S., R.63E.	6 cfs	Clark
54056	13-210	Coyote Springs Valley	SE¼ SE¼ Sec. 32, T.13S., R.63E.	6 cfs	Clark
54057	13-210	Coyote Springs Valley	SE¼ NW¼ Sec. 21, T.14S., R.63E.	6 cfs	Clark
/ 54058	13-210	Coyote Springs Valley	NE¼ NE¼ Sec. 1, T.13S., R.63E.	10 cfs	Clark
/ 54059	13-210	Coyote Springs Valley	NE¼ NW¼ Sec. 19, T.13S., R.64E.	10 cfs	Clark
/ 54060	10-168	Three Lakes Valley (North)	NE¼ NE¼ Sec. 17, T.13S., R.59E.	6 cfs	Clark
54061	10-168	Three Lakes Valley (North)	NE¼ SE¼ Sec. 17, T.12S., R.59E.	10 cfs	Lincoln

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
✓ 54062	13-211	Three Lakes Valley (South)	NE¼ NW¼ Sec. 7, T.17S., R.58E.	6 cfs	Clark
54063	13-211	Three Lakes Valley (South)	NE¼ NE¼ Sec. 23, T.16S., R.57E.	6 cfs	Clark
✓ 54064	13-211	Three Lakes Valley (South)	SE¼ SE¼ Sec. 14, T.16S., R.56E.	10 cfs	Clark
54065	13-211	Three Lakes Valley (South)	SE¼ NW¼ Sec. 36, T.14S., R.58E.	10 cfs	Clark
54066	13-211	Three Lakes Valley (South)	SW¼ SW¼ Sec. 19, T.14S., R.59E.	10 cfs	Clark
54067 WRONG LOCATION - WITHDRAWN AND REFILED SEE APPLICATION 54106	13-211	Three Lakes Valley (South)	SE¼ SW¼ Sec. 6, T.15N., R.57E.	10 cfs	White Pine
/ 54068	10-168	Three Lakes Valley (North)	SE¼ NW¼ Sec. 26, T.13S., R.59E.	6 cfs	Clark
54069	10-168	Three Lakes Valley (North)	NE¼ SE¼ Sec. 36, T.13S., R.59E.	10 cfs	Clark
54070	13-212	Las Vegas Valley	SE¼ NE¼ Sec. 18, T.16S., R.59E.	10 cfs	Clark
54071	13-212	Las Vegas Valley	NE¼ NE¼ Sec. 29, T.16S., R.59E.	10 cfs	Clark
54072	13-212	Las Vegas Valley	SE¼ SE¼ Sec. 16, T.15S., R.59E.	10 cfs	Clark
/ 54073	13-216	Dry Lake Valley (Garnet Valley)	SW¼ SW¼ Sec. 32, T.17S., R.63E.	10 cfs	Clark
54074	13-217	Hidden Valley	SW¼ SW¼ Sec. 25, T.16S., R.62E.	10 cfs	Clark

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
54075	13-218	California Wash	NE¼ NE¼ Sec. 8, T.16S., R.66E.	10 cfs	Clark
54076	13-218	California Wash	SE¼ NW¼ Sec. 17, T.15S., R.64E.	10 cfs	Clark
54077	13-222	The Virgin River	NE¼ NW¼ Sec. 13, T.14S., R.69E.	60,000 AC-FT	Clark
54078	13-222	Virgin River Valley	NE¼ SE¼ Sec. 11, T.14S., R.69E.	6 cfs	Clark
54079	13-222	Virgin River Valley	NE¼ NE¼ Sec. 14, T.14S., R.69E.	6 cfs	Clark
54080	13-222	Virgin River Valley	NW¼ NW¼ Sec. 14, T.14S., R.69E.	6 cfs	Clark
54081	13-222	Virgin River Valley	NE¼ SE¼ Sec. 15, T.14S., R.69E.	6 cfs	Clark
54082	13-222	Virgin River Valley	SE¼ SW¼ Sec. 15, T.14S., R.69E.	6 cfs	Clark
54083	13-222	Virgin River Valley	SW¼ SE¼ Sec. 16, T.14S., R.69E.	6 cfs	Clark
54084	13-222	Virgin River Valley	SE¼ NE¼ Sec. 21, T.14S., R.69E.,	6 cfs	Clark
54085	13-222	Virgin River Valley	SE¼ NW¼ Sec. 21, T.14S., R.69E.	6 cfs	Clark
54086	13-222	Virgin River Valley	SW¼ SE¼ Sec. 21, T.14S., R.69E.	6 cfs	Clark
54087	13-222	Virgin River Valley	SW¼ NW¼ Sec. 28, T.14S., R.69E.	6 cfs	Clark

APP #	BASIN NO.	BASIN NAME	POINT OF DIVERSION	DIVERSION RATE	COUNTY IN WHICH POINT OF DIVERSION IS LOCATED
54088	13-222	Virgin River Valley	NE¼ NE¼ Sec. 29, T.14S., R.69E.	6 cfs	Clark
54089	13-222	Virgin River Valley	SE¼ SE¼ Sec. 29, T.14S., R.69E.	6 cfs	Clark
54090	13-222	Virgin River Valley	NW¼ NW¼ Sec. 32 T.14S., R.69E.	6 cfs	Clark
54091	13-222	Virgin River Valley	SW¼ SW¼ Sec. 31, T.14S., R.69E.	6 cfs	Clark
54092	13-222	Virgin River Valley	SE¼ SE¼ Sec. 31, T.14S., R.69E.	6 cfs	Clark
54105	13-205	Lower Meadow Valley	SW¼ NE¼ Sec. 9, T.8S., R.68E.	10 cfs	Lincoln
54106	13-211	Three Lakes Valley (South)	NE¼ SW¼ Sec. 12 T.15S., R.57E.	10 cfs	Clark

APPENDIX B



6 10 – GW Diversion Rate at site
38 – Total GW Diversion Rate for Basin

PIPELINE CHARACTERISTICS LAS VEGAS VALLEY (2007) VEGFP5.WK1

Pipe I.D.	Flow (CFS)	Peak (GPM)	Size (In)	Velocity (FPS)	Length (Ft)	H.L. (Ft)	$/LF	Cost ($)
L1L2	14	9430	36	2.97	124800	112.1	270	33696000
L2L3	14	9430	36	2.97	14200	12.8	270	3834000
L3L4	11	7410	30	3.36	24000	33.5	210	5040000
L4L5	7	4710	24	3.34	7500	13.5	160	1200000
L5L6	7	4710	24	3.34	43800	78.6	160	7008000
L6L7	7	4710	24	3.34	6500	11.7	160	1040000
L7L8	7	4710	24	3.34	47200	84.7	160	7552000
L8L9	7	4710	24	3.34	14100	25.3	160	2256000
L9L10	3	2020	16	3.23	9800	26.4	110	1078000
L3L21	3	2020	16	3.23	7200	19.4	110	792000
L4L20	4	2690	20	2.75	32400	50.2	130	4212000
L10L19	3	2020	16	3.23	6900	18.6	110	759000
					SUBTOTAL		$	68467000

PIPELINE CHARACTERISTICS VIRGIN RIVER (2007) VEGFP5.WK1

Pipe I.D.	Flow (CFS)	Peak (GPM)	Size (In)	Velocity (FPS)	Length (Ft)	H.L. (Ft)	$/LF	Cost ($)
V1V2	21	14150	48	2.51	133800	62.7	380	50844000
V2V3	14	9430	36	2.97	14900	13.4	270	4023000
V3V4	14	9430	36	2.97	29000	26.0	270	7830000
V4V5	14	9430	36	2.97	87100	78.2	270	23517000
V5V6	14	9430	36	2.97	8800	7.9	270	2376000
V6V7	14	9430	36	2.97	29200	26.2	270	7884000
V2V9	7	4710	24	3.34	55900	100.3	160	8944000
					SUBTOTAL		$	105418000

PIPELINE CHARACTERISTICS WHITE RIVER (2007) VEGFP5.WK1

Pipe I.D.	Flow (CFS)	Peak (GPM)	Size (In)	Velocity (FPS)	Length (Ft)	H.L. (Ft)	$/LF	Cost ($)
W1W2	13	8760	84	0.51	50000	0.6	920	46000000
W2W3	10	6740	84	0.39	26900	0.2	920	24748000
W3W4	7	4710	84	0.27	79800	0.3	920	73416000
W4W5	7	4710	84	0.27	27200	0.1	920	25024000
W5W6	7	4710	84	0.27	35300	0.1	920	32476000
W6W41	7	4710	24	3.34	5600	10.0	160	896000
W41W42	7	4710	24	3.34	24500	44.0	160	3920000
W42W43	3	2020	20	2.06	21800	19.8	130	2834000
W2W37	3	2020	16	3.23	3400	9.2	110	374000
					SUBTOTAL		$	209688000
					TOTAL		$	383573000

PIPELINE CHARACTERISTICS MEADOW VALLEY (2014) VEGFP4.WK1

Pipe I.D.	Flow (CFS)	Peak (GPM)	Size (In)	Velocity (FPS)	Length (Ft)	H.L. (Ft)	$/LF	Cost ($)
W7M1	17	11450	84	0.66	4800	0.1	920	4416000
M1M2	17	11450	84	0.66	93100	1.9	920	85652000
M2M3	17	11450	84	0.66	50100	1.0	920	46092000
M3M4	13	8760	84	0.51	21700	0.3	920	19964000
M4M5	13	8760	84	0.51	74300	0.9	920	68356000
M5M6	9	6060	84	0.35	109300	0.7	920	100556000
M6M7	3	2020	84	0.12	22000	0.0	920	20240000
M3M22	4	2690	20	2.75	25800	40.0	130	3354000
M6M60	6	4040	24	2.87	31600	42.6	160	5056000
M7M26	3	2020	16	3.23	17700	47.7	110	1947000
					SUBTOTAL		$	355633000

PIPELINE CHARACTERISTICS WHITE RIVER (2014) VEGFP4.WK1

Pipe I.D.	Flow (CFS)	Peak (GPM)	Size (In)	Velocity (FPS)	Length (Ft)	H.L. (Ft)	$/LF	Cost ($)
W6W7	47	31650	84	1.83	130300	17.8	920	119876000
W7W8	30	20210	84	1.17	19900	1.2	920	18308000
W8W9	30	20210	48	3.58	7300	6.6	380	2774000
W9W10	30	20210	48	3.58	32000	29.0	380	12160000
W10W11	30	20210	48	3.58	20000	18.1	380	7600000
W11W12	30	20210	48	3.58	34600	31.4	380	13148000
W12W13	30	20210	48	3.58	122700	111.2	380	46626000
W13W14	24	16160	42	3.74	4400	5.1	330	1452000
W14W15	24	16160	42	3.74	43300	49.8	330	14289000
W15W16	8	5390	30	2.45	49000	38.0	210	10290000
W15W52	10	6740	30	3.06	3200	3.7	210	672000
W15W53	6	4040	20	4.13	3100	10.2	130	403000
W16W17	8	5390	30	2.45	28600	22.2	210	6006000
W17W18	4	2690	20	2.75	14300	22.1	130	1859000
W18W19	4	2690	20	2.75	11700	18.1	130	1521000
W13W47	6	4040	20	4.13	2600	8.5	130	338000
					SUBTOTAL		$	257322000
					TOTAL		$	612955000

PIPELINE CHARACTERISTICS MEADOW VALLEY (2018) VEGFP3.WK1

Pipe I.D.	Flow (CFS)	Peak (GPM)	Size (In)	Velocity (FPS)	Length (Ft)	H.L. (Ft)	$/LF	Cost ($)
M7M8	102	68700	84	3.98	128900	73.6	920	118588000
M8M9	102	68700	84	3.98	41200	23.5	920	37904000
M9M10	102	68700	84	3.98	28900	16.5	920	26588000
M10M11	102	68700	84	3.98	35800	20.5	920	32936000
M11M31	102	68700	84	3.98	83900	47.9	920	77188000
M31M12	46	30980	60	3.52	30600	20.6	530	16218000
M12M13	43	28960	60	3.29	36000	21.4	530	19080000
M13M14	40	26940	60	3.06	44200	23.0	530	23426000
M14M15	29	19530	48	3.46	4000	3.4	380	1520000
M15M16	23	15490	42	3.59	28700	30.5	330	9471000
M16M17	17	11450	36	3.61	14200	18.3	270	3834000
M17M18	12	8080	30	3.67	19500	32.0	210	4095000
M18M19	6	4040	20	4.13	5900	19.3	130	767000
M31M50	3	2020	16	3.23	4500	12.1	110	495000
M31M32	53	35700	60	4.05	43900	38.5	530	23267000
M32M33	47	31650	60	3.59	19300	13.5	530	10229000
M33M34	41	27610	60	3.13	12500	6.8	530	6625000
M34M35	35	23570	60	2.68	13500	5.5	530	7155000
M35M37	35	23570	60	2.68	88500	36.0	530	46905000
M37M38	3	2020	16	3.23	22300	60.1	110	2453000
M37M39	32	21550	48	3.82	5900	6.0	380	2242000
M39M40	26	17510	48	3.11	11200	7.8	380	4256000
M40M41	21	14140	48	2.51	72500	34.0	380	27550000
M41M42	16	10780	36	3.40	12600	14.5	270	3402000
M42M61	13	8760	36	2.76	18900	14.8	270	5103000
M61M62	5	3370	20	3.44	10700	25.0	130	1391000
M61M43	8	5390	24	3.82	12400	28.5	160	1984000
M43M44	5	3370	20	3.44	22800	53.4	130	2964000
M39M45	6	4040	20	4.13	9700	31.8	130	1261000
M40M47	5	3370	20	3.44	7200	16.8	130	936000
M41M48	5	3370	20	3.44	15200	35.6	130	1976000
M42M49	3	2020	16	3.23	6700	18.1	110	737000
M13M52	3	2020	16	3.23	5100	13.8	110	561000
M14M53	3	2020	16	3.23	5300	14.3	110	583000
M14M54	8	5390	30	2.45	12500	9.7	210	2625000
M54M55	5	3370	20	3.44	9400	22.0	130	1222000
M15M57	6	4040	20	4.13	12500	41.0	130	1625000
M16M58	6	4040	20	4.13	2300	7.5	130	299000
M17M59	5	3370	20	3.44	16900	39.5	130	2197000
					SUBTOTAL		$	531658000

PIPELINE CHARACTERISTICS WHITE RIVER (2018) VEGFP3.WK1

Pipe I.D.	Flow (CFS)	Peak (GPM)	Size (In)	Velocity (FPS)	Length (Ft)	H.L. (Ft)	$/LF	Cost ($)
W1W2	119	80150	84	4.64	128900	97.9	920	118588000
W2W3	119	80150	84	4.64	41200	31.3	920	37904000
W3W4	119	80150	84	4.64	28900	22.0	920	26588000
W4W5	119	80150	84	4.64	35800	27.2	920	32936000
W5W6	119	80150	84	4.64	83900	63.7	920	77188000
W6W7	119	80150	84	4.64	30600	23.2	920	28152000
					SUBTOTAL		$	321356000
					TOTAL		$	853014000

PIPELINE CHARACTERISTICS RAILROAD VALLEY (2025) VEGFP2.WK1

Pipe I.D.	Flow (CFS)	Peak (GPM)	Size (IN)	Velocity (FPS)	Length (Ft)	H.L. (Ft)	$/LF	Cost ($)
W8R1	78	52530	72	4.14	71600	52.8	710	50836000
R1R2	78	52530	72	4.14	151100	111.3	710	107281000
R2R3	76	51190	72	4.03	74000	52.0	710	52540000
R3R4	74	49840	72	3.93	97400	65.1	710	69154000
R4R5	74	49840	72	3.93	39500	26.4	710	28045000
R5R6	74	49840	72	3.93	44000	29.4	710	31240000
R6R7	74	49840	72	3.93	102300	68.4	710	72633000
R7R8	63	42430	72	3.34	122400	60.7	710	86904000
R8R9	60	40410	60	4.59	22900	25.2	530	12137000
R9R10	54	36370	60	4.13	15900	14.4	530	8427000
R10R11	46	30980	60	3.52	27300	18.4	530	14469000
R11R12	41	27610	60	3.13	12600	6.9	530	6678000
R12R13	36	24250	48	4.30	13900	17.6	380	5282000
R13R14	33	22230	48	3.94	18600	20.1	380	7068000
R14R15	25	16840	42	3.90	13300	16.5	330	4389000
R15R16	22	14820	42	3.43	12200	11.9	330	4026000
R16R17	14	9430	36	2.97	16600	14.9	270	4482000
R17R18	11	7410	36	2.34	18800	10.8	270	5076000
R18R19	6	4040	20	4.13	8300	27.2	130	1079000
R19R20	3	2020	16	3.23	9300	25.1	110	1023000
R7R24	11	7410	36	2.34	34100	19.6	270	9207000
R24R25	8	5390	30	2.45	40100	31.1	210	8421000
R25R26	5	3370	20	3.44	22900	53.6	130	2977000
R8R38	3	2020	16	3.23	3700	10.0	110	407000
R9R28	6	4040	20	4.13	7800	25.6	130	1014000
R28R29	3	2020	20	2.06	45300	41.2	130	5889000
R10R31	8	5390	24	3.82	3700	8.5	160	592000
R31R32	5	3370	20	3.44	21200	49.6	130	2756000
R11R39	5	3370	20	3.44	2400	5.6	130	312000
R12R33	5	3370	20	3.44	3300	7.7	130	429000
R13R34	3	2020	16	3.23	2200	5.9	110	242000
R14R43	5	3370	20	3.44	18000	42.1	130	2340000
R16R35	5	3370	20	3.44	4600	10.8	130	598000
R16R36	3	2020	16	3.23	4000	10.8	110	440000
R18R37	5	3370	20	3.44	11200	26.2	130	1456000
					SUBTOTAL		$	609849000
					TOTAL		$	609849000

PIPELINE CHARACTERISTICS LAS VEGAS VALLEY OVERALL VEGFP1.WK1

Pipe I.D.	Flow (CFS)	Peak (GPM)	Size (In)	Velocity (FPS)	Length (Ft)	H.L. (Ft)	$/LF	Cost ($)
L1L2	14	9430	36	2.97	124800	112.1	270	33696000
L2L3	14	9430	36	2.97	14200	12.8	270	3834000
L3L4	11	7410	30	3.36	24000	33.5	210	5040000
L4L5	7	4710	24	3.34	7500	13.5	160	1200000
L5L6	7	4710	24	3.34	43800	78.6	160	7008000
L6L7	7	4710	24	3.34	6500	11.7	160	1040000
L7L8	7	4710	24	3.34	47200	84.7	160	7552000
L8L9	7	4710	24	3.34	14100	25.3	160	2256000
L9L10	3	2020	16	3.23	9800	26.4	110	1078000
L3L21	3	2020	16	3.23	7200	19.4	110	792000
L4L20	4	2690	20	2.75	32400	50.2	130	4212000
L10L19	3	2020	16	3.23	6900	18.6	110	759000
					SUBTOTAL		$	68467000

PIPELINE CHARACTERISTICS VIRGIN RIVER OVERALL VEGFP1.WK1

Pipe I.D.	Flow (CFS)	Peak (GPM)	Size (In)	Velocity (FPS)	Length (Ft)	H.L. (Ft)	$/LF	Cost ($)
V1V2	21	14150	48	2.51	133800	62.7	380	50844000
V2V3	14	9430	36	2.97	14900	13.4	270	4023000
V3V4	14	9430	36	2.97	29000	26.0	270	7830000
V4V5	14	9430	36	2.97	87100	78.2	270	23517000
V5V6	14	9430	36	2.97	8800	7.9	270	2376000
V6V7	14	9430	36	2.97	29200	26.2	270	7884000
V2V9	7	4710	24	3.34	55900	100.3	160	8944000
					SUBTOTAL		$	105418000

PIPELINE CHARACTERISTICS RAILROAD VALLEY OVERALL VEGFP1.WK1

Pipe I.D.	Flow (CFS)	Peak (GPM)	Size (IN)	Velocity (FPS)	Length (Ft)	H.L. (Ft)	$/LF	Cost ($)
W8R1	78	52530	72	4.14	71600	52.8	710	50836000
R1R2	78	52530	72	4.14	151100	111.3	710	107281000
R2R3	76	51190	72	4.03	74000	52.0	710	52540000
R3R4	74	49840	72	3.93	97400	65.1	710	69154000
R4R5	74	49840	72	3.93	39500	26.4	710	28045000
R5R6	74	49840	72	3.93	44000	29.4	710	31240000
R6R7	74	49840	72	3.93	102300	68.4	710	72633000
R7R8	63	42430	72	3.34	122400	60.7	710	86904000
R8R9	60	40410	60	4.59	22900	25.2	530	12137000
R9R10	54	36370	60	4.13	15900	14.4	530	8427000
R10R11	46	30980	60	3.52	27300	18.4	530	14469000
R11R12	41	27610	60	3.13	12600	6.9	530	6678000
R12R13	36	24250	48	4.30	13900	17.6	380	5282000
R13R14	33	22230	48	3.94	18600	20.1	380	7068000
R14R15	25	16840	42	3.90	13300	16.5	330	4389000
R15R16	22	14820	42	3.43	12200	11.9	330	4026000
R16R17	14	9430	36	2.97	16600	14.9	270	4482000
R17R18	11	7410	36	2.34	18800	10.8	270	5076000
R18R19	6	4040	20	4.13	8300	27.2	130	1079000
R19R20	3	2020	16	3.23	9300	25.1	110	1023000
R7R24	11	7410	36	2.34	34100	19.6	270	9207000
R24R25	8	5390	30	2.45	40100	31.1	210	8421000
R25R26	5	3370	20	3.44	22900	53.6	130	2977000
R8R38	3	2020	16	3.23	3700	10.0	110	407000
R9R28	6	4040	20	4.13	7800	25.6	130	1014000
R28R29	3	2020	20	2.06	45300	41.2	130	5889000
R10R31	8	5390	24	3.82	3700	8.5	160	592000
R31R32	5	3370	20	3.44	21200	49.6	130	2756000
R11R39	5	3370	20	3.44	2400	5.6	130	312000
R12R33	5	3370	20	3.44	3300	7.7	130	429000
R13R34	3	2020	16	3.23	2200	5.9	110	242000
R14R43	5	3370	20	3.44	18000	42.1	130	2340000
R16R35	5	3370	20	3.44	4600	10.8	130	598000
R16R36	3	2020	16	3.23	4000	10.8	110	440000
R18R37	5	3370	20	3.44	11200	26.2	130	1456000
					SUBTOTAL		$	609849000

PIPELINE CHARACTERISTICS MEADOW VALLEY OVERALL VEGFP1.WK1

Pipe I.D.	Flow (CFS)	Peak (GPM)	Size (In)	Velocity (FPS)	Length (Ft)	H.L. (Ft)	$/LF	Cost ($)
W7M1	119	80150	84	4.64	4800	3.6	920	4416000
M1M2	119	80150	84	4.64	93100	70.7	920	85652000
M2M3	119	80150	84	4.64	50100	38.1	920	46092000
M3M4	115	77450	84	4.49	21700	15.5	920	19964000
M4M5	115	77450	84	4.49	74300	53.0	920	68356000
M5M6	115	77450	84	4.49	109300	78.0	920	100556000
M6M7	105	70720	84	4.10	22000	13.3	920	20240000
M7M8	102	68700	84	3.98	128900	73.6	920	118588000
M8M9	102	68700	84	3.98	41200	23.5	920	37904000
M9M10	102	68700	84	3.98	28900	16.5	920	26588000
M10M11	102	68700	84	3.98	35800	20.5	920	32936000
M11M31	102	68700	84	3.98	83900	47.9	920	77188000
M31M12	46	30980	60	3.52	30600	20.6	530	16218000
M12M13	43	28960	60	3.29	36000	21.4	530	19080000
M13M14	40	26940	60	3.06	44200	23.0	530	23426000
M14M15	29	19530	48	3.46	4000	3.4	380	1520000
M15M16	23	15490	42	3.59	28700	30.5	330	9471000
M16M17	17	11450	36	3.61	14200	18.3	270	3834000
M17M18	12	8080	30	3.67	19500	32.0	210	4095000
M18M19	6	4040	20	4.13	5900	19.3	130	767000
M3M22	4	2690	20	2.75	25800	40.0	130	3354000
M6M60	6	4040	24	2.87	31600	42.6	160	5056000
M7M26	3	2020	16	3.23	17700	47.7	110	1947000
M31M50	3	2020	16	3.23	4500	12.1	110	495000
M31M32	53	35700	60	4.05	43900	38.5	530	23267000
M32M33	47	31650	60	3.59	19300	13.5	530	10229000
M33M34	41	27610	60	3.13	12500	6.8	530	6625000
M34M35	35	23570	60	2.68	13500	5.5	530	7155000
M35M37	35	23570	60	2.68	88500	36.0	530	46905000
M37M38	3	2020	16	3.23	22300	60.1	110	2453000
M37M39	32	21550	48	3.82	5900	6.0	380	2242000
M39M40	26	17510	48	3.11	11200	7.8	380	4256000
M40M41	21	14140	48	2.51	72500	34.0	380	27550000
M41M42	16	10780	36	3.40	12600	14.5	270	3402000
M42M61	13	8760	36	2.76	18900	14.8	270	5103000
M61M62	5	3370	20	3.44	10700	25.0	130	1391000
M61M43	8	5390	24	3.82	12400	28.5	160	1984000
M43M44	5	3370	20	3.44	22800	53.4	130	2964000
M39M45	6	4040	20	4.13	9700	31.8	130	1261000
M40M47	5	3370	20	3.44	7200	16.8	130	936000
M41M48	5	3370	20	3.44	15200	35.6	130	1976000
M42M49	3	2020	16	3.23	6700	18.1	110	737000
M13M52	3	2020	16	3.23	5100	13.8	110	561000
M14M53	3	2020	16	3.23	5300	14.3	110	583000
M14M54	8	5390	24	3.82	12500	28.7	160	2000000
M54M55	5	3370	20	3.44	9400	22.0	130	1222000
M15M57	6	4040	20	4.13	12500	41.0	130	1625000
M16M58	6	4040	20	4.13	2300	7.5	130	299000
M17M59	5	3370	20	3.44	16900	39.5	130	2197000

SUBTOTAL $ 886666000

PIPELINE CHARACTERISTICS WHITE RIVER OVERALL VEGFP1.WK1

Pipe I.D.	Flow (CFS)	Peak (GPM)	Size (In)	Velocity (FPS)	Length (Ft)	H.L. (Ft)	$/LF	Cost ($)
W1W2	237	159620	120	4.53	50000	23.9	1900	95000000
W2W3	234	157600	120	4.47	26900	12.6	1900	51110000
W3W4	234	157600	120	4.47	79800	37.3	1900	151620000
W4W5	234	157600	120	4.47	27200	12.7	1900	51680000
W5W6	234	157600	120	4.47	35300	16.5	1900	67070000
W6W7	227	152880	120	4.34	130300	57.6	1900	247570000
W7W8	108	72740	84	4.21	19900	12.6	920	18308000
W8W9	30	20210	48	3.58	7300	6.6	380	2774000
W9W10	30	20210	48	3.58	32000	29.0	380	12160000
W10W11	30	20210	48	3.58	20000	18.1	380	7600000
W11W12	30	20210	48	3.58	34600	31.4	380	13148000
W12W13	30	20210	48	3.58	122700	111.2	380	46626000
W13W14	24	16160	42	3.74	4400	5.1	330	1452000
W14W15	24	16160	42	3.74	43300	49.8	330	14289000
W15W16	8	5390	30	2.45	49000	38.0	210	10290000
W15W52	10	6740	30	3.06	3200	3.7	210	672000
W15W53	6	4040	20	4.13	3100	10.2	130	403000
W16W17	8	5390	30	2.45	28600	22.2	210	6006000
W17W18	4	2690	20	2.75	14300	22.1	130	1859000
W18W19	4	2690	20	2.75	11700	18.1	130	1521000
W13W47	6	4040	20	4.13	2600	8.5	130	338000
W6W41	7	4710	24	3.34	5600	10.0	160	896000
W41W42	7	4710	24	3.34	24500	44.0	160	3920000
W42W43	3	2020	20	2.06	21800	19.8	130	2834000
W2W37	3	2020	16	3.23	3400	9.2	110	374000
					SUBTOTAL			$ 809520000
					TOTAL			$ 2479920000

ACK ENGINEERS, INC.
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SHEET ______ OF ______

BY SEK DATE 4-9-92

CHECK ______ DATE ______

CLIENT Las Vegas Water Study

JOB ______

JOB NO. 445.40

WATER LINE COSTS

Based on Telephone Conversation with John Porterfield of Ameron Pipe (213) 268-4111 this afternoon :

Pipe Size	Cost Per in-Dia.	Pipe Cost	Installation Cost	Total (Rounded)	Adjusted Cost
30"	$ 2.50	$ 75	$ 75	$ 150	$ 160
36"	$ 2.50	$ 90	$ 90	$ 180	$ 200
48"	3.00	144	144	290	290
60"	3.50	210	210	420	400
72"	3.75	270	270	540	540
84"	4.00	336	336	670	700
96"	4.50	432	432	860	900
108"	5.25	567	567	1,130	1,130
120"	6.00	720	720	1,440	1,430

NOTE : 1. Installation Cost is assumed to be 100% of pipe cost.

By Extrapolation :

132"	7.00	924	924	1,850	1,850
144"	8.00	1,152	1,152	2,300	2,300
12"					70
16"		40	40	80	80
20"		54	54	108	100
24"		62	62	124	120

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SHEET ______ OF ______

BY SEK DATE 4-9-92

CHECK ______ DATE ______

CLIENT Las Vegas Water Supply

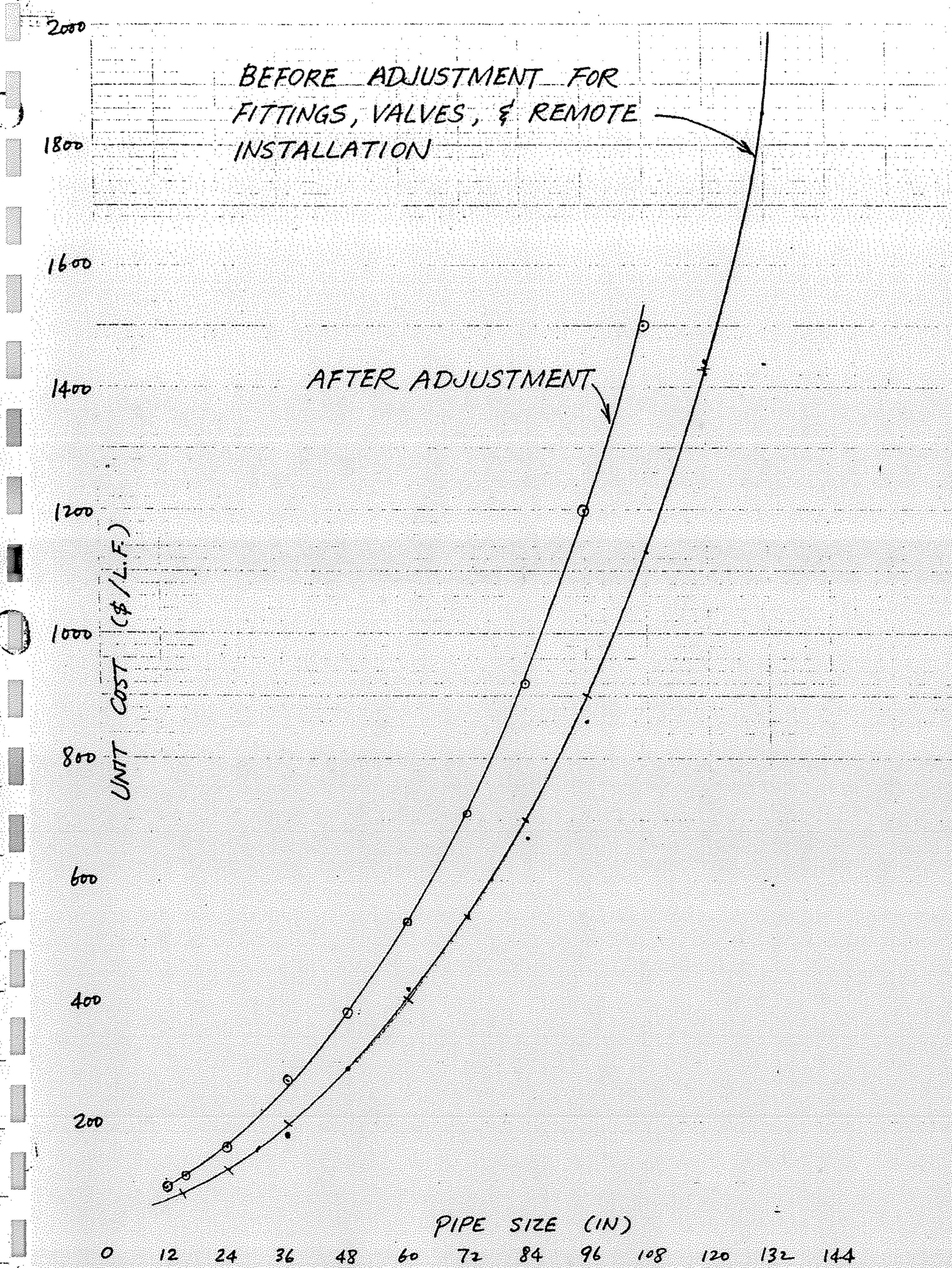
JOB ______ JOB NO. 445.40

ADJUSTED COSTS FOR WATER PIPELINES

Pipe Size	Cost/L.F.	Including Fittings (1)	Remote Installation (2)	Total Adjusted
12"	$ 70	$ 77	$ 93	$ 90
16"	$ 80	$ 88	$ 106	$ 110
20"	100	110	132	130
24"	120	132	158	160
30"	160	176	211	210
36"	200	220	264	270
42"				330
48"	290	319	383	380
54"				460
60"	400	440	528	530
66"				620
72"	540	594	713	710
84"	700	770	924	920
96"	900	990	1,188	1,200
108"	1,130	1,243	1,492	1,500
120"	1,430	1,573	1,888	1,900
132"	1,850	2,035	2,442	2,500
144"	2,300	2,530	3,036	3,000

(1) Assumed to be 110% of Pipe Cost

(2) Assumed to be 120% of (Pipe Cost + Fitting/Valve Cost)



BEFORE ADJUSTMENT FOR FITTINGS, VALVES, & REMOTE INSTALLATION
AFTER ADJUSTMENT
UNIT COST ($/L.F.)
PIPE SIZE (IN)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
12
24
36
48
60
72
84
96
108
120
132
144

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SHEET 1 OF ____
BY SEK DATE 6/4/92
CHECK ____ DATE ____

CLIENT Mifflin International
JOB Las Vegas Water Study
JOB NO. 445.40

PRESSURE REDUCING STATIONS

LAS VEGAS VALLEY – ALL FOR YEAR 2007

1.	STA. 450+00	9430 gpm		2 – 12" PRV	
				1 – 12" Standby	
			Total	3 – 12" PRV	$91,000
2.	STA. 650+00	9430 gpm	Total	3–12" PRV	$91,000
3.	STA. 2300+00	4710 gpm		1 – 12" PRV	
				1 – 12" Standby	
			Total	2–12" PRV	$64,000
4.	STA. 2475+00	4710 gpm	Total	2–12" PRV	$64,000
					$310,000

VIRGIN RIVER – NONE

ACK ENGINEERS, INC.
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SHEET 2 OF ____
BY ____ DATE ____
CHECK ____ DATE ____
CLIENT ____
JOB ____ JOB NO. ____

RAILROAD VALLEY — ALL FOR YEAR 2025

1. STA. 50+00 52530 gpm 3 – 20" 3 × 16500 = 49500 gpm
1 – 10" 1 × 4100 = 4100 gpm
Standby : 1 – 20" Sum = 53600 gpm
Total 4 – 20" ; 1 – 10" $357,000

2. STA. 225+00 52530 gpm Total 4 – 20" ; 1 – 10" $357,000

3. STA. 2225+00 51190 gpm Total 4 – 20" ; 1 – 10" $357,000

4. STA. 2725+00 51190 gpm Total 4 – 20" ; 1 – 10" $357,000

5. STA. 2970+00 49840 gpm Total 4 – 20" ; 1 – 10" $357,000

6. STA. 3030+00 49840 gpm Total 4 – 20" ; 1 – 10" $357,000

7. Between R25 & R26, 3370 gpm 2 – 10" PRV (One for standby) $54,000

8. Between R31 & R32, 3370 gpm 2 – 10" PRV $54,000

9. Between R14 & R43, 3370 gpm 2 – 10" PRV $54,000

10. Between R18 & R37, 3370 gpm 2 – 10" PRV $54,000

$2,358,000

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MEADOW VALLEY

1. STA. 110+00 , 11450 gpm FOR 2014 2-20" PRV (1 for Standby) $ 180,000
68700 gpm FOR (2018) 4-20" PRV $357,000
80150 gpm OVERALL 6-20" PRV (1 for Standby)

2. STA. 250+00 , Same as STA. 110+00

3. STA. 1050+00 , 11450 gpm FOR 2014 2-20" PRV (1 for Standby) $ 180,000
68700 gpm FOR (2018) 4-20" PRV $ 357,000
80150 gpm OVERALL 6-20" PRV (1 for Standby)

4. STA. 2620+00 , 6060 gpm FOR 2014 2-20" PRV (1 for Standby)
68700 gpm FOR (2018) 4-20" PRV
77450 gpm OVERALL 6-20" PRV (1 for Standby)

(2018)

5. STA. 2775+00 , Same as STA. 2620+00

6. STA. 3340+00 , Same as STA. 2620+00

7. Between M32 & M33, 31650 gpm , 3-20" PRV (1 for Standby) $270,000

8. Between M40 & M47, 3370 gpm , 2-10" PRV (1 for Standby) $ 54,000

9. Between M41 & M48, Same as above

10. Between M61 & M62, Same as above

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MEADOW VALLEY [redacted] 6 × $180,000 = $1,080,000

(2018)

11. Between M43 & M44, 3370 gpm, 2-10" PRV (1 for Standby)

12. Between M54 & M55, Same as above

13. Between M17 & M59, Same as above

MEADOW VALLEY 2018 TOTAL 6 × $357,000 + $270,000 + 6 × $54,000 = $2,736,000

WHITE RIVER

1. STA. 70+00, 8760 gpm FOR 2007 2-20" PRV $180,000
   - 40420 gpm FOR 2014 2-20" PRV $180,000
   - {80150 gpm / 28970 gpm} FOR (2018): 6-20" PRV $500,000 / 0
   - {80150 gpm / 81,500 gpm} FOR 2025: 0 / 2-20" PRV $180,000
   - {80150 gpm / 81,500 gpm} OVERALL: 6-20" PRV / 6-20" PRV

2. STA. 3450+00, 0 gpm FOR 2007 0
   - 31650 gpm FOR 2014 3-20" PRV $270,000
   - {80150 gpm / 20,210 gpm} FOR (2018): 6-20" PRV $500,000 / 0
   - {80150 gpm / 72,730 gpm} FOR 2025: 0 / 3-20" PRV $270,000

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[redacted]

3. STA. 3980+00, 20210 gpm 2-20" PRV (w/ 1 standby)
   1-10" PRV $197,000
4. STA. 5050+00, 20210 gpm Same as above $197,000
5. STA. 5860+00, 16160 gpm 2-20" PRV (w/ 1 standby) $180,000
6. STA. 6350+00, 5390 gpm 2-12" PRV (w/ 1 standby) $64,000

WHITE RIVER

2007 = $180,000

[redacted] = 2×180,000 + 270,000 + 2×197,000 + 64,000 = $1,088,000

2018 = 500,000 + 500,000 = $1,000,000

2025 = 180,000 + 270,000 = $450,000

WHITE RIVER FLOWS

1. BETWEEN W1 & W6 :

2007 8760 gpm

2014 11450 gpm from Meadow Valley
20210 gpm from Upstreams
8760 gpm from W37 and W41
40420 gpm

2018 80150 gpm from Meadow Valley — for one 84" Pipe
20210 gpm from upstreams
8760 gpm from W37 and W41
28970 gpm — for another 84" pipe

2025 80150 gpm from Meadow Valley — for one 84" Pipe
28970 gpm
+ 52530 gpm from Railroad Valley
81,500 gpm — for another 84" pipe

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UNIT COST FOR VALVES

Size	PRV Capacity (gpm)	PRV Unit Price (1)	Assumed Installation Cost (2)	Total Unit Cost
10"	4,100	$ 4,000	$ 4,000	$ 8,000
12"	6,400	$ 6,000	$ 6,000	$ 12,000
16"	9,230	$ 10,000	$ 10,000	$ 20,000
20"	16,500	$ 20,000	$ 20,000	$ 40,000

Size	Isolation Valve Cost	Installation Cost (4)	Total Isolation Valve Cost (3)
10"	$ 800	$1200	2× (800+1200) = $ 4,000
12"	$ 1000	$1,500	2× (1000+1500) = $ 5,000
16"	$ 3,000	$ 4500	2× (3000+4,500) = $ 15,000
20"	$ 5,000	$ 7,500	2× (5000+7500) = $ 25,000

NOTES:

(1) From Jim Thomas of Engineered Sales Company on 6/3/92
(2) Assume 100% of PRV Unit Price
(3) Assume Two Isolation Valves for Each PRV
(4) Assume 150% of Isolation Valve Cost
The Installation Cost includes Pipe Fittings (Couplings)

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TYPE 1 : 2-10" PRV

PRV	2 × 8000	= $ 16,000
Iso. V.	2 × 4000	= 8,000
Building		10,000
Site Work (Including Manifold, typ.)		20,000
	Total	$54,000

TYPE 2 : 2-12" PRV

PRV	2 × 12,000	= $ 24,000
Iso. V.	2 × 5,000	= 10,000
Bldg.		10,000
Site Work		20,000
	Total	$ 64,000

TYPE 3 : 3-12" PRV

PRV	3 × 12,000	= $ 36,000
Iso. V.	3 × 5,000	= 15,000
Bldg.		15,000
Site Work		25,000
	Total	$ 91,000

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TYPE 4 : 2 - 20" PRV

PRV	2 × 40,000	= $ 80,000
Iso. V.	2 × 25,000	= 50,000
Bldg.		20,000
Site Work		30,000
	Total	$ 180,000

TYPE 5 : 2 - 20" PRV ; 1 - 10" PRV

PRV	2×40,000 + 1×8,000	= $ 88,000
Iso. V.	2×25,000 + 1×4,000	= 54,000
Bldg.		20,000
Site Work		35,000
	Total	$ 197,000

TYPE 6 : 3 - 20" PRV

PRV	3 × 40,000	= $ 120,000
Iso. V.	3 × 25,000	= 75,000
Bldg.		30,000
Site Work		45,000
	Total	$ 270,000

TYPE 7: 4-20" PRV

PRV	4 × 40,000	= $	160,000
Iso. V.	4 × 25,000	=	100,000
Bldg.			35,000
Site Work			50,000
	Total		$ 345,000

TYPE 8: 4-20" PRV ; 1-10" PRV

PRV	4×40,000 + 1 × 8,000	= $	168,000
Iso. V.	4 × 25,000 + 1 × 4,000	=	104,000
Bldg.			35,000
Site Work			50,000
	Total		$ 357,000

TYPE 9: 6-20" PRV

PRV	6 × 40,000	= $	240,000
Iso. V.	6 × 25,000	=	150,000
Bldg.			50,000
Site Work			60,000
	Total		$ 500,000

BOOSTER STATIONS

LAS VEGAS VALLEY — NONE

VIRGIN RIVER — ALL FOR YEAR 2007

1. Between V1 & V2 :	Q = 14,150 gpm	8-250 HP Pumps
	TDH = 470'	$1,420,000
2. At V7 :	Q = 9,430 gpm	7-250 HP Pumps
	TDH = 560'	$1,180,000
	Total =	$2,600,000

RAILROAD VALLEY — ALL FOR YEAR 2025

1. At R7 :	Q = 42,430 gpm	30-250 HP Pumps
	TDH = 590'	$4,600,000
2. At R9 :	Q = 40,410 gpm	16-250 HP Pumps
	TDH = 340'	$2,590,000
3. At R16 :	Q = 10,450 gpm	4-200 HP Pumps
	TDH = 210'	$630,000
4. AT R38 :	Q = 2,020 gpm	2-200 HP Pumps
	TDH = 270'	$300,000
	Total =	$8,120,000

MEADOW VALLEY — YEAR 2014

1. AT M60 :	Q = 4,040 gpm	3 - 200HP Pumps
	TDH = 250'	$460,000
2. AT M26 :	Q = 2,020 gpm	3 - 250 HP Pumps
	TDH = 770'	$570,000
		Total = $1,030,000

MEADOW VALLEY — YEAR 2018

1. AT M31 :	Q = 68,700 gpm	48 - 250HP Pumps
	TDH = 600'	$7,120,000
2. AT M37 :	Q = 23,600 gpm	16 - 250HP Pumps
	TDH = 560'	$2,590,000
3. AT M49 :	Q = 2,020 gpm	3 - 200 HP Pumps
	TDH = 490'	$460,000
		Total = $10,170,000

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WHITE RIVER – YEAR 2007

1. AT W42 : Q = 4,710 gpm 6–200 HP Pumps
TDH = 610' $ 870,000

WHITE RIVER – YEAR 2014

1. AT W53 : Q = 4,040 gpm 3–250 HP Pumps
TDH = 410' $ 570,000

Per Chuck on 6/5/92

$ 70,000 per each 250 HP Installed (Pump Only)
$ 60,000 per each 200 HP Installed (Pump Only)

ASSUMPTIONS

1. Costs for site work, control, piping, painting, building, etc. are assumed to be 100% of pump cost.
2. Storage Tanks are sized to provide 30 to 60 minutes of storage capacity.
3. Pump Cost = $ 70,000 / each 250 HP
$ 60,000 / each 200 HP

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BOOSTER STATION COSTS

Size (HP)	Cost of Pumps ($)	Installation Cost ($)	Storage Tank (gallons)	Tank Cost ($)	Station Cost ($)
2-200	$120,000	$120,000	100,000	$60,000	$300,000
3-200	180,000	180,000	200,000	100,000	460,000
4-200	240,000	240,000	300,000	150,000	630,000
6-200	360,000	360,000	300,000	150,000	870,000
3-250	210,000	210,000	300,000	150,000	570,000
7-250	490,000	490,000	500,000	200,000	1,180,000
8-250	560,000	560,000	1,000,000	300,000	1,420,000
16-250	1,120,000	1,120,000	1,500,000	350,000	2,590,000
30-250	2,100,000	2,100,000	2,000,000	400,000	4,600,000
48-250	3,360,000	3,360,000	2,000,000	400,000	7,120,000

Appendix IV

Drilling and Well Construction Costs

EXPLORATION AND WELL CONSTRUCTION

Currently, LVVWD has 659,914 acre/ft of application and is pursuing 190,800 acre-feet of ground water, and 60,000 acre-feet of Virgin River water (Appendix II).

The following calculates the well exploration and development costs. The following discussion explains assumptions and calculations. The following discussion is organized by the Appendix II phases with the exception of Tikapoo Valley applications that have been placed in Phase IV.

Column: A. Application Number. These are applications that are considered potentially favorable for development by our reconnaissance analysis.

B. Basin Name: The hydrologic management basin in which the application occurs. Some of the LVVWD application and associated basins for development that have not been included because of very deep static water levels, or distant location of proposed well fields. Such factors either raise the cost of water, development in relationship to water produced, or may result in absence of engineering feasibility. Basins dropped include Hidden (217), Coal (171), Garden (172), and Cave (180). The 10,000 acre-feet of water from the Virgin River floodplain would be of very poor quality. We have located four well fields (listed as 54078, 054079, 54080, 054081) to an area near Flat Top Mesa where water quality is believed to be acceptable.

C. Flow in cfs: Each LVVWD application applied for 6 or 10 cfs. In order to create a scenario approximating the districts ground-water withdraw plan (Appendix II) the amount of withdraw has generally decreased to between 2 and 5 cfs per application.

D. SWL: The static water level has been based on a litature and map review, plotting of data from wells within the basin, and/or expert judgement

E. Anticipated total well depth: Static water level plus 600 feet. E = D + 600

F. Estimated yield: Within carbonate aquifer basins that are hydrologically unknown a yield of 500 gpm was used. Within known carbonate basins such as Coyote Springs Valley a yield of 1,000 gpm was used. Alluvial basins have been evaluated at 1,000 gpm unless testing has indicated that production figure to be too high, such as Delmar and Indian Springs area.

G. Number of production wells: The number of production wells required to produce the volume of water necessary to meet the annual demand cycle and total annual production. The total number of wells and associated pumping capacity reflects the increased summer demand (1.5 x average demand).

H. Number of boreholes per completed production well: In known basin such as Railroad Valley or Snake Valley an assumption was made that 3 exploratory boreholes will have to be drilled for each production well completed. In basins that are unknown it is assumed that 5 exploration boreholes will have to be drilled to complete each production well.

I. Total number of exploratory wells: The total number of exploratory boreholes that will be drilled during the development of the application. I = Gx(H-1)

J. Total miles of feeder pipeline: The production wells within the well field are assumed to be 1/4 of a mile apart. The feeder pipeline is that necessary to bring the production wells output to one central point. J = (G-1) x 0.25

K. Exploration cost per well: The cost to drill an exploratory borehole is estimated at $25.00 a foot. The completion of the borehole to monitoring wells is estimated to cost an additional $12.00 per foot.

K = (E x 25 x H) + (E x 12 x H-1)

L. Production well construction cost: The construction costs are estimated to be approximately the same as those in Las Vegas Valley by the LVVWD. Three wells recently drilled by LVVWD cost $181.00 per foot to drill. This is the value used to calculate production well costs. L = E x 181

M. Change in head: The lift necessary to bring water into the pipeline or to a booster pump.

N. Horsepower per pump: The calculated horsepower need in M. N = (F x M) / (3960 x .75)

O. Pump Cost: The water district has historically used the top of the line pumps with stainless steel bowls, removable bearings and poly coated. A local pump supplier estimated the cost of the pumps at $70,000 to $120,000 for 250 to 500 hp units. All of the pumps used in this scenario are less than 250 hp. The cost per pump was estimated at $70,000 each.

P. Above-ground cost: Included in the above-ground costs are site improvements, road construction, telemetry and communication infrastructure and other support facilities. We estimate that the LVVWD spends aproximately 500,000 dollars on the combination of above-ground facilities and pumps. Therefore, the $500,000 was adopted for column O+P and the above-ground cost at least 430,000 per well site, considering the great distances and remote nature of the majority of well sites.

Q. Engineering: The cost of the technical support for developing the system, including the exploration and well construction supervision, is estimated at 30% of the accumulated cost for exploration, drilling, pump and the above ground components. Q = (K + L + O + P) x .30

R. Total/Well: This column represents the total cost to complete one production well within the well field represented by the application number. R = K + O + P + L + Q

S. Blank column

T. Total for Application: This is the total cost to develop the application water. The sum of this column is the cost to develop this phase of this scenario. T = R x G

U. Lifetime replacement costs: During the estimated 50 year life of the pipeline it will be necessary to replace the pumps and wells. The average useful life for pumps is assumed to be 10 years and the wells 25 years. Therefore, during the lifetime of the pipeline the pumps will be replaced 4 times and each well abandoned and redrilled once. The calculation uses the column price and the 30% engineering addition. [(4x0+L) + (4x0+L)] x .30.

Phase I Costs

A	B	C	D	E	F	G	H	I	J	K	L
	phase one										
application number	Basin name	cfs	SWL	anticipated total depth	estimated yield	production wells necassary	number of exploration wells per production	total number of exploration wells	total miles of feeder pipeline	exploration costs per well	production well drilling cost
54064	L. Three Lakes	4	50	650	500	6	5	24	1.25	120249	117650
54062	L. Three Lakes	3	100	700	500	4	5	16	0.75	129499	126700
54060	U. Three Lakes	4	600	1200	500	6	5	24	1.25	221999	217200
54068	U. Three Lakes	3	600	1200	500	4	5	16	0.75	221999	217200
54073	Garnet Valley	3	1178	1778	500	4	5	16	0.75	328929	321818
54058	Coyote Spring	4	578	1178	1000	3	3	6	0.5	130757	213218
54059	Coyote Spring	3	578	1178	1000	2	3	4	0.25	130757	213218
54076	California Wash	7	978	1578	500	10	5	40	2.25	291929	285618
54078	Virgin River	4	400	1000	500	6	5	24	1.25	184999	181000
54079	Virgin River	4	300	900	500	6	5	24	1.25	166499	162900
54080	Virgin River	4	200	800	500	6	5	24	1.25	147999	144800
54081	Virgin River	2	100	700	500	3	5	12	0.5	129499	126700
	TOTALS	45				60		230	12		

Static water levels greater than 600 feet are assumed to yield 500gpm.

carbonate aquifer assumed to yield 500 gpm in unexplored basins.

M	N	O	P	Q	R	S	T	U
change in head	horsepower per pump	pump cost	above ground cost	engineering/ consultation cost	total cost per production well		total cost per application	lifetime replacement costs
250	42	70000	430000	221369.7	959268.7		5755612.2	516945
100	17	70000	430000	226859.7	983058.7		3932234.8	528710
650	109	70000	430000	281759.7	1220958.7		7325752.2	646360
600	101	70000	430000	281759.7	1220958.7		4883834.8	646360
1178	198	70000	430000	345224.1	1495971.1		5983884.4	782363.4
578	195	70000	430000	253192.5	1097167.5		3291502.5	641183.4
578	195	70000	430000	253192.5	1097167.5		2194335	641183.4
988	166	70000	430000	323264.1	1400811.1		14008111	735303.4
400	67	70000	430000	259799.7	1125798.7		6754792.2	599300
300	51	70000	430000	248819.7	1078218.7		6469312.2	575770
200	34	70000	430000	237839.7	1030638.7		6183832.2	552240
100	17	70000	430000	226859.7	983058.7		2949176.1	528710
								7394429
					cost of phase one.		69732379.6	
					total cost of phase one.		77126808.2	

A	B	C	D	E	F	G
	phase one			anticipated		production
application				total	estimated	wells
number	Basin name	cfs	SWL	depth	yield	necassary
54064	L. Three Lakes	4	50	=D5+600	500	6
54062	L. Three Lakes	3	100	=D6+600	500	4
54060	U. Three Lakes	4	600	=D7+600	500	6
54068	U. Three Lakes	3	600	=D8+600	500	4
54073	Garnet Valley	3	1178	=D9+600	500	4
54058	Coyote Spring	4	578	=D10+60	1000	3
54059	Coyote Spring	3	578	=D11+60	1000	2
54076	California Wash	7	978	=D12+60	500	10
54078	Virgin River	4	400	=D13+60	500	6
54079	Virgin River	4	300	=D14+60	500	6
54080	Virgin River	4	200	=D15+60	500	6
54081	Virgin River	2	100	=D16+60	500	3
	TOTALS	=SUM(C5:C17)				=SUM(G5:G17)

Static water levels greater than 600 feet are assumed to yield 500gpm.

carbonate aquifer assumed to yield 500 gpm in unexplored basins.

H	I	J	K	L	M	N	O
number of exploration wells per production	total number of exploration wells	total miles of feeder pipeline	exploration costs per well	production well drilling cost	change in head	horsepower per pump	pump cost
5	=G5*(H5-1)	=(G5-1)*0.25	=(E5*25*H5)+(E5*12*H5-1)	=E5*181	250	=(F5*M5)/(3960*0.75)	70000
5	=G6*(H6-1)	=(G6-1)*0.25	=(E6*25*H6)+(E6*12*H6-1)	=E6*181	=D6	=(F6*M6)/(3960*0.75)	70000
5	=G7*(H7-1)	=(G7-1)*0.25	=(E7*25*H7)+(E7*12*H7-1)	=E7*181	650	=(F7*M7)/(3960*0.75)	70000
5	=G8*(H8-1)	=(G8-1)*0.25	=(E8*25*H8)+(E8*12*H8-1)	=E8*181	=D8	=(F8*M8)/(3960*0.75)	70000
5	=G9*(H9-1)	=(G9-1)*0.25	=(E9*25*H9)+(E9*12*H9-1)	=E9*181	=D9	=(F9*M9)/(3960*0.75)	70000
3	=G10*(H10-1)	=(G10-1)*0.25	=(E10*25*H10)+(E10*12*H10-1)	=E10*181	=D10	=(F10*M10)/(3960*0.75	70000
3	=G11*(H11-1)	=(G11-1)*0.25	=(E11*25*H11)+(E11*12*H11-1)	=E11*181	=D11	=(F11*M11)/(3960*0.75	70000
5	=G12*(H12-1)	=(G12-1)*0.25	=(E12*25*H12)+(E12*12*H12-1)	=E12*181	988	=(F12*M12)/(3960*0.75	70000
5	=G13*(H13-1)	=(G13-1)*0.25	=(E13*25*H13)+(E13*12*H13-1)	=E13*181	=D13	=(F13*M13)/(3960*0.75	70000
5	=G14*(H14-1)	=(G14-1)*0.25	=(E14*25*H14)+(E14*12*H14-1)	=E14*181	=D14	=(F14*M14)/(3960*0.75	70000
5	=G15*(H15-1)	=(G15-1)*0.25	=(E15*25*H15)+(E15*12*H15-1)	=E15*181	=D15	=(F15*M15)/(3960*0.75	70000
5	=G16*(H16-1)	=(G16-1)*0.25	=(E16*25*H16)+(E16*12*H16-1)	=E16*181	=D16	=(F16*M16)/(3960*0.75	70000
	=SUM(I5:I17)	=SUM(J5:J17)					

P	Q	R	S	T	U
above ground cost	engineering/ consultation cost	total cost per production well		total cost per application	lifetime replacement costs
430000	=(K5+L5+O5+P5)*0.3	=K5+L5+O5+P5+Q5		=R5*G5	=((4*O5)+L5)+((4*O5+L5)*0.3)
430000	=(K6+L6+O6+P6)*0.3	=K6+L6+O6+P6+Q6		=R6*G6	=((4*O6)+L6)+((4*O6+L6)*0.3)
430000	=(K7+L7+O7+P7)*0.3	=K7+L7+O7+P7+Q7		=R7*G7	=((4*O7)+L7)+((4*O7+L7)*0.3)
430000	=(K8+L8+O8+P8)*0.3	=K8+L8+O8+P8+Q8		=R8*G8	=((4*O8)+L8)+((4*O8+L8)*0.3)
430000	=(K9+L9+O9+P9)*0.3	=K9+L9+O9+P9+Q9		=R9*G9	=((4*O9)+L9)+((4*O9+L9)*0.3)
430000	=(K10+L10+O10+P10)*0	=K10+L10+O10+P10+Q		=R10*G10	=((4*O10)+L10)+((4*O10+L10)*0
430000	=(K11+L11+O11+P11)*0	=K11+L11+O11+P11+Q		=R11*G11	=((4*O11)+L11)+((4*O11+L11)*0
430000	=(K12+L12+O12+P12)*0	=K12+L12+O12+P12+Q		=R12*G12	=((4*O12)+L12)+((4*O12+L12)*0
430000	=(K13+L13+O13+P13)*0	=K13+L13+O13+P13+Q		=R13*G13	=((4*O13)+L13)+((4*O13+L13)*0
430000	=(K14+L14+O14+P14)*0	=K14+L14+O14+P14+Q		=R14*G14	=((4*O14)+L14)+((4*O14+L14)*0
430000	=(K15+L15+O15+P15)*0	=K15+L15+O15+P15+Q		=R15*G15	=((4*O15)+L15)+((4*O15+L15)*0
430000	=(K16+L16+O16+P16)*0	=K16+L16+O16+P16+Q		=R16*G16	=((4*O16)+L16)+((4*O16+L16)*0
					=SUM(V5:V17)
		cost of phase one.		=SUM(T5:T19)	
		total cost of phase one.		=T20+V18	

Phase II Costs

A	B	C	D	E	F	G	H	I	J	K	L	M
phase two application number	Basin name	cfs	SWL	anticipated total depth	estimated yield	production wells necassary	number of exploration wells per production	total number of exploration wells	total miles of feeder pipeline pipe	exploration costs per well	production well drilling cost	change in head
53991	Delmar	4	1210	1810	500	6	5	24	1.25	334849	327610	1350
53990	Dry Lake	4	650	1250	500	6	5	24	1.25	231249	226250	920
53043	Pahroc	4	350	950	1000	3	5	12	0.5	175749	171950	350
54044	Pahroc	4	700	1300	500	6	5	24	1.25	240499	235300	700
54047	Pahroc	6	100	700	1000	3	5	12	0.5	129499	126700	100
54046	Pahroc	10	450	1050	1000	7	5	28	1.5	194249	190050	460
54049	Pahroc	6	400	1000	1000	4	5	16	0.75	184999	181000	460
54031	Patterson	3	100	700	1000	2	3	4	0.25	77699	126700	100
54032	Patterson	6	57	657	1000	4	3	8	0.75	72926	118917	57
	TOTALS					41		152	8			

Static water levels greater that 600 feet yield assumed to be 500 gpm

N horsepower per pump	O pump cost	P above ground costs	Q engineering/ consultation cost	R total cost per production well	S	T total cost per application	V lifetime replacement costs
227	70000	430000	348737.7	1511196.7		9067180.2	789893
155	70000	430000	287249.7	1244748.7		7468492.2	658125
118	70000	430000	254309.7	1102008.7		3306026.1	587535
118	70000	430000	292739.7	1268538.7		7611232.2	669890
34	70000	430000	226859.7	983058.7		2949176.1	528710
155	70000	430000	265289.7	1149588.7		8047120.9	611065
155	70000	430000	259799.7	1125798.7		4503194.8	599300
34	70000	430000	211319.7	915718.7		1831437.4	528710
19	70000	430000	207552.9	899395.9		3597584	518592.1
							5491820

cost of phase two	39314263
Total cost of phase two	44806083

A	B	C	D	E	F	G	H
phase two application number	Basin name	cfs	SWL	anticipated total depth	estimated yield	production wells necassary	number of exploration wells per production
53991	Delmar	4	1210	=D5+600	500	6	5
53990	Dry Lake	4	650	=D6+600	500	6	5
53043	Pahroc	4	350	=D7+600	1000	3	5
54044	Pahroc	4	700	=D8+600	500	6	5
54047	Pahroc	6	100	=D9+600	1000	3	5
54046	Pahroc	10	450	=D10+60	1000	7	5
54049	Pahroc	6	400	=D11+60	1000	4	5
54031	Patterson	3	100	=D12+60	1000	2	3
54032	Patterson	6	57	=D13+60	1000	4	3
	TOTALS					=SUM(G5:G14)	

Static water levels greater that 600 feet yield assumed to be 500 gpm

I total number of exploration wells	J total miles of feeder pipeline pipe	K exploration costs per well	L production well drilling cost	M change in head	N horsepower per pump	O pump cost	P above ground costs
=(H5-1)*G5	=(G5-1)*0.25	=(E5*25*H5)+(E5*12*H5-1)	=E5*181	1350	=(F5*M5)/(3960*0.75)	70000	430000
=(H6-1)*G6	=(G6-1)*0.25	=(E6*25*H6)+(E6*12*H6-1)	=E6*181	920	=(F6*M6)/(3960*0.75)	70000	430000
=(H7-1)*G7	=(G7-1)*0.25	=(E7*25*H7)+(E7*12*H7-1)	=E7*181	=D7	=(F7*M7)/(3960*0.75)	70000	430000
=(H8-1)*G8	=(G8-1)*0.25	=(E8*25*H8)+(E8*12*H8-1)	=E8*181	=D8	=(F8*M8)/(3960*0.75)	70000	430000
=(H9-1)*G9	=(G9-1)*0.25	=(E9*25*H9)+(E9*12*H9-1)	=E9*181	=D9	=(F9*M9)/(3960*0.75)	70000	430000
=(H10-1)*G10	=(G10-1)*0.25	=(E10*25*H10)+(E10*12*H10-1)	=E10*181	460	=(F10*M10)/(3960*0.75	70000	430000
=(H11-1)*G11	=(G11-1)*0.25	=(E11*25*H11)+(E11*12*H11-1)	=E11*181	460	=(F11*M11)/(3960*0.75	70000	430000
=(H12-1)*G12	=(G12-1)*0.25	=(E12*25*H12)+(E12*12*H12-1)	=E12*181	=D12	=(F12*M12)/(3960*0.75	70000	430000
=(H13-1)*G13	=(G13-1)*0.25	=(E13*25*H13)+(E13*12*H13-1)	=E13*181	=D13	=(F13*M13)/(3960*0.75	70000	430000
=SUM(I5:I14)	=SUM(J5:J14)						

Q	R	S	T	V
engineering/ consultation cost	total cost per production well		total cost per application	lifetime replacement costs
=(K5+L5+O5+P5)*0.3	=K5+L5+O5+P5+Q5		=R5*G5	=((4*O5)+L5)+((4*O5+L5)*0.3)
=(K6+L6+O6+P6)*0.3	=K6+L6+O6+P6+Q6		=R6*G6	=((4*O6)+L6)+((4*O6+L6)*0.3)
=(K7+L7+O7+P7)*0.3	=K7+L7+O7+P7+Q7		=R7*G7	=((4*O7)+L7)+((4*O7+L7)*0.3)
=(K8+L8+O8+P8)*0.3	=K8+L8+O8+P8+Q8		=R8*G8	=((4*O8)+L8)+((4*O8+L8)*0.3)
=(K9+L9+O9+P9)*0.3	=K9+L9+O9+P9+Q9		=R9*G9	=((4*O9)+L9)+((4*O9+L9)*0.3)
=(K10+L10+O10+P10)*0	=K10+L10+O10+P10+Q		=R10*G10	=((4*O10)+L10)+((4*O10+L10)*0
=(K11+L11+O11+P11)*0	=K11+L11+O11+P11+Q		=R11*G11	=((4*O11)+L11)+((4*O11+L11)*0
=(K12+L12+O12+P12)*0	=K12+L12+O12+P12+Q		=R12*G12	=((4*O12)+L12)+((4*O12+L12)*0
=(K13+L13+O13+P13)*0	=K13+L13+O13+P13+Q		=R13*G13	=((4*O13)+L13)+((4*O13+L13)*0
				=SUM(V5:V13)
	cost of phase two		=SUM(T6:T16)	
	Total cost of phase two		=T17+V14	

Phase III

phase three to be on line by 2018

A	B	C	D	E	F	G	H	I	J	K	L	M
application number	Basin name	cfs	SWL	anticipated total depth	estimated yield	production wells necassary	number of exploration wells per production	total number of exploration wells	total miles of feeder pipeline	exploration costs per well	production well drilling cost	change in head
54018	Spring	6	100	700	1000	4	3	8	0.75	77699	126700	270
54017	Spring	6	100	700	1000	4	3	8	0.75	77699	126700	250
54021	Spring	5	600	1200	500	6	3	12	1.25	133199	217200	600
54016	Spring	6	50	650	1000	4	3	8	0.75	72149	117650	150
54013	Spring	6	50	650	1000	4	3	8	0.75	72149	117650	160
54011	Spring	6	250	850	1000	4	3	8	0.75	94349	153850	250
54012	Spring	3	50	650	1000	2	3	4	0.25	72149	117650	130
54020	Spring	5	200	800	1000	3	3	6	0.5	88799	144800	200
54010	Spring	3	50	650	1000	2	3	4	0.25	72149	117650	50
54009	Spring	3	100	700	1000	2	3	4	0.25	77699	126700	100
54008	Spring	3	50	650	1000	2	3	4	0.25	72149	117650	70
54007	Spring	3	100	700	1000	2	3	4	0.25	77699	126700	100
54006	Spring	6	175	775	1000	4	3	8	0.75	86024	140275	175
54005	Spring	6	400	1000	1000	4	3	8	0.75	110999	181000	400
54004	Spring	6	350	950	1000	4	3	8	0.75	105449	171950	460
54026	Snake Valley	5	500	1100	500	3	3	6	0.5	122099	199100	500
54022	Snake Valley	3	50	650	1000	2	3	4	0.25	72149	117650	470
54027	Snake Valley	5	600	1200	500	6	3	12	1.25	133199	217200	600
54023	Snake Valley	3	100	700	1000	2	3	4	0.25	77699	126700	100
54028	Snake Valley	5	800	1400	500	6	3	12	1.25	155399	253400	800
54029	Snake Valley	5	925	1525	500	6	3	12	1.25	169274	276025	925
54030	Snake Valley	6	50	650	1000	2	3	4	0.25	72149	117650	90
54025	Snake Valley	3	200	800	1000	2	3	4	0.25	88799	144800	260
	TOTALS	108				80		160	14.25			

carbonate aquifer assumed to yield 500 gpm in unexplored basins

Static water levels greater that 600 feet are assumed to yield 500 gpm.

N horsepower per pump	O pump cost	P above ground costs	Q engineering/ consultation costs	R total cost per production well	S	T total cost per application	Lifetime replacement costs
91	70000	430000	211319.7	915718.7		3662874.8	528710
84	70000	430000	211319.7	915718.7		3662874.8	528710
101	70000	430000	255119.7	1105518.7		6633112.2	646360
51	70000	430000	206939.7	896738.7		3586954.8	516945
54	70000	430000	206939.7	896738.7		3586954.8	516945
84	70000	430000	224459.7	972658.7		3890634.8	564005
44	70000	430000	206939.7	896738.7		1793477.4	516945
67	70000	430000	220079.7	953678.7		2861036.1	552240
17	70000	430000	206939.7	896738.7		1793477.4	516945
34	70000	430000	211319.7	915718.7		1831437.4	528710
24	70000	430000	206939.7	896738.7		1793477.4	516945
34	70000	430000	211319.7	915718.7		1831437.4	528710
59	70000	430000	217889.7	944188.7		3776754.8	546357.5
135	70000	430000	237599.7	1029598.7		4118394.8	599300
155	70000	430000	233219.7	1010618.7		4042474.8	587535
84	70000	430000	246359.7	1067558.7		3202676.1	622830
158	70000	430000	206939.7	896738.7		1793477.4	516945
101	70000	430000	255119.7	1105518.7		6633112.2	646360
34	70000	430000	211319.7	915718.7		1831437.4	528710
135	70000	430000	272639.7	1181438.7		7088632.2	693420
156	70000	430000	283589.7	1228888.7		7373332.2	722832.5
30	70000	430000	206939.7	896738.7		1793477.4	516945
88	70000	430000	220079.7	953678.7		1907357.4	552240
							12995645

cost of phase three	76826001.2
total cost of phase three	89821646.2

A	B	C	D	E	F
phase three to be on line by 2018				anticipated	
application				total	estimated
number	Basin name	cfs	SWL	depth	yield
54018	Spring	6	100	=D5+600	1000
54017	Spring	6	100	=D6+600	1000
54021	Spring	5	600	=D7+600	500
54016	Spring	6	50	=D8+600	1000
54013	Spring	6	50	=D9+600	1000
54011	Spring	6	250	=D10+60	1000
54012	Spring	3	50	=D11+60	1000
54020	Spring	5	200	=D12+60	1000
54010	Spring	3	50	=D13+60	1000
54009	Spring	3	100	=D14+60	1000
54008	Spring	3	50	=D15+60	1000
54007	Spring	3	100	=D16+60	1000
54006	Spring	6	175	=D17+60	1000
54005	Spring	6	400	=D18+60	1000
54004	Spring	6	350	=D19+60	1000
54026	Snake Valley	5	500	=D20+60	500
54022	Snake Valley	3	50	=D21+60	1000
54027	Snake Valley	5	600	=D22+60	500
54023	Snake Valley	3	100	=D23+60	1000
54028	Snake Valley	5	800	=D24+60	500
54029	Snake Valley	5	925	=D25+60	500
54030	Snake Valley	6	50	=D26+60	1000
54025	Snake Valley	3	200	=D27+60	1000
	TOTALS	=SUM(C5:C27)			

carbonate aquifer assumed to yield 500 gpm in unexplored basins

Static water levels greater that 600 feet are assumed to yield 500 gpm.

G	H	I	J	K	L	M
production wells necassary	number of exploration wells per production	total number of exploration wells	total miles of feeder pipeline	exploration costs per well	production well drilling cost	change in head
4	3	=G5*(H5-1)	=(G5-1)*0.25	=(E5*25*H5)+(E5*12*H5-1)	=E5*181	270
4	3	=G6*(H6-1)	=(G6-1)*0.25	=(E6*25*H6)+(E6*12*H6-1)	=E6*181	250
6	3	=G7*(H7-1)	=(G7-1)*0.25	=(E7*25*H7)+(E7*12*H7-1)	=E7*181	=D7
4	3	=G8*(H8-1)	=(G8-1)*0.25	=(E8*25*H8)+(E8*12*H8-1)	=E8*181	150
4	3	=G9*(H9-1)	=(G9-1)*0.25	=(E9*25*H9)+(E9*12*H9-1)	=E9*181	160
4	3	=G10*(H10-1)	=(G10-1)*0.25	=(E10*25*H10)+(E10*12*H10-1)	=E10*181	=D10
2	3	=G11*(H11-1)	=(G11-1)*0.25	=(E11*25*H11)+(E11*12*H11-1)	=E11*181	130
3	3	=G12*(H12-1)	=(G12-1)*0.25	=(E12*25*H12)+(E12*12*H12-1)	=E12*181	=D12
2	3	=G13*(H13-1)	=(G13-1)*0.25	=(E13*25*H13)+(E13*12*H13-1)	=E13*181	=D13
2	3	=G14*(H14-1)	=(G14-1)*0.25	=(E14*25*H14)+(E14*12*H14-1)	=E14*181	=D14
2	3	=G15*(H15-1)	=(G15-1)*0.25	=(E15*25*H15)+(E15*12*H15-1)	=E15*181	70
2	3	=G16*(H16-1)	=(G16-1)*0.25	=(E16*25*H16)+(E16*12*H16-1)	=E16*181	=D16
4	3	=G17*(H17-1)	=(G17-1)*0.25	=(E17*25*H17)+(E17*12*H17-1)	=E17*181	=D17
4	3	=G18*(H18-1)	=(G18-1)*0.25	=(E18*25*H18)+(E18*12*H18-1)	=E18*181	=D18
4	3	=G19*(H19-1)	=(G19-1)*0.25	=(E19*25*H19)+(E19*12*H19-1)	=E19*181	460
3	3	=G20*(H20-1)	0.5	=(E20*25*H20)+(E20*12*H20-1)	=E20*181	=D20
2	3	=G21*(H21-1)	=(G21-1)*0.25	=(E21*25*H21)+(E21*12*H21-1)	=E21*181	470
6	3	=G22*(H22-1)	=(G22-1)*0.25	=(E22*25*H22)+(E22*12*H22-1)	=E22*181	=D22
2	3	=G23*(H23-1)	=(G23-1)*0.25	=(E23*25*H23)+(E23*12*H23-1)	=E23*181	=D23
6	3	=G24*(H24-1)	=(G24-1)*0.25	=(E24*25*H24)+(E24*12*H24-1)	=E24*181	=D24
6	3	=G25*(H25-1)	=(G25-1)*0.25	=(E25*25*H25)+(E25*12*H25-1)	=E25*181	=D25
2	3	=G26*(H26-1)	=(G26-1)*0.25	=(E26*25*H26)+(E26*12*H26-1)	=E26*181	90
2	3	=G27*(H27-1)	=(G27-1)*0.25	=(E27*25*H27)+(E27*12*H27-1)	=E27*181	260
=SUM(G5:G27)		=SUM(I5:I27)	=SUM(J5:J27)			

N horsepower per pump	O pump cost	P above ground costs	Q engineering/ consultation costs	R total cost per production well	S	T total cost per application
=(F5*M5)/(3960*0.75)	70000	430000	=(K5+L5+O5+P5)*0.3	=K5+L5+O5+P5+Q5		=R5*G5
=(F6*M6)/(3960*0.75)	70000	430000	=(K6+L6+O6+P6)*0.3	=K6+L6+O6+P6+Q6		=R6*G6
=(F7*M7)/(3960*0.75)	70000	430000	=(K7+L7+O7+P7)*0.3	=K7+L7+O7+P7+Q7		=R7*G7
=(F8*M8)/(3960*0.75)	70000	430000	=(K8+L8+O8+P8)*0.3	=K8+L8+O8+P8+Q8		=R8*G8
=(F9*M9)/(3960*0.75)	70000	430000	=(K9+L9+O9+P9)*0.3	=K9+L9+O9+P9+Q9		=R9*G9
=(F10*M10)/(3960*0.75	70000	430000	=(K10+L10+O10+P10)*0	=K10+L10+O10+P10+Q		=R10*G10
=(F11*M11)/(3960*0.75	70000	430000	=(K11+L11+O11+P11)*0	=K11+L11+O11+P11+Q		=R11*G11
=(F12*M12)/(3960*0.75	70000	430000	=(K12+L12+O12+P12)*0	=K12+L12+O12+P12+Q		=R12*G12
=(F13*M13)/(3960*0.75	70000	430000	=(K13+L13+O13+P13)*0	=K13+L13+O13+P13+Q		=R13*G13
=(F14*M14)/(3960*0.75	70000	430000	=(K14+L14+O14+P14)*0	=K14+L14+O14+P14+Q		=R14*G14
=(F15*M15)/(3960*0.75	70000	430000	=(K15+L15+O15+P15)*0	=K15+L15+O15+P15+Q		=R15*G15
=(F16*M16)/(3960*0.75	70000	430000	=(K16+L16+O16+P16)*0	=K16+L16+O16+P16+Q		=R16*G16
=(F17*M17)/(3960*0.75	70000	430000	=(K17+L17+O17+P17)*0	=K17+L17+O17+P17+Q		=R17*G17
=(F18*M18)/(3960*0.75	70000	430000	=(K18+L18+O18+P18)*0	=K18+L18+O18+P18+Q		=R18*G18
=(F19*M19)/(3960*0.75	70000	430000	=(K19+L19+O19+P19)*0	=K19+L19+O19+P19+Q		=R19*G19
=(F20*M20)/(3960*0.75	70000	430000	=(K20+L20+O20+P20)*0	=K20+L20+O20+P20+Q		=R20*G20
=(F21*M21)/(3960*0.75	70000	430000	=(K21+L21+O21+P21)*0	=K21+L21+O21+P21+Q		=R21*G21
=(F22*M22)/(3960*0.75	70000	430000	=(K22+L22+O22+P22)*0	=K22+L22+O22+P22+Q		=R22*G22
=(F23*M23)/(3960*0.75	70000	430000	=(K23+L23+O23+P23)*0	=K23+L23+O23+P23+Q		=R23*G23
=(F24*M24)/(3960*0.75	70000	430000	=(K24+L24+O24+P24)*0	=K24+L24+O24+P24+Q		=R24*G24
=(F25*M25)/(3960*0.75	70000	430000	=(K25+L25+O25+P25)*0	=K25+L25+O25+P25+Q		=R25*G25
=(F26*M26)/(3960*0.75	70000	430000	=(K26+L26+O26+P26)*0	=K26+L26+O26+P26+Q		=R26*G26
=(F27*M27)/(3960*0.75	70000	430000	=(K27+L27+O27+P27)*0	=K27+L27+O27+P27+Q		=R27*G27
				cost of phase three		=SUM(T6:T29)
				total cost of phase three		=T30+V28

Lifetime replacement costs
=((4*O5)+L5)+((4*O5+L5)*0.3)
=((4*O6)+L6)+((4*O6+L6)*0.3)
=((4*O7)+L7)+((4*O7+L7)*0.3)
=((4*O8)+L8)+((4*O8+L8)*0.3)
=((4*O9)+L9)+((4*O9+L9)*0.3)
=((4*O10)+L10)+((4*O10+L10)*0
=((4*O11)+L11)+((4*O11+L11)*0
=((4*O12)+L12)+((4*O12+L12)*0
=((4*O13)+L13)+((4*O13+L13)*0
=((4*O14)+L14)+((4*O14+L14)*0
=((4*O15)+L15)+((4*O15+L15)*0
=((4*O16)+L16)+((4*O16+L16)*0
=((4*O17)+L17)+((4*O17+L17)*0
=((4*O18)+L18)+((4*O18+L18)*0
=((4*O19)+L19)+((4*O19+L19)*0
=((4*O20)+L20)+((4*O20+L20)*0
=((4*O21)+L21)+((4*O21+L21)*0
=((4*O22)+L22)+((4*O22+L22)*0
=((4*O23)+L23)+((4*O23+L23)*0
=((4*O24)+L24)+((4*O24+L24)*0
=((4*O25)+L25)+((4*O25+L25)*0
=((4*O26)+L26)+((4*O26+L26)*0
=((4*O27)+L27)+((4*O27+L27)*0
=SUM(V5:V27)

Phase IV

A	B	C	D	E	F	G	H	I	J	K	L
phase 4 application number	Basin name	cfs	SWL	anticipated total depth	estimated yield	production wells necassary	number of exploration wells per production	total number of exploration wells	total miles of feeder pipeline	exploration costs per well	production well drilling cost
53971	Railroad Valley	3	150	750	1000	2	3	4	0.25	74250	135750
53974	Railroad Valley	3	150	750	1000	2	3	4	0.25	74250	135750
53973	Railroad Valley	3	100	700	500	4	3	8	0.75	69300	126700
53970	Railroad Valley	3	150	750	1000	2	3	4	0.25	74250	135750
53980	Railroad Valley	5	800	1400	500	7	3	14	1.5	138600	253400
53979	Railroad Valley	5	100	700	1000	4	3	8	0.75	69300	126700
53978	Railroad Valley	5	200	800	1000	4	3	8	0.75	79200	144800
53969	Railroad Valley	3	100	700	1000	2	3	4	0.25	69300	126700
53977	Railroad Valley	5	800	1400	500	7	3	14	1.5	138600	253400
53968	Railroad Valley	3	100	700	1000	2	3	4	0.25	69300	126700
53967	Railroad Valley	3	100	700	1000	2	3	4	0.25	69300	126700
53976	Railroad Valley	5	200	800	1000	4	3	8	0.75	79200	144800
53966	Railroad Valley	3	50	650	1000	2	3	4	0.25	64350	117650
53965	Railroad Valley	3	50	650	1000	2	3	4	0.25	64350	117650
53975	Railroad Valley	5	600	1200	1000	4	3	8	0.75	118800	217200
53986	Railroad Valley	3	50	650	1000	2	3	4	0.25	64350	117650
53985	Railroad Valley	3	50	650	1000	2	3	4	0.25	64350	117650
53981	Railroad Valley	3	600	1200	500	4	5	16	0.75	207600	217200
53982	Railroad Valley	3	500	1100	500	4	5	16	0.75	190300	199100
53983	Railroad Valley	5	200	800	500	7	5	28	1.5	138400	144800
53947	Tikapoo	2	800	1400	500	3	5	12	0.5	242200	253400
53949	Tikapoo	2	400	1000	500	3	5	12	0.5	173000	181000
	TOTALS	78				75		192	13.25		

carbonate aquifers assumed to yield 500 gpm in unexplored basins.

Static water levels greater than 600 feet are assumed to yield 500gpm.

M	N	O	P	Q	R	S	T	
change in head	horsepower per pump	pump cost	above ground cost	engineering/ consultation cost	total cost per production well		total cost per application	Lifetime replacement cost
150	51	70000	430000	213000	923000		1846000	540475
180	61	70000	430000	213000	923000		1846000	540475
220	37	70000	430000	208800	904800		3619200	528710
170	57	70000	430000	213000	923000		1846000	540475
800	135	70000	430000	267600	1159600		8117200	693420
190	64	70000	430000	208800	904800		3619200	528710
200	67	70000	430000	217200	941200		3764800	552240
220	74	70000	430000	208800	904800		1809600	528710
800	135	70000	430000	267600	1159600		8117200	693420
230	77	70000	430000	208800	904800		1809600	528710
250	84	70000	430000	208800	904800		1809600	528710
200	67	70000	430000	217200	941200		3764800	552240
110	37	70000	430000	204600	886600		1773200	516945
50	17	70000	430000	204600	886600		1773200	516945
610	205	70000	430000	250800	1086800		4347200	646360
50	17	70000	430000	204600	886600		1773200	516945
180	61	70000	430000	204600	886600		1773200	516945
600	101	70000	430000	277440	1202240		4808960	646360
500	84	70000	430000	266820	1156220		4624880	622830
200	34	70000	430000	234960	1018160		7127120	552240
840	141	70000	430000	298680	1294280		3882840	693420
400	67	70000	430000	256200	1110200		3330600	599300
								12584585
					cost of phase four		77183600	
					total cost of phase four		89768185	

A	B	C	D	E	F	G
phase 4 application number	Basin name	cfs	SWL	anticipated total depth	estimated yield	production wells necassary
53971	Railroad Valley	3	150	=D5+600	1000	2
53974	Railroad Valley	3	150	=D6+600	1000	2
53973	Railroad Valley	3	100	=D7+600	500	4
53970	Railroad Valley	3	150	=D8+600	1000	2
53980	Railroad Valley	5	800	=D9+600	500	7
53979	Railroad Valley	5	100	=D10+60	1000	4
53978	Railroad Valley	5	200	=D11+60	1000	4
53969	Railroad Valley	3	100	=D12+60	1000	2
53977	Railroad Valley	5	800	=D13+60	500	7
53968	Railroad Valley	3	100	=D14+60	1000	2
53967	Railroad Valley	3	100	=D15+60	1000	2
53976	Railroad Valley	5	200	=D16+60	1000	4
53966	Railroad Valley	3	50	=D17+60	1000	2
53965	Railroad Valley	3	50	=D18+60	1000	2
53975	Railroad Valley	5	600	=D19+60	1000	4
53986	Railroad Valley	3	50	=D20+60	1000	2
53985	Railroad Valley	3	50	=D21+60	1000	2
53981	Railroad Valley	3	600	=D22+60	500	4
53982	Railroad Valley	3	500	=D23+60	500	4
53983	Railroad Valley	5	200	=D24+60	500	7
53947	Tikapoo	2	800	=D25+60	500	3
53949	Tikapoo	2	400	=D26+60	500	3
	TOTALS	=SUM(C5:C27)				=SUM(G5:G27)

carbonate aquifers assumed to yield 500 gpm in unexplored basins.

Static water levels greater than 600 feet are assumed to yield 500gpm.

H number of exploration wells per production	I total number of exploration wells	J total miles of feeder pipeline	K exploration costs per well	L production well drilling cost	M change in head	N horsepower per pump	O pump cost
3	=(H5-1)*G5	=(G5-1)*0.25	=(E5*25*H5)+(E5*12*(H5-1))	=E5*181	=D5	=(F5*M5)/(3960*0.75)	70000
3	=(H6-1)*G6	=(G6-1)*0.25	=(E6*25*H6)+(E6*12*(H6-1))	=E6*181	180	=(F6*M6)/(3960*0.75)	70000
3	=(H7-1)*G7	=(G7-1)*0.25	=(E7*25*H7)+(E7*12*(H7-1))	=E7*181	220	=(F7*M7)/(3960*0.75)	70000
3	=(H8-1)*G8	=(G8-1)*0.25	=(E8*25*H8)+(E8*12*(H8-1))	=E8*181	170	=(F8*M8)/(3960*0.75)	70000
3	=(H9-1)*G9	=(G9-1)*0.25	=(E9*25*H9)+(E9*12*(H9-1))	=E9*181	=D9	=(F9*M9)/(3960*0.75)	70000
3	=(H10-1)*G10	=(G10-1)*0.25	=(E10*25*H10)+(E10*12*(H10-1))	=E10*181	190	=(F10*M10)/(3960*0.75	70000
3	=(H11-1)*G11	=(G11-1)*0.25	=(E11*25*H11)+(E11*12*(H11-1))	=E11*181	=D11	=(F11*M11)/(3960*0.75	70000
3	=(H12-1)*G12	=(G12-1)*0.25	=(E12*25*H12)+(E12*12*(H12-1))	=E12*181	220	=(F12*M12)/(3960*0.75	70000
3	=(H13-1)*G13	=(G13-1)*0.25	=(E13*25*H13)+(E13*12*(H13-1))	=E13*181	=D13	=(F13*M13)/(3960*0.75	70000
3	=(H14-1)*G14	=(G14-1)*0.25	=(E14*25*H14)+(E14*12*(H14-1))	=E14*181	230	=(F14*M14)/(3960*0.75	70000
3	=(H15-1)*G15	=(G15-1)*0.25	=(E15*25*H15)+(E15*12*(H15-1))	=E15*181	250	=(F15*M15)/(3960*0.75	70000
3	=(H16-1)*G16	=(G16-1)*0.25	=(E16*25*H16)+(E16*12*(H16-1))	=E16*181	=D16	=(F16*M16)/(3960*0.75	70000
3	=(H17-1)*G17	=(G17-1)*0.25	=(E17*25*H17)+(E17*12*(H17-1))	=E17*181	110	=(F17*M17)/(3960*0.75	70000
3	=(H18-1)*G18	=(G18-1)*0.25	=(E18*25*H18)+(E18*12*(H18-1))	=E18*181	=D18	=(F18*M18)/(3960*0.75	70000
3	=(H19-1)*G19	=(G19-1)*0.25	=(E19*25*H19)+(E19*12*(H19-1))	=E19*181	610	=(F19*M19)/(3960*0.75	70000
3	=(H20-1)*G20	=(G20-1)*0.25	=(E20*25*H20)+(E20*12*(H20-1))	=E20*181	=D20	=(F20*M20)/(3960*0.75	70000
3	=(H21-1)*G21	=(G21-1)*0.25	=(E21*25*H21)+(E21*12*(H21-1))	=E21*181	180	=(F21*M21)/(3960*0.75	70000
5	=(H22-1)*G22	=(G22-1)*0.25	=(E22*25*H22)+(E22*12*(H22-1))	=E22*181	=D22	=(F22*M22)/(3960*0.75	70000
5	=(H23-1)*G23	=(G23-1)*0.25	=(E23*25*H23)+(E23*12*(H23-1))	=E23*181	500	=(F23*M23)/(3960*0.75	70000
5	=(H24-1)*G24	=(G24-1)*0.25	=(E24*25*H24)+(E24*12*(H24-1))	=E24*181	=D24	=(F24*M24)/(3960*0.75	70000
5	=(H25-1)*G25	=(G25-1)*0.25	=(E25*25*H25)+(E25*12*(H25-1))	=E25*181	840	=(F25*M25)/(3960*0.75	70000
5	=(H26-1)*G26	=(G26-1)*0.25	=(E26*25*H26)+(E26*12*(H26-1))	=E26*181	=D26	=(F26*M26)/(3960*0.75	70000
	=SUM(I5:I27)	=SUM(J5:J27)					

P	Q	R	S	T	
above ground cost	engineering/ consultation cost	total cost per production well		total cost per application	Lifetime replacement cost
430000	=(K5+L5+O5+P5)*0.3	=K5+L5+O5+P5+Q5		=R5*G5	=((4*O5)+L5)+((4*O5+L5)*0.3)
430000	=(K6+L6+O6+P6)*0.3	=K6+L6+O6+P6+Q6		=R6*G6	=((4*O6)+L6)+((4*O6+L6)*0.3)
430000	=(K7+L7+O7+P7)*0.3	=K7+L7+O7+P7+Q7		=R7*G7	=((4*O7)+L7)+((4*O7+L7)*0.3)
430000	=(K8+L8+O8+P8)*0.3	=K8+L8+O8+P8+Q8		=R8*G8	=((4*O8)+L8)+((4*O8+L8)*0.3)
430000	=(K9+L9+O9+P9)*0.3	=K9+L9+O9+P9+Q9		=R9*G9	=((4*O9)+L9)+((4*O9+L9)*0.3)
430000	=(K10+L10+O10+P10)*0	=K10+L10+O10+P10+Q		=R10*G10	=((4*O10)+L10)+((4*O10+L10)*0
430000	=(K11+L11+O11+P11)*0	=K11+L11+O11+P11+Q		=R11*G11	=((4*O11)+L11)+((4*O11+L11)*0
430000	=(K12+L12+O12+P12)*0	=K12+L12+O12+P12+Q		=R12*G12	=((4*O12)+L12)+((4*O12+L12)*0
430000	=(K13+L13+O13+P13)*0	=K13+L13+O13+P13+Q		=R13*G13	=((4*O13)+L13)+((4*O13+L13)*0
430000	=(K14+L14+O14+P14)*0	=K14+L14+O14+P14+Q		=R14*G14	=((4*O14)+L14)+((4*O14+L14)*0
430000	=(K15+L15+O15+P15)*0	=K15+L15+O15+P15+Q		=R15*G15	=((4*O15)+L15)+((4*O15+L15)*0
430000	=(K16+L16+O16+P16)*0	=K16+L16+O16+P16+Q		=R16*G16	=((4*O16)+L16)+((4*O16+L16)*0
430000	=(K17+L17+O17+P17)*0	=K17+L17+O17+P17+Q		=R17*G17	=((4*O17)+L17)+((4*O17+L17)*0
430000	=(K18+L18+O18+P18)*0	=K18+L18+O18+P18+Q		=R18*G18	=((4*O18)+L18)+((4*O18+L18)*0
430000	=(K19+L19+O19+P19)*0	=K19+L19+O19+P19+Q		=R19*G19	=((4*O19)+L19)+((4*O19+L19)*0
430000	=(K20+L20+O20+P20)*0	=K20+L20+O20+P20+Q		=R20*G20	=((4*O20)+L20)+((4*O20+L20)*0
430000	=(K21+L21+O21+P21)*0	=K21+L21+O21+P21+Q		=R21*G21	=((4*O21)+L21)+((4*O21+L21)*0
430000	=(K22+L22+O22+P22)*0	=K22+L22+O22+P22+Q		=R22*G22	=((4*O22)+L22)+((4*O22+L22)*0
430000	=(K23+L23+O23+P23)*0	=K23+L23+O23+P23+Q		=R23*G23	=((4*O23)+L23)+((4*O23+L23)*0
430000	=(K24+L24+O24+P24)*0	=K24+L24+O24+P24+Q		=R24*G24	=((4*O24)+L24)+((4*O24+L24)*0
430000	=(K25+L25+O25+P25)*0	=K25+L25+O25+P25+Q		=R25*G25	=((4*O25)+L25)+((4*O25+L25)*0
430000	=(K26+L26+O26+P26)*0	=K26+L26+O26+P26+Q		=R26*G26	=((4*O26)+L26)+((4*O26+L26)*0
					=SUM(V5:V27)
		cost of phase four		=SUM(T5:T29)	
		total cost of phase four		=T30+V28	

Appendix V

A. Operational Cost - Electricity

B. LVVWD Monthly Water Demand

C. Power Rate Schedules
   I. Nevada Power
   II. Overton Power
   III. Lincoln County Power District
   IV. Mt. Wheeler Power

OPERATIONAL COST- ELECTRICITY

The completion of the proposed Las Vegas Valley Water Districts importation project will need large quantities of electrical power to operate the well fields and pipeline booster stations. Four electrical utilities, Nevada Power Company, Overton Power District, Lincoln County Power District and Mount Wheeler Power District would be called upon to upgrade their systems to accommodate the additional pumping loads. The following section outlines the load requirements of those well fields that would deliver the most economical water in phased ground-water development (Appendix II).

This appendix section is broken into 5 evaluation subsections. Subsections 1a and 1b deal with Phase I; 1a) evaluates those well fields within the Nevada Power service area, and 1b) evaluates those within the Overton Power service area. Applications 54060, 54068 located within the Upper Three Lakes ground-water basin lie outside all service areas. In order to complete the scenario we have arbitrarily placed the well fields as serviced by Nevada Power, but it must be stressed that Nevada Power has expressed deep concerns about servicing anything within the Desert Game Refuge or Nellis Bombing Range. Subsections 3, 4, and 5 evaluates Phases II, III, and IV.

Each of the evaluation subsections can be subdivided into four primary divisions. Division 1 (columns A through Q) are evaluated the same in all subsections, division 2 (columns R through V or R through X) evaluates the average bill for the well field and charges depending on the providing utility rate structure, division 3 (columns Y through Aj) deals with the month by month fluctuations of electrical costs, division 4 evaluates the total energy costs, annual water production, and cost per acre foot for each well field and for the average cost per acre foot for the evaluation subdivision in general.
The following is a detailed explanation of each column within each division.

Columns A-Q:

Columns A-F have been explained previously in the drilling cost evaluations (Appendix IV).
Column: G. Change in head: Refers to the number of feet that the water will have to be lifted from the static water level to ground level and then into a booster pump or directly into the pipeline.
H. Average gpm yield: cfs is converted to gallons per minute and multiplied by the total cfs to be produced from the well field. H = C x 449 gpm
I. Maximum peak demand: In this scenario the capacity of the system can maintain the July\August peak demand period. The system has the designed capacity to operate at 1 1/2 times the average rate.
I = H x 1.5 = peak gallons per minute demand.
J. Number of pumps: This column determines the number of pumps necessary to deliver the maximum peak demand. In most cases the number is carried over to the next whole number. However, some exceptions occur, for example maximum peak demand of 4041 gpm with a 1,000 gpm yield is determined to need 4 pumps. J = I/F
L. hp each pump: This column evaluates the hp required to deliver the individual well yield to a pipeline or booster pump. A pump efficiency of 75% is assumed. K = (F x G)/(3960 x .75)
K. Average hp needed: The horse power required to deliver the average gpm yield.
L = (G x H)/(3960 x .75)
M. hp per pump used: The horsepower of the pump used in this evaluation. The pump used is the closest equivalent + safety margin. Pump motor specifications as supplied by Franklin Motor Works.
N. Volts: This evaluation assumed a 480 volt system.
O. Amps: As supplied by Franklin Motor Works for hp of pump motor in column M.
P. Power factor: The highest possible power factor listed by Franklin Motor Works for hp of pump motor in column M.
Q. Average Kv: The Kv of the pump motor listed in column M. Q = (N x O x P)/(1000 x 1.73)

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Columns R-V:

EVALUATION OF NEVADA POWER, LARGE GENERAL SERVICE - WATER PUMPING.

Nevada Power has developed a special rate for major water pumping organizations. This rate is based on a June through September peak demand period (10am to 10pm). The hours 10pm to 10am are off peak hours. The rest of the year is considered a separate season, and charged at a uniform rate. The charges used in our example are based on primary distribution rates.

R. Demand charge, June-September: The billing during this period of the calendar year is based on a peak (10 am - 10 pm) demand charge and an off peak (10 pm - 10 am) demand charge. Therefore it is assumed that all wells will be pumping 24 hours a day seven days a week for this entire period. The evaluation is 1/2 of the average Kv times peak demand charge plus 1/2 of the average Kv times the off peak demand charge. R = (1/2 Q x 7.97) + (1/2 Q x .11)

S. Demand charge, October-May: The demand charge throughout this portion of the calendar year is charged at a rate of $0.97 per Kv. S = Q x .97

T. Average Kilowatt hours: This column determines the average number of kilowatt hours that would be accumulated by pumping the volume of water listed in column H. In this column the days per month are listed as 30.43. This is the average days per month per year. T = Q x (K/L) x 24 x 30.43

U. Energy charge, June-September: The charge assessed for the kilowatt hours used. Twelve hours a day (10 am - 10 pm) is considered on peak, the charge for this period is $0.06361 per Kwh. The other over half of the day is billed at a reduced off peak rate of $0.03463 per Kwh. The charge is evaluated by using the average kilowatts hours calculated in column T. U = (1/2T x .0636) + (1/2T x .03463)

V. Energy charge, October-May: The kilowatt hours accumulated during this portion of the calendar year is charged out at a uniform rate of .03904 per kilowatt hr.

W. Average electric bill, June-September: This column represents the cost to pump the average amount of water as listed in column H for 30.43 days (the average month per year) from June thorough September. It is the sum of columns R and V. W = R + U

X. Average electric bill, October-May: This column represents the cost to pump the average amount of water as listed in column H for 30.43 days from October though May. It is the sum of columns S and V.

EVALUATION OF OVERTON POWER GENERAL SERVICE RATE.

Overton Power has developed a rate structure that charges $8.25 per Kv for the first 25 Kv; and $3.85 for each subsequent Kv. Also, $0.033 is charged for the initial 300 Kwh per Kv, and $0.028 for all subsequent Kwh.

R. Initial demand charge: The initial Kv demand charge, plus the 16.50 customer service charge.
R = 25 x 8.25 + 16.50

S. Demand charge: This evaluation is made on the average pumping requirements as listed in column H. Therefore the average Kv times a multiplier necessary to bring one pump to that necessary to lift the average volume required. S = [Q x (K/L) - 25] x 3.85

T. Average kilowatt hours: This column determines the average number of kilowatt hours that would be accumulated by pumping the volume of water listed in column H. T = Q x (K/L) x 24 x 30.43

U. Initial energy charge: The Overton Power charges a higher rate for the first 300 Kwh per Kv than all subsequent Kwh. This column evaluates the cost of the first 300 Kwh per Kv.
U = 300 x [Q x (K/L)] x .033

V. Energy Charge: This is the determination of the cost of all Kwh beyond the initial 300 per Kv.
V = (T- (300 x [Q x(K/L)])) x .028

W. Average electric bill: This column represents the cost to pump the average amount of water as listed in column H for 30.43 days (the average month per year). It is the sum of the initial demand charge, the demand charge, initial energy charge and the energy charge. W = R + S + U + V

EVALUATION OF LINCOLN COUNTY POWER COMMERCIAL AND INDUSTRIAL 50 - 1000 KVA RATE.

Lincoln Power has developed a rate schedule based on a demand charge that is constant at $5.15 per Kw. Also, the kilowatt hour rate is based on a rate of $0.0124 per Kwh. A customer fee of $40.00 per meter is charged. It has been assumed that each well will be assigned its own meter.

R. Meter charge: This column evaluates the minimal charge per well per month. Las Vegas Valley Water district may reduce this cost to one meter per well field. However, the loses of information of an individual pump's efficiency may make this unattractive. R = 40 x J

S. Average demand charge: The average demand has been calculated by multiplying the average Kv by the average number of pumps operating and the result by 5.15. S = Q x (L/M) x 5.15

T. Average Kwhr: The average kilowatt hours have been calculated by multiplying the average Kv by the average number of pumps operating and the result by 24 hours a day for 30.43 days per month. The result is the number of Kwh utilized in a 30.43 day month. T = Q x (L/M) x 24 x 30.43

U. Average energy charge: The average energy charge is determined by multiplying column T by $0.0124. U = T x .0124

V. Average electric bill: The sum of columns U, S, and R give the average monthly bill that would result in the pumping the amount of water listed in column H for 30.43 days. V = U + S + R

EVALUATION OF MOUNT WHEELER POWER

Phase III and IV of the Appendix II plan imports water from Spring, Snake, and Railroad Valleys. All applications except 54005 and 54004 utilized in this scenario are serviced by Mount Wheeler Power. Applications 54005 and 54004 are serviced by Lincoln County Power and are calculated at those rates. The southern end of Railroad Valley lies with the Sierra Pacific service area; however Mount Wheeler Power services customers in the area at this time and it is assumed that Mount Wheeler Power would continue to do so.

The Mount Wheeler Power's large general service rate requires a $45.00 per month per meter customer charge. Each well within an individual well field is assumed to be installed with an individual meter. A uniform demand charge of $8.00 per Kw per month and a constant energy charge of $0.05198 per Kwh used is levied under this rate structure.

R. Meter Charge: The customer charge is the minimal charge per month. It is based on the number of production wells with pumps installed. R = J x 45

S. Average demand charge: This column calculates the demand charge of a well operating 24 hours a day 30.43 days a month (365.25/12). S = Q x (L/M) x 8

T. Average Kwhr: The average kilowatt hours have been calculated by the product of the average Kv, the average number of wells operating, 24 hours a day and 30.43 days per month.
T = Q x (L/M) x 24 x 30.43

U. Average energy charge: The average energy charge is determined by multiplying column T by .05198
U = T x .05198

V. Average power bill: The sum of columns R, S, and U gives the average monthly bill that would be the result of pumping the amount of water listed in column H for 30.43 days.

Columns W-Ah:

This division evaluates the electrical cost of each well field for each month of the year. The Las Vegas Valley Water District's historical monthly usage is determined as a percentage of the average. The LVVWD monthly water demand (Appendix V, Section B) outlines the monthly acre feet distributed in 1991. The average number of acre feet distributed by the Las Vegas Valley Water District is 18,667.54 per month, or 6.085 million gallons a month. The general percentage of water consumed with respect to the average is assumed to remain the same.

W. Cost for January: In the month of January the water distributed was 63.7% of the average. Therefore, the electric bill for an application would be .637 of the average production. X = W x 0.637

X - Ah. Cost of February - December: The cost for each of these months was evaluated by calculating the percentage of use as it relates to the monthly average and multiplying that by the average cost per month calculated in column V. Example July = Ac = V x (8897514/6085620)

Nevada Power service area costs are calculated utilizing the same procedure. But, unlike the other electrical purveyors, the rate is based on peak demand. Therefore, it is necessary to use a June-September multiplier and a October-May multiplier to accurately determine the cost of electrical power by the month.

Columns Ai-Aq:

The cost of electrical power by application and total phase, the total yearly production in millions of gallons and total acre feet is determined by application and total acre feet produced per development phase. The average cost per acre foot as it relates to total production is calculated.

Nevada Power

Phase I

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
well #	Basin name	cfs	swl	depth	yield	change in head	average gpm yield	maximum peak demand	number of pumps	average hp needed	hp each pump	hp per/pump used	volts	Amps	Power factor	average Kv
54064	L. Three Lakes	4	50	650	500	250	1796	2694	5.39	151.18	42.09	50.00	480.00	77.00	0.84	53.71
54062	L. Three Lakes	3	100	700	500	100	1347	2021	4.04	45.35	16.84	30.00	480.00	48.20	0.88	35.06
54060	U. Three Lakes	4	600	1200	500	650	1796	2694	5.39	393.06	109.43	125.00	480.00	180.00	0.82	122.57
54068	U. Three Lakes	3	600	1200	500	600	1347	2021	4.04	272.12	101.01	125.00	480.00	180.00	0.82	122.57
54073	Garnet Valley	3	778	1378	500	788	1347	2021	4.04	357.39	132.66	150.00	480.00	221.00	0.83	152.32

carbonate aquifer assumed to yield 500 gpm in unexplored basins

Phase one   Nevada Power service area

R	S	T	U	V	W	X
Jun-Sept demand charge	Oct-May demand charge	Kwhr	Jun-Sept energy charge	Oct-May energy charge	Jun-Sept average bill	Oct-May average bill
216.99	52.10	118601.57	5825.71	4630.21	6042.70	4682.30
141.65	34.01	38711.64	1901.52	1511.30	2043.17	1545.31
495.17	118.89	281475.19	13826.06	10988.79	14321.23	11107.68
495.17	118.89	194867.44	9571.89	7607.62	10067.06	7726.51
615.37	147.75	265043.41	13018.93	10347.29	13634.31	10495.05

Y	Z	Aa	Ab	Ac	Ad	Ae	Af	Ag	Ah	Ai	Aj
cost for January	cost for February	cost for March	cost for April	cost for May	cost for June	cost for July	cost for August	cost for September	cost for October	cost for November	cost for December
2982.63	3164.71	3251.56	4345.11	4345.11	7820.25	8834.76	8370.89	7267.99	5233.63	3729.70	4050.62
984.36	1044.46	1073.12	1434.03	1434.03	2644.20	2987.22	2830.38	2457.46	1727.27	1230.92	1369.60
7075.59	7507.55	7713.56	10307.77	10307.77	18534.05	20938.44	19839.06	17225.18	12415.57	8847.85	9599.99
4921.79	5222.26	5365.56	7170.09	7170.09	13028.44	14718.60	13945.80	12108.38	8636.28	6154.58	6748.28
6685.34	7093.47	7288.13	9739.25	9739.25	17645.05	19934.11	18887.47	16398.96	11730.80	8359.86	9139.52

	Al	Am	An	Ao	Ap	Aq
	Total yearly Energy Cost	Yearly water production millions gallons		well #	cost per acre foot	total acre feet
	63396.95	944.62		54064	21.88	2897.62
	21217.05	708.47		54062	9.76	2173.22
	150312.36	944.62		54060	51.87	2897.62
	105190.14	708.47		54068	48.40	2173.22
	142641.20	708.47		54073	65.64	2173.22
Totals	482757.70	4014.65				9417.27
					Avg cost/acft	51.26

A	B	C	D	E	F	G	H	I	J	K
							average	maximum	number	average
						change	gpm	peak	of	hp
well #	Basin name	cfs	swl	depth	yield	in head	yield	demand	pumps	needed
54064	L. Three Lakes	4	50	=D5+600	500	250	=C5*449	=1.5*H5	=I5/F5	=(G5*H5)/(3960*0.75)
54062	L. Three Lakes	3	100	=D6+600	500	100	=C6*449	=1.5*H6	=I6/F6	=(G6*H6)/(3960*0.75)
54060	U. Three Lakes	4	600	=D7+600	500	650	=C7*449	=1.5*H7	=I7/F7	=(G7*H7)/(3960*0.75)
54068	U. Three Lakes	3	600	=D8+600	500	600	=C8*449	=1.5*H8	=I8/F8	=(G8*H8)/(3960*0.75)
54073	Garnet Valley	3	778	=D9+600	500	788	=C9*449	=1.5*H9	=I9/F9	=(G9*H9)/(3960*0.75)

carbonate aquifer assumed to yield 500 gpm in unexplored basins

Phase one   Nevada Power service area

L	M	N	O	P	Q
hp each pump	hp per/pump used	volts	Amps	Power factor	average Kv
=(F5*G5)/(3960*0.75)	50	480	77	0.84	=((N5*O5*P5)/1000)*1.73
=(F6*G6)/(3960*0.75)	30	480	48.2	0.876	=((N6*O6*P6)/1000)*1.73
=(F7*G7)/(3960*0.75)	125	480	180	0.82	=((N7*O7*P7)/1000)*1.73
=(F8*G8)/(3960*0.75)	125	480	180	0.82	=((N8*O8*P8)/1000)*1.73
=(F9*G9)/(3960*0.75)	150	480	221	0.83	=((N9*O9*P9)/1000)*1.73

R	S	T	U	V	W	X
Jun-Sept demand charge	Oct-May demand charge	Kwhr	Jun-Sept energy charge	Oct-May energy charge	Jun-Sept average bill	Oct-May average bill
=((Q5*0.5)*7.97)+((Q5*0.5)*0.11	=Q5*0.97	=Q5*(K5/M5)*24*30.43	=((T5*0.5)*0.06361)+((T5*0.5)*0.03463)	=T5*0.03904	=R5+U5	=S5+V5
=((Q6*0.5)*7.97)+((Q6*0.5)*0.11	=Q6*0.97	=Q6*(K6/M6)*24*30.43	=((T6*0.5)*0.06361)+((T6*0.5)*0.03463)	=T6*0.03904	=R6+U6	=S6+V6
=((Q7*0.5)*7.97)+((Q7*0.5)*0.11	=Q7*0.97	=Q7*(K7/M7)*24*30.43	=((T7*0.5)*0.06361)+((T7*0.5)*0.03463)	=T7*0.03904	=R7+U7	=S7+V7
=((Q8*0.5)*7.97)+((Q8*0.5)*0.11	=Q8*0.97	=Q8*(K8/M8)*24*30.43	=((T8*0.5)*0.06361)+((T8*0.5)*0.03463)	=T8*0.03904	=R8+U8	=S8+V8
=((Q9*0.5)*7.97)+((Q9*0.5)*0.11	=Q9*0.97	=Q9*(K9/M9)*24*30.43	=((T9*0.5)*0.06361)+((T9*0.5)*0.03463)	=T9*0.03904	=R9+U9	=S9+V9

Y	Z	Aa	Ab	Ac	Ad
cost for January	cost for February	cost for March	cost for April	cost for May	cost for June
=X5*0.637	=X5*(4113196/6085620)	=X5*(4226068/6085620)	=X5*(5647366/6085620)	=X5*(5647366/6085620)	=W5*(7875800/6085620)
=X6*0.637	=X6*(4113196/6085620)	=X6*(4226068/6085620)	=X6*(5647366/6085620)	=X6*(5647366/6085620)	=W6*(7875800/6085620)
=X7*0.637	=X7*(4113196/6085620)	=X7*(4226068/6085620)	=X7*(5647366/6085620)	=X7*(5647366/6085620)	=W7*(7875800/6085620)
=X8*0.637	=X8*(4113196/6085620)	=X8*(4226068/6085620)	=X8*(5647366/6085620)	=X8*(5647366/6085620)	=W8*(7875800/6085620)
=X9*0.637	=X9*(4113196/6085620)	=X9*(4226068/6085620)	=X9*(5647366/6085620)	=X9*(5647366/6085620)	=W9*(7875800/6085620)

Ae	Af	Ag	Ah	Ai
cost for July	cost for August	cost for September	cost for October	cost for November
=W5*(8897514/6085620)	=W5*(8430348/6085620)	=W5*(7319613/6085620)	=X5*(6802178/6085620)	=X5*(4847517/6085620)
=W6*(8897514/6085620)	=W6*(8430348/6085620)	=W6*(7319613/6085620)	=X6*(6802178/6085620)	=X6*(4847517/6085620)
=W7*(8897514/6085620)	=W7*(8430348/6085620)	=W7*(7319613/6085620)	=X7*(6802178/6085620)	=X7*(4847517/6085620)
=W8*(8897514/6085620)	=W8*(8430348/6085620)	=W8*(7319613/6085620)	=X8*(6802178/6085620)	=X8*(4847517/6085620)
=W9*(8897514/6085620)	=W9*(8430348/6085620)	=W9*(7319613/6085620)	=X9*(6802178/6085620)	=X9*(4847517/6085620)

Aj
cost for December
=W5*(4079389/6085620)
=W6*(4079389/6085620)
=W7*(4079389/6085620)
=W8*(4079389/6085620)
=W9*(4079389/6085620)

	Al	Am	An	Ao	Ap	Aq
	Total yearly Energy Cost	Yearly water production millions gallons		well #	cost per acre foot	total acre feet
	=SUM(Y5:AJ5)	=(H5*365.25*60*24)/1000000		54064	=AL5/(AM5*1000000/326000)	=AM5*1000000/326000
	=SUM(Y6:AJ6)	=(H6*365.25*60*24)/1000000		54062	=AL6/(AM6*1000000/326000)	=AM6*1000000/326000
	=SUM(Y7:AJ7)	=(H7*365.25*60*24)/1000000		54060	=AL7/(AM7*1000000/326000)	=AM7*1000000/326000
	=SUM(Y8:AJ8)	=(H8*365.25*60*24)/1000000		54068	=AL8/(AM8*1000000/326000)	=AM8*1000000/326000
	=SUM(Y9:AJ9)	=(H9*365.25*60*24)/1000000		54073	=AL9/(AM9*1000000/326000)	=AM9*1000000/326000
Totals	=SUM(AL5:AL12)	=SUM(AM5:AM12)				=SUM(AQ6:AQ12)
	total $482,757.70	yearly production 4014.65 million gals.				9,417.27 acre feet
					Avg cost/acft	=AL13/AQ13
						$51.26 acre foot

Ai	Aj	Ak	Al	Am	An	Ao
	Total yearly Energy Cost	Yearly water production millions gallons		well #	cost per acre foot	total acre feet
	=SUM(X5:AJ5)	=(H5*365.25*60*24)/1000000		54058	=AK5/((AL5*1000000)/326000)	=(AL5*1000000)/326000
	=SUM(X6:AJ6)	=(H6*365.25*60*24)/1000000		54059	=AK6/((AL6*1000000)/326000)	=(AL6*1000000)/326000
	=SUM(X7:AJ7)	=(H7*365.25*60*24)/1000000		54076	=AK7/((AL7*1000000)/326000)	=(AL7*1000000)/326000
	=SUM(X8:AJ8)	=(H8*365.25*60*24)/1000000		54078	=AK8/((AL8*1000000)/326000)	=(AL8*1000000)/326000
	=SUM(X9:AJ9)	=(H9*365.25*60*24)/1000000		54079	=AK9/((AL9*1000000)/326000)	=(AL9*1000000)/326000
	=SUM(X10:AJ10)	=(H10*365.25*60*24)/100000		54080	=AK10/((AL10*1000000)/326000)	=(AL10*1000000)/326000
	=SUM(X11:AJ11)	=(H11*365.25*60*24)/100000		54081	=AK11/((AL11*1000000)/326000)	=(AL11*1000000)/326000
	=SUM(X12:AJ12)	=(H12*365.25*60*24)/100000				
	=SUM(X13:AJ13)	=(H13*365.25*60*24)/100000				
	=SUM(X14:AJ14)	=(H14*365.25*60*24)/100000				
Totals	=SUM(AK5:AK14)	=SUM(AL5:AL14)				=SUM(AP6:AP12)
	$2,668,993	21,492				
					avg cost/acft	=AK15/AP15
						$153.52

Overton Power

Phase I

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
well #	Basin name	cfs	swl	depth	yield	change in head	average gpm yield	maximum peak demand	number of pumps	average hp needed	hp each pump	hp per/pump used	volts	amps	power factor	average Kv
54058	Coyote Springs	4	578	1178	1000	578.00	1796	2694	3.00	349.52	194.61	225	480	324.00	0.90	242.14
54059	Coyote Springs	3	578	1178	1000	608.00	1347	2021	2.00	275.75	204.71	225	480	324.00	0.90	242.14
54076	Calf. Wash	7	978	1578	500	978.00	3143	4715	10.00	1034.97	164.65	200	480	288.00	0.89	212.85
54078	Virgin River V.	4	400	1000	500	400.00	1796	2694	4.00	241.89	67.34	75	480	110.00	0.88	80.38
54079	Virgin River V.	4	300	900	500	300.00	1796	2694	4.00	181.41	50.51	60	480	91.00	0.85	64.23
54080	Virgin River V.	4	200	800	500	200.00	1796	2694	4.00	120.94	33.67	50	480	77.00	0.84	53.71
54081	Virgin River V.	2	100	700	500	100.00	898	1347	2.00	30.24	16.84	30	480	48.20	0.88	35.22
	Lift Station V7				9430	560.00	9430	14145	1.00	1778.05	1778.05	2000	480	2880.00	0.90	2152.40
	Lift Station V2				14150	470.00	14150	21225	1.00	2239.23	2239.23	2300	480	3312.00	0.90	2475.26
	Lift Station W42				4710	610.00	4710	7065	1.00	967.37	967.37	1000	480	1440.00	0.90	1076.20

carbonate aquifer assumed to yield 500 gpm in unexplored basins

Phase one Overton Power service area and rates.

R	S	T	U	V	W
initial demand charge	demand charge	Kwhr	initial energy charge	energy charge	average monthly bill
206.25	1578.08	317610.16	4305.43	5239.99	11329.76
206.25	1159.50	238207.62	3229.07	3930.00	8524.82
206.25	5054.91	977141.38	13245.84	16121.07	34628.06
206.25	1015.38	210868.75	2858.47	3478.95	7559.06
206.25	792.02	168498.94	2284.12	2779.93	6062.32
206.25	646.52	140898.66	1909.98	2324.57	5087.32
206.25	147.30	46199.43	626.27	762.21	1742.02
206.25	8190.48	1571938.43	21308.73	25934.14	55639.60
206.25	9433.49	1807729.20	24505.04	29824.26	63969.04
206.25	4047.11	785969.22	10654.36	12967.07	27874.80

X	Y	Z	Aa	Aa	Ab	Ac	Ad	Ae	Af	Ag	Ah
cost for January	cost for February	cost for March	cost for April	cost for May	cost for June	cost for July	cost for August	cost for September	cost for October	cost for November	cost for December
7217	7658	7868	10514	12868	14663	16565	15695	13627	12664	9025	7595
5430	5762	5920	7911	9682	11033	12464	11809	10253	9529	6790	5714
22058	23405	24047	32134	39328	44814	50628	47970	41650	38705	27583	23212
4815	5109	5249	7015	8585	9783	11052	10471	9092	8449	6021	5067
3862	4097	4210	5626	6885	7846	8863	8398	7292	6776	4829	4064
3241	3438	3533	4721	5778	6584	7438	7047	6119	5686	4052	3410
1110	1177	1210	1617	1978	2254	2547	2413	2095	1947	1388	1168
35442	37606	38638	51633	63192	72007	81348	77077	66922	62191	44320	37297
40748	43236	44422	59362	72652	82787	93526	88616	76940	71501	50955	42881
17756	18840	19357	25867	31659	36075	40755	38615	33527	31157	22204	18685

Ai	Aj	Ak	Al	Am	An	Ao
	Total yearly Energy Cost	Yearly water production millions gallons		well #	cost per acre foot	total acre feet
	135957	945		54058	47	2898
	102297	708		54059	47	2173
	415535	1653		54076	82	5071
	90708	945		54078	31	2898
	72748	945		54079	25	2898
	61048	945		54080	21	2898
	20904	472		54081	14	1449
	667673	4960				
	767626	7442				
	334497	2477				
Totals	2668993	21492				17386
					avg cost/acft	153.52

A	B	C	D	E	F	G	H	I	J
							average	maximum	number
						change	gpm	peak	of
well #	Basin name	cfs	swl	depth	yield	in head	yield	demand	pumps
54058	Coyote Springs	4	578	=D5+600	1000	578	=C5*449	=H5*1.5	3
54059	Coyote Springs	3	578	=D6+600	1000	608	=C6*449	=H6*1.5	2
54076	Calf. Wash	7	978	=D7+600	500	978	=C7*449	=H7*1.5	10
54078	Virgin River V.	4	400	=D8+600	500	400	=C8*449	=H8*1.5	4
54079	Virgin River V.	4	300	=D9+600	500	300	=C9*449	=H9*1.5	4
54080	Virgin River V.	4	200	=D10+60	500	200	=C10*449	=H10*1.5	4
54081	Virgin River V.	2	100	=D11+60	500	100	=C11*449	=H11*1.5	2
	Lift Station V7				9430	560	9430	=H12*1.5	1
	Lift Station V2				14150	470	14150	=H13*1.5	1
	Lift Station W42				4710	610	4710	=H14*1.5	1

carbonate aquifer assumed to yield 500 gpm in unexplored basins

Phase one   Overton Power service area and rates.

K	L	M	N	O	P	Q
average hp needed	hp each pump	hp per/pump used	volts	amps	power factor	average Kv
=(H5*G5)/(3960*0.75)	=(F5*G5)/(3960*0.75)	225	480	324	0.9	=((N5*O5*P5)/1000)*1.73
=(H6*G6)/(3960*0.75)	=(F6*G6)/(3960*0.75)	225	480	324	0.9	=((N6*O6*P6)/1000)*1.73
=(H7*G7)/(3960*0.75)	=(F7*G7)/(3960*0.75)	200	480	288	0.89	=((N7*O7*P7)/1000)*1.73
=(H8*G8)/(3960*0.75)	=(F8*G8)/(3960*0.75)	75	480	110	0.88	=((N8*O8*P8)/1000)*1.73
=(H9*G9)/(3960*0.75)	=(F9*G9)/(3960*0.75)	60	480	91	0.85	=((N9*O9*P9)/1000)*1.73
=(H10*G10)/(3960*0.75)	=(F10*G10)/(3960*0.75)	50	480	77	0.84	=((N10*O10*P10)/1000)*1.73
=(H11*G11)/(3960*0.75)	=(F11*G11)/(3960*0.75)	30	480	48.2	0.88	=((N11*O11*P11)/1000)*1.73
=(H12*G12)/(3960*0.75)	=(F12*G12)/(3960*0.75)	2000	480	=1.44*M12	0.9	=((N12*O12*P12)/1000)*1.73
=(H13*G13)/(3960*0.75)	=(F13*G13)/(3960*0.75)	2300	480	=1.44*M13	0.9	=((N13*O13*P13)/1000)*1.73
=(H14*G14)/(3960*0.75)	=(F14*G14)/(3960*0.75)	1000	480	=1.44*M14	0.9	=((N14*O14*P14)/1000)*1.73

R	S	T	U	V
initial demand charge	demand charge	Kwhr	initial energy charge	energy charge
=25*8.2	=(Q5*(K5/L5)-25)*3.85	=Q5*(K5/L5)*24*30.43	=300*(Q5*(K5/L5))*0.033	=(T5-(300*(Q5*K5/L5)))*0.028
=25*8.2	=(Q6*(K6/L6)-25)*3.85	=Q6*(K6/L6)*24*30.43	=300*(Q6*(K6/L6))*0.033	=(T6-(300*(Q6*K6/L6)))*0.028
=25*8.2	=(Q7*(K7/L7)-25)*3.85	=Q7*(K7/L7)*24*30.43	=300*(Q7*(K7/L7))*0.033	=(T7-(300*(Q7*K7/L7)))*0.028
=25*8.2	=(Q8*(K8/L8)-25)*3.85	=Q8*(K8/L8)*24*30.43	=300*(Q8*(K8/L8))*0.033	=(T8-(300*(Q8*K8/L8)))*0.028
=25*8.2	=(Q9*(K9/L9)-25)*3.85	=Q9*(K9/L9)*24*30.43	=300*(Q9*(K9/L9))*0.033	=(T9-(300*(Q9*K9/L9)))*0.028
=25*8.2	=(Q10*(K10/L10)-25)*3.85	=Q10*(K10/L10)*24*30.4	=300*(Q10*(K10/L10))*0.03	=(T10-(300*(Q10*K10/L10)))*0.028
=25*8.2	=(Q11*(K11/L11)-25)*3.85	=Q11*(K11/L11)*24*30.4	=300*(Q11*(K11/L11))*0.03	=(T11-(300*(Q11*K11/L11)))*0.028
=25*8.2	=(Q12*(K12/L12)-25)*3.85	=Q12*(K12/L12)*24*30.4	=300*(Q12*(K12/L12))*0.03	=(T12-(300*(Q12*K12/L12)))*0.028
=25*8.2	=(Q13*(K13/L13)-25)*3.85	=Q13*(K13/L13)*24*30.4	=300*(Q13*(K13/L13))*0.03	=(T13-(300*(Q13*K13/L13)))*0.028
=25*8.2	=(Q14*(K14/L14)-25)*3.85	=Q14*(K14/L14)*24*30.4	=300*(Q14*(K14/L14))*0.03	=(T14-(300*(Q14*K14/L14)))*0.028

W
average monthly bill
=R5+S5+U5+V5
=R6+S6+U6+V6
=R7+S7+U7+V7
=R8+S8+U8+V8
=R9+S9+U9+V9
=R10+S10+U10+V1
=R11+S11+U11+V1
=R12+S12+U12+V1
=R13+S13+U13+V1
=R14+S14+U14+V1

X	Y	Z	Aa	Aa
cost for January	cost for February	cost for March	cost for April	cost for May
=W5*0.637	=W5*(4113196/6085620)	=W5*(4226068/6085620)	=W5*(5647366/6085620)	=W5*(6911681/6085620)
=W6*0.637	=W6*(4113196/6085620)	=W6*(4226068/6085620)	=W6*(5647366/6085620)	=W6*(6911681/6085620)
=W7*0.637	=W7*(4113196/6085620)	=W7*(4226068/6085620)	=W7*(5647366/6085620)	=W7*(6911681/6085620)
=W8*0.637	=W8*(4113196/6085620)	=W8*(4226068/6085620)	=W8*(5647366/6085620)	=W8*(6911681/6085620)
=W9*0.637	=W9*(4113196/6085620)	=W9*(4226068/6085620)	=W9*(5647366/6085620)	=W9*(6911681/6085620)
=W10*0.637	=W10*(4113196/6085620)	=W10*(4226068/6085620)	=W10*(5647366/6085620)	=W10*(6911681/6085620)
=W11*0.637	=W11*(4113196/6085620)	=W11*(4226068/6085620)	=W11*(5647366/6085620)	=W11*(6911681/6085620)
=W12*0.637	=W12*(4113196/6085620)	=W12*(4226068/6085620)	=W12*(5647366/6085620)	=W12*(6911681/6085620)
=W13*0.637	=W13*(4113196/6085620)	=W13*(4226068/6085620)	=W13*(5647366/6085620)	=W13*(6911681/6085620)
=W14*0.637	=W14*(4113196/6085620)	=W14*(4226068/6085620)	=W14*(5647366/6085620)	=W14*(6911681/6085620)

Ab	Ac	Ad	Ae
cost for June	cost for July	cost for August	cost for September
=W5*(7875800/6085620)	=W5*(8897514/6085620)	=W5*(8430348/6085620)	=W5*(7319613/6085620)
=W6*(7875800/6085620)	=W6*(8897514/6085620)	=W6*(8430348/6085620)	=W6*(7319613/6085620)
=W7*(7875800/6085620)	=W7*(8897514/6085620)	=W7*(8430348/6085620)	=W7*(7319613/6085620)
=W8*(7875800/6085620)	=W8*(8897514/6085620)	=W8*(8430348/6085620)	=W8*(7319613/6085620)
=W9*(7875800/6085620)	=W9*(8897514/6085620)	=W9*(8430348/6085620)	=W9*(7319613/6085620)
=W10*(7875800/6085620)	=W10*(8897514/6085620)	=W10*(8430348/6085620)	=W10*(7319613/6085620)
=W11*(7875800/6085620)	=W11*(8897514/6085620)	=W11*(8430348/6085620)	=W11*(7319613/6085620)
=W12*(7875800/6085620)	=W12*(8897514/6085620)	=W12*(8430348/6085620)	=W12*(7319613/6085620)
=W13*(7875800/6085620)	=W13*(8897514/6085620)	=W13*(8430348/6085620)	=W13*(7319613/6085620)
=W14*(7875800/6085620)	=W14*(8897514/6085620)	=W14*(8430348/6085620)	=W14*(7319613/6085620)

Af	Ag	Ah
cost for October	cost for November	cost for December
=W5*(6802178/6085620)	=W5*(4847517/6085620)	=W5*(4079389/6085620)
=W6*(6802178/6085620)	=W6*(4847517/6085620)	=W6*(4079389/6085620)
=W7*(6802178/6085620)	=W7*(4847517/6085620)	=W7*(4079389/6085620)
=W8*(6802178/6085620)	=W8*(4847517/6085620)	=W8*(4079389/6085620)
=W9*(6802178/6085620)	=W9*(4847517/6085620)	=W9*(4079389/6085620)
=W10*(6802178/6085620)	=W10*(4847517/6085620)	=W10*(4079389/6085620)
=W11*(6802178/6085620)	=W11*(4847517/6085620)	=W11*(4079389/6085620)
=W12*(6802178/6085620)	=W12*(4847517/6085620)	=W12*(4079389/6085620)
=W13*(6802178/6085620)	=W13*(4847517/6085620)	=W13*(4079389/6085620)
=W14*(6802178/6085620)	=W14*(4847517/6085620)	=W14*(4079389/6085620)

Ai	Aj	Ak	Al	Am	An	Ao
	Total yearly Energy Cost	Yearly water production millions gallons		well #	cost per acre foot	total acre feet
	=SUM(X5:AJ5)	=(H5*365.25*60*24)/1000000		54058	=AK5/((AL5*1000000)/326000)	=(AL5*1000000)/326000
	=SUM(X6:AJ6)	=(H6*365.25*60*24)/1000000		54059	=AK6/((AL6*1000000)/326000)	=(AL6*1000000)/326000
	=SUM(X7:AJ7)	=(H7*365.25*60*24)/1000000		54076	=AK7/((AL7*1000000)/326000)	=(AL7*1000000)/326000
	=SUM(X8:AJ8)	=(H8*365.25*60*24)/1000000		54078	=AK8/((AL8*1000000)/326000)	=(AL8*1000000)/326000
	=SUM(X9:AJ9)	=(H9*365.25*60*24)/1000000		54079	=AK9/((AL9*1000000)/326000)	=(AL9*1000000)/326000
	=SUM(X10:AJ10)	=(H10*365.25*60*24)/100000		54080	=AK10/((AL10*1000000)/326000)	=(AL10*1000000)/326000
	=SUM(X11:AJ11)	=(H11*365.25*60*24)/100000		54081	=AK11/((AL11*1000000)/326000)	=(AL11*1000000)/326000
	=SUM(X12:AJ12)	=(H12*365.25*60*24)/100000				
	=SUM(X13:AJ13)	=(H13*365.25*60*24)/100000				
	=SUM(X14:AJ14)	=(H14*365.25*60*24)/100000				
Totals	=SUM(AK5:AK14)	=SUM(AL5:AL14)				=SUM(AP6:AP12)
	$2,668,993	21,492				
					avg cost/acft	=AK15/AP15
						$153.52

Lincoln County Power

Phase II

R	S	T	U	V
meter charge	average demand charge	kwhr	average energy charge	average power bill
240.00	4486.93	636289.71	7889.99	12616.92
240.00	2991.00	424153.33	5259.50	8490.50
120.00	1068.78	151563.56	1879.39	3068.17
240.00	2137.56	303127.13	3758.78	6136.34
120.00	423.60	60070.92	744.88	1288.48
280.00	3738.75	530191.66	6574.38	10593.13
160.00	2256.14	319943.24	3967.30	6383.44
80.00	211.80	30035.46	372.44	664.24
160.00	423.60	60070.92	744.88	1328.48
0.00	2902.59	411614.99	5104.03	8006.61
0.00	1884.80	267282.46	3314.30	5199.10
0.00	3091.07	438343.24	5435.46	8526.52

W	X	Y	Z	Aa	Ab	Ac	Ad	Ae	Af	Ag	Ah
cost for January	cost for February	cost for March	cost for April	cost for May	cost for June	cost for July	cost for August	cost for September	cost for October	cost for November	cost for December
8036.98	8516.42	8756.14	11708.32	14329.54	16328.38	18446.64	17478.09	15175.28	14102.51	10050.04	8457.53
5408.45	5731.09	5892.41	7879.06	9643.00	10988.12	12413.59	11761.81	10212.14	9490.23	6763.13	5691.46
1954.42	2071.01	2129.31	2847.22	3484.64	3970.72	4485.83	4250.30	3690.31	3429.43	2443.96	2056.69
3908.85	4142.03	4258.62	5694.43	6969.28	7941.44	8971.67	8500.61	7380.62	6858.87	4887.92	4113.39
820.76	869.73	894.21	1195.69	1463.38	1667.51	1883.83	1784.92	1549.75	1440.20	1026.34	863.71
6747.82	7150.36	7351.63	9830.27	12031.04	13709.27	15487.74	14674.56	12741.12	11840.43	8437.99	7100.92
4066.25	4308.82	4430.11	5923.74	7249.93	8261.23	9332.94	8842.92	7677.82	7135.07	5084.75	4279.03
423.12	448.36	460.98	616.41	754.40	859.64	971.16	920.17	798.93	742.45	529.10	445.26
846.24	896.73	921.97	1232.81	1508.81	1719.28	1942.31	1840.33	1597.86	1484.91	1058.21	890.52
5100.21	5404.46	5556.59	7430.02	9093.43	10361.88	11706.11	11091.48	9630.13	8949.36	6377.69	5367.09
3311.83	3509.39	3608.17	4824.69	5904.82	6728.50	7601.37	7202.26	6253.33	5811.27	4141.36	3485.13
5431.39	5755.40	5917.41	7912.49	9683.91	11034.73	12466.25	11811.71	10255.46	9530.49	6791.82	5715.61

Ai	Aj	Ak	Al	Am	An	Ao
	Total yearly Energy Cost	yearly water production millions of gallons		well #	cost per acre foot	total acre feet
	151385.86	944.62		53991	52.24	2897.62
	101874.50	944.62		53990	35.16	2897.62
	36813.86	944.62		54063	12.70	2897.62
	73627.72	944.62		54044	25.41	2897.62
	15460.03	1416.94		54047	3.56	4346.43
	127103.16	2361.56		54046	17.55	7244.05
	76592.61	1416.94		54049	17.62	4346.43
	7969.99	708.47		54031	3.67	2173.22
	15939.97	1416.94		54032	3.67	4346.43
	96068.46					
	62382.12					
	102306.67					
Totals	867524.94	11099.33				34047
					avg. cost/acft	25.48

A	B	C	D	E	F	G	H	I	J
								maximum	
						change	average	peak	#
well #	Basin name	cfs	swl	depth	yield	in head	gpm yield	demand	pumps
53991	Delmar	4	1210	=D5+600	500	1350	=C5*449	=H5*1.5	6
53990	Dry Lake	4	650	=D6+600	500	920	=C6*449	=H6*1.5	6
54043	Pahroc	4	350	=D7+600	1000	350	=C7*449	=H7*1.5	3
54044	Pahroc	4	700	=D8+600	500	700	=C8*449	=H8*1.5	6
54047	Pahroc	6	100	=D9+600	1000	100	=C9*449	=H9*1.5	3
54046	Pahroc	10	450	=D10+600	1000	460	=C10*449	=H10*1.5	7
54049	Pahroc	6	400	=D11+600	1000	460	=C11*449	=H11*1.5	4
54031	Patterson	3	100	=D12+600	1000	100	=C12*449	=H12*1.5	2
54032	Patterson	6	57	=D13+600	1000	100	=C13*449	=H13*1.5	4
	Lift station M26				2020	770	2020		
	Lift station M60				4040	250	4040		
	Lift station W 53				4040	410	4040		

carbonate aquifer assumed to yield 500 gpm in unexplored basins

Phase two   Lincoln County Power service area.

K	L	M	N	O	P	Q
hp each pump	average hp needed	hp per/pump used	volts	amps	power factor	average Kv
=(F5*G5)/(3960*0.75)	=(H5*G5)/(3960*0.75)	250	480	357	0.9	=((N5*O5*P5)/1000)*1.73
=(F6*G6)/(3960*0.75)	=(H6*G6)/(3960*0.75)	175	480	250	0.88	=((N6*O6*P6)/1000)*1.73
=(F7*G7)/(3960*0.75)	=(H7*G7)/(3960*0.75)	125	480	180	0.82	=((N7*O7*P7)/1000)*1.73
=(F8*G8)/(3960*0.75)	=(H8*G8)/(3960*0.75)	125	480	180	0.82	=((N8*O8*P8)/1000)*1.73
=(F9*G9)/(3960*0.75)	=(H9*G9)/(3960*0.75)	40	480	52	0.84	=((N9*O9*P9)/1000)*1.73
=(F10*G10)/(3960*0.75)	=(H10*G10)/(3960*0.75)	175	480	250	0.88	=((N10*O10*P10)/1000)*1.73
=(F11*G11)/(3960*0.75)	=(H11*G11)/(3960*0.75)	174	480	250	0.88	=((N11*O11*P11)/1000)*1.73
=(F12*G12)/(3960*0.75)	=(H12*G12)/(3960*0.75)	40	480	52	0.84	=((N12*O12*P12)/1000)*1.73
=(F13*G13)/(3960*0.75)	=(H13*G13)/(3960*0.75)	40	480	52	0.84	=((N13*O13*P13)/1000)*1.73
=(F14*G14)/(3960*0.75)	=(H14*G14)/(3960*0.75)	=L14	480	=M14*1.44	0.9	=((N14*O14*P14)/1000)*1.73
=(F15*G15)/(3960*0.75)	=(H15*G15)/(3960*0.75)	=L15	480	=M15*1.44	0.9	=((N15*O15*P15)/1000)*1.73
=(F16*G16)/(3960*0.75)	=(H16*G16)/(3960*0.75)	=L16	480	=M16*1.44	0.9	=((N16*O16*P16)/1000)*1.73

R	S	T	U	V
	average		average	average
meter	demand		energy	power
charge	charge	kwhr	charge	bill
=40*J5	=Q5*(L5/M5)*5.15	=Q5*(L5/M5)*24*30.43	=T5*0.0124	=U5+S5+R5
=40*J6	=Q6*(L6/M6)*5.15	=Q6*(L6/M6)*24*30.43	=T6*0.0124	=U6+S6+R6
=40*J7	=Q7*(L7/M7)*5.15	=Q7*(L7/M7)*24*30.43	=T7*0.0124	=U7+S7+R7
=40*J8	=Q8*(L8/M8)*5.15	=Q8*(L8/M8)*24*30.43	=T8*0.0124	=U8+S8+R8
=40*J9	=Q9*(L9/M9)*5.15	=Q9*(L9/M9)*24*30.43	=T9*0.0124	=U9+S9+R9
=40*J10	=Q10*(L10/M10)*5.15	=Q10*(L10/M10)*24*30.43	=T10*0.0124	=U10+S10+R10
=40*J11	=Q11*(L11/M11)*5.15	=Q11*(L11/M11)*24*30.43	=T11*0.0124	=U11+S11+R11
=40*J12	=Q12*(L12/M12)*5.15	=Q12*(L12/M12)*24*30.43	=T12*0.0124	=U12+S12+R12
=40*J13	=Q13*(L13/M13)*5.15	=Q13*(L13/M13)*24*30.43	=T13*0.0124	=U13+S13+R13
=40*J14	=Q14*(L14/M14)*5.15	=Q14*(L14/M14)*24*30.43	=T14*0.0124	=U14+S14+R14
=40*J15	=Q15*(L15/M15)*5.15	=Q15*(L15/M15)*24*30.43	=T15*0.0124	=U15+S15+R15
=40*J16	=Q16*(L16/M16)*5.15	=Q16*(L16/M16)*24*30.43	=T16*0.0124	=U16+S16+R16

W	X	Y	Z	Aa	Ab	Ac
cost for January	cost for February	cost for March	cost for April	cost for May	cost for June	cost for July
=V5*0.637	=V5*0.675	=V5*0.694	=V5*(5647366/6085620)	=V5*(6911681/6085620)	=V5*(7875800/6085620)	=V5*(8897514/6085620)
=V6*0.637	=V6*0.675	=V6*0.694	=V6*(5647366/6085620)	=V6*(6911681/6085620)	=V6*(7875800/6085620)	=V6*(8897514/6085620)
=V7*0.637	=V7*0.675	=V7*0.694	=V7*(5647366/6085620)	=V7*(6911681/6085620)	=V7*(7875800/6085620)	=V7*(8897514/6085620)
=V8*0.637	=V8*0.675	=V8*0.694	=V8*(5647366/6085620)	=V8*(6911681/6085620)	=V8*(7875800/6085620)	=V8*(8897514/6085620)
=V9*0.637	=V9*0.675	=V9*0.694	=V9*(5647366/6085620)	=V9*(6911681/6085620)	=V9*(7875800/6085620)	=V9*(8897514/6085620)
=V10*0.637	=V10*0.675	=V10*0.694	=V10*(5647366/6085620)	=V10*(6911681/6085620)	=V10*(7875800/6085620)	=V10*(8897514/6085620)
=V11*0.637	=V11*0.675	=V11*0.694	=V11*(5647366/6085620)	=V11*(6911681/6085620)	=V11*(7875800/6085620)	=V11*(8897514/6085620)
=V12*0.637	=V12*0.675	=V12*0.694	=V12*(5647366/6085620)	=V12*(6911681/6085620)	=V12*(7875800/6085620)	=V12*(8897514/6085620)
=V13*0.637	=V13*0.675	=V13*0.694	=V13*(5647366/6085620)	=V13*(6911681/6085620)	=V13*(7875800/6085620)	=V13*(8897514/6085620)
=V14*0.637	=V14*0.675	=V14*0.694	=V14*(5647366/6085620)	=V14*(6911681/6085620)	=V14*(7875800/6085620)	=V14*(8897514/6085620)
=V15*0.637	=V15*0.675	=V15*0.694	=V15*(5647366/6085620)	=V15*(6911681/6085620)	=V15*(7875800/6085620)	=V15*(8897514/6085620)
=V16*0.637	=V16*0.675	=V16*0.694	=V16*(5647366/6085620)	=V16*(6911681/6085620)	=V16*(7875800/6085620)	=V16*(8897514/6085620)

Ad	Ae	Af	Ag	Ah
cost for August	cost for September	cost for October	cost for November	cost for December
=V5*(8430348/6085620)	=V5*(7319613/6085620)	=V5*(6802178/6085620)	=V5*(4847517/6085620)	=V5*(4079389/6085620)
=V6*(8430348/6085620)	=V6*(7319613/6085620)	=V6*(6802178/6085620)	=V6*(4847517/6085620)	=V6*(4079389/6085620)
=V7*(8430348/6085620)	=V7*(7319613/6085620)	=V7*(6802178/6085620)	=V7*(4847517/6085620)	=V7*(4079389/6085620)
=V8*(8430348/6085620)	=V8*(7319613/6085620)	=V8*(6802178/6085620)	=V8*(4847517/6085620)	=V8*(4079389/6085620)
=V9*(8430348/6085620)	=V9*(7319613/6085620)	=V9*(6802178/6085620)	=V9*(4847517/6085620)	=V9*(4079389/6085620)
=V10*(8430348/6085620)	=V10*(7319613/6085620)	=V10*(6802178/6085620)	=V10*(4847517/6085620)	=V10*(4079389/6085620)
=V11*(8430348/6085620)	=V11*(7319613/6085620)	=V11*(6802178/6085620)	=V11*(4847517/6085620)	=V11*(4079389/6085620)
=V12*(8430348/6085620)	=V12*(7319613/6085620)	=V12*(6802178/6085620)	=V12*(4847517/6085620)	=V12*(4079389/6085620)
=V13*(8430348/6085620)	=V13*(7319613/6085620)	=V13*(6802178/6085620)	=V13*(4847517/6085620)	=V13*(4079389/6085620)
=V14*(8430348/6085620)	=V14*(7319613/6085620)	=V14*(6802178/6085620)	=V14*(4847517/6085620)	=V14*(4079389/6085620)
=V15*(8430348/6085620)	=V15*(7319613/6085620)	=V15*(6802178/6085620)	=V15*(4847517/6085620)	=V15*(4079389/6085620)
=V16*(8430348/6085620)	=V16*(7319613/6085620)	=V16*(6802178/6085620)	=V16*(4847517/6085620)	=V16*(4079389/6085620)

Ai	Aj	Ak	Al	Am	An	Ao
	Total yearly Energy Cost	yearly water production millions of gallons		well #	cost per acre foot	total acre feet
	=SUM(W5:AI5)	=(H5*365.25*60*24)/1000000		53991	=AJ5/((AK5*1000000)/326000)	=AK5*1000000/326000
	=SUM(W6:AI6)	=(H6*365.25*60*24)/1000000		53990	=AJ6/((AK6*1000000)/326000)	=AK6*1000000/326000
	=SUM(W7:AI7)	=(H7*365.25*60*24)/1000000		54063	=AJ7/((AK7*1000000)/326000)	=AK7*1000000/326000
	=SUM(W8:AI8)	=(H8*365.25*60*24)/1000000		54044	=AJ8/((AK8*1000000)/326000)	=AK8*1000000/326000
	=SUM(W9:AI9)	=(H9*365.25*60*24)/1000000		54047	=AJ9/((AK9*1000000)/326000)	=AK9*1000000/326000
	=SUM(W10:AI10)	=(H10*365.25*60*24)/1000000		54046	=AJ10/((AK10*1000000)/326000)	=AK10*1000000/326000
	=SUM(W11:AI11)	=(H11*365.25*60*24)/1000000		54049	=AJ11/((AK11*1000000)/326000)	=AK11*1000000/326000
	=SUM(W12:AI12)	=(H12*365.25*60*24)/1000000		54031	=AJ12/((AK12*1000000)/326000)	=AK12*1000000/326000
	=SUM(W13:AI13)	=(H13*365.25*60*24)/1000000		54032	=AJ13/((AK13*1000000)/326000)	=AK13*1000000/326000
	=SUM(W14:AI14)					
	=SUM(W15:AI15)					
	=SUM(W16:AI16)					
Totals	=SUM(AJ5:AJ17)	=SUM(AK5:AK17)				=SUM(AO5:AO13)
	total $867,524.94	yearly production 11099.93 million gals.				34,047 acre feet
					avg. cost/acft	=AJ18/AO18
						$25.48 acre foot

Mount Wheeler Power (Lincoln Power)

Phase III

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
well #	Basin name	cfs	swl	depth	yield	change in head	average gpm yield	maximum peak demand	# pumps	hp each pump	average hp needed	hp per/pump used	volts	amps	power factor	average Kv
54018	Spring	6	100	700	1000	270	2694	4041	4.00	91	244.91	50	480	77	0.84	53.71
54017	Spring	6	100	700	1000	250	2694	4041	4.00	84	226.77	50	480	77	0.84	53.71
54021	Spring	5	600	1200	500	600	2245	3368	7.00	101	453.54	125	480	180	0.82	122.57
54016	Spring	6	50	650	1000	150	2694	4041	4.00	51	136.06	30	480	48	0.876	34.92
54013	Spring	6	50	650	1000	160	2694	4041	4.00	54	145.13	30	480	48	0.876	34.92
54011	Spring	6	250	850	1000	250	2694	4041	4.00	84	226.77	100	480	148	0.888	109.13
54012	Spring	3	50	650	1000	130	1347	2021	2.00	44	58.96	30	480	48	0.876	34.92
54020	Spring	5	200	800	1000	200	2245	3368	4.00	67	151.18	100	480	148	0.888	109.13
54010	Spring	3	50	650	1000	50	1347	2021	2.00	17	22.68	30	480	48	0.876	34.92
54009	Spring	3	100	700	1000	100	1347	2021	2.00	34	45.35	50	480	77	0.84	53.71
54008	Spring	3	50	650	1000	70	1347	2021	2.00	24	31.75	30	480	48	0.876	34.92
54007	Spring	3	100	700	1000	100	1347	2021	2.00	34	45.35	50	480	77	0.84	53.71
54006	Spring	6	175	775	1000	175	2694	4041	4.00	59	158.74	75	480	110	0.88	80.38
54005	Spring	6	400	1000	1000	400	2694	4041	4.00	135	362.83	175	480	250	0.88	182.69
54004	Spring	6	250	850	1000	460	2694	4041	4.00	155	417.25	100	480	148	0.888	109.13
54026	Snake Valley	5	500	1100	500	500	2245	3368	7.00	84	377.95	100	480	148	0.888	109.13
54022	Snake Valley	3	50	650	1000	470	1347	2021	2.00	158	213.16	30	480	48	0.876	34.92
54027	Snake Valley	5	600	1200	500	600	2245	3368	7.00	101	453.54	175	480	250	0.88	182.69
54023	Snake Valley	3	100	700	1000	100	1347	2021	2.00	34	45.35	50	480	77	0.84	53.71
54028	Snake Valley	5	800	1400	500	800	2245	3368	7.00	135	604.71	175	480	250	0.88	182.69
54029	Snake Valley	5	925	1525	500	700	2245	3368	7.00	118	529.12	150	480	221	0.83	152.32
54030	Snake Valley	3	50	650	1000	90	1347	2021	2.00	30	40.82	50	480	77	0.84	53.71
54025	Snake Valley	3	200	800	1000	260	1347	2021	2.00	88	117.92	100	480	148	0.888	109.13
	Lift Station M-37	53			23600	560	15865		1	4450	2991.32	4000.00	480	5760	0.90	4305
	Lift Station M-31	153			68700	600	45798		1	13879	9252.12	9300.00	480	13392	0.90	10009
	Lift Station M-49	4.5			2020	300	1347		1	204	136.03	225.00	480	324	0.90	242.14

carbonate aquifer assumed to yield 500 gpm in unexplored basins

Phase three Mount Wheeler Power rate; 54005, 54004 are Lincoln County Power rate.

Lift Station M-37 is located at T10N R70E aprox section 31. Pump efficency 75%.

Lift Station M-31 is located at T11 R66. Pump efficency 75%

R	S	T	U	V
meter charge	average demand charge	Kwhr	average energy charge	average power bill
180.00	2104.66	192134.54	9987.15	12271.81
180.00	1948.76	177902.35	9247.36	11376.12
315.00	3557.66	324779.06	16882.02	20754.68
180.00	1266.88	115653.03	6011.64	7458.52
180.00	1351.33	123363.23	6412.42	7943.75
180.00	1979.85	180740.87	9394.91	11554.76
90.00	548.98	50116.31	2605.05	3244.03
180.00	1319.90	120493.91	6263.27	7763.18
90.00	211.15	19275.51	1001.94	1303.09
90.00	389.75	35580.47	1849.47	2329.22
90.00	295.60	26985.71	1402.72	1788.32
90.00	389.75	35580.47	1849.47	2329.22
180.00	1361.04	124249.26	6458.48	7999.52
160.00	1950.65	276621.73	3430.11	5540.76
160.00	2345.14	332563.20	4123.78	6628.92
315.00	3299.76	301234.78	15658.18	19272.94
90.00	1984.77	181189.75	9418.24	11493.01
315.00	3787.68	345777.17	17973.50	22076.18
90.00	389.75	35580.47	1849.47	2329.22
315.00	5050.24	461036.22	23964.66	29329.90
315.00	4298.47	392407.75	20397.35	25010.83
90.00	350.78	32022.42	1664.53	2105.30
90.00	1029.52	93985.25	4885.35	6004.88
45.00	25754.01	2351083.56	122209.32	148008.33
45.00	79656.94	7271882.45	377992.45	457694.39
45.00	1171.14	106912.98	5557.34	6773.47

W	X	Y	Z	Aa	Ab	Ac	Ad	Ae	Af	Ag	Ah
cost for January	cost for February	cost for March	cost for April	cost for May	cost for June	cost for July	cost for August	cost for September	cost for October	cost for November	cost for December
7817	8294	8522	11388	13938	15882	17942	17000	14760	13717	9775	8226
7247	7689	7900	10557	12920	14723	16633	15759	13683	12716	9062	7626
13221	14028	14413	19260	23572	26860	30344	28751	24963	23198	16532	13913
4751	5041	5179	6921	8471	9653	10905	10332	8971	8337	5941	5000
5060	5369	5516	7372	9022	10281	11614	11004	9555	8879	6328	5325
7360	7810	8024	10723	13123	14954	16894	16007	13898	12915	9204	7746
2066	2193	2253	3010	3684	4198	4743	4494	3902	3626	2584	2175
4945	5247	5391	7204	8817	10047	11350	10754	9337	8677	6184	5204
830	881	905	1209	1480	1686	1905	1805	1567	1457	1038	874
1484	1574	1617	2161	2645	3014	3405	3227	2802	2603	1855	1561
1139	1209	1242	1660	2031	2314	2615	2477	2151	1999	1424	1199
1484	1574	1617	2161	2645	3014	3405	3227	2802	2603	1855	1561
5096	5407	5555	7423	9085	10353	11696	11082	9622	8941	6372	5362
3529	3745	3848	5142	6293	7171	8101	7676	6664	6193	4414	3714
4223	4480	4603	6152	7529	8579	9692	9183	7973	7409	5280	4444
12277	13026	13384	17885	21889	24942	28178	26699	23181	21542	15352	12919
7321	7768	7981	10665	13053	14874	16803	15921	13823	12846	9155	7704
14063	14921	15330	20486	25073	28570	32277	30582	26553	24676	17585	14798
1484	1574	1617	2161	2645	3014	3405	3227	2802	2603	1855	1561
18683	19824	20368	27218	33311	37958	42882	40630	35277	32783	23363	19661
15932	16905	17368	23210	28406	32368	36567	34647	30082	27956	19922	16766
1341	1423	1462	1954	2391	2725	3078	2916	2532	2353	1677	1411
3825	4059	4170	5572	6820	7771	8779	8318	7222	6712	4783	4025
94281	100037	102782	137350	168099	191547	216396	205034	178020	165436	117896	99215
291551	309350	317839	424734	519822	592332	669175	634039	550502	511586	364578	306807
4315	4578	4704	6286	7693	8766	9903	9383	8147	7571	5395	4540

Ai	Aj	Ak	Al	Am	An	Ao
	Total yearly Energy Cost	Yearly water production millions gallons		well #	cost per acre foot	acre feet
	147261.31	1416.94		54018	33.88	4346.43
	136513.07	1416.94		54017	31.41	4346.43
	249055.36	1180.78		54021	68.76	3622.03
	89501.96	1416.94		54016	20.59	4346.43
	95324.75	1416.94		54013	21.93	4346.43
	138656.74	1416.94		54011	31.90	4346.43
	38928.18	708.47		54012	17.91	2173.22
	93157.82	1180.78		54020	25.72	3622.03
	15636.99	708.47		54010	7.20	2173.22
	27950.61	708.47		54009	12.86	2173.22
	21459.79	708.47		54008	9.87	2173.22
	27950.61	708.47		54007	12.86	2173.22
	95993.89	1416.94		54006	22.09	4346.43
	66488.96	1416.94		54005	15.30	4346.43
	79546.80	1416.94		54004	18.30	4346.43
	231274.56	1180.78		54026	63.85	3622.03
	137915.74	708.47		54022	63.46	2173.22
	264913.27	1180.78		54027	73.14	3622.03
	27950.61	708.47		54023	12.86	2173.22
	351957.70	1180.78		54028	97.17	3622.03
	300129.01	1180.78		54029	82.86	3622.03
	25263.55	708.47		54030	11.62	2173.22
	72058.30	708.47		54025	33.16	2173.22
	1776094.41	8344.18		lift 1	69.39	25595.64
	5492315.43	24087.92		lift 2	74.33	73889.31
	81281.42	708.29		lift 3	37.41	2172.68
Totals	10084580.83	57936.77				76063

avg. cost/acft	132.58

A	B	C	D	E
well #	Basin name	cfs	swl	depth
54018	Spring	6	100	=D5+600
54017	Spring	6	100	=D6+600
54021	Spring	5	600	=D7+600
54016	Spring	6	50	=D8+600
54013	Spring	6	50	=D9+600
54011	Spring	6	250	=D10+600
54012	Spring	3	50	=D11+600
54020	Spring	5	200	=D12+600
54010	Spring	3	50	=D13+600
54009	Spring	3	100	=D14+600
54008	Spring	3	50	=D15+600
54007	Spring	3	100	=D16+600
54006	Spring	6	175	=D17+600
54005	Spring	6	400	=D18+600
54004	Spring	6	250	=D19+600
54026	Snake Valley	5	500	=D20+600
54022	Snake Valley	3	50	=D21+600
54027	Snake Valley	5	600	=D22+600
54023	Snake Valley	3	100	=D23+600
54028	Snake Valley	5	800	=D24+600
54029	Snake Valley	5	925	=D25+600
54030	Snake Valley	3	50	=D26+600
54025	Snake Valley	3	200	=D27+600
	Lift Station M-37	=C20+C21+C22+C23+C24+C25+C26+C2		
	Lift Station M-31	=SUM(C5:C27)		
	Lift Station M-49	=F30/449		
	carbonate aquifer assumed to be 500 gpm in unexplored basins			

Phase three Mount Wheeler Power rate; 54005, 54004 are Lincoln Power District rate.

Lift Station 1 is located at T10N R70E aprox section 31. Pump efficency 75%.
Lift Station 2 is located at T11 R66. Pump efficency 75%

F	G	H	I	J	K	L	M	N	O	P
			maximum		hp	average	hp			
	change	average	peak	#	each	hp	per/pump			power
yield	in head	gpm yield	demand	pumps	pump	needed	used	volts	amps	factor
1000	270	=C5*449	=1.5*H5	4	=(F5*G5)/(3960*0.75)	=(G5*H5)/(3960*0.75)	125	480	180	0.82
1000	250	=C6*449	=1.5*H6	4	=(F6*G6)/(3960*0.75)	=(G6*H6)/(3960*0.75)	100	480	148	0.88
500	600	=C7*449	=1.5*H7	7	=(F7*G7)/(3960*0.75)	=(G7*H7)/(3960*0.75)	125	480	180	0.82
1000	150	=C8*449	=1.5*H8	4	=(F8*G8)/(3960*0.75)	=(G8*H8)/(3960*0.75)	60	480	89	0.887
1000	160	=C9*449	=1.5*H9	4	=(F9*G9)/(3960*0.75)	=(G9*H9)/(3960*0.75)	60	480	89	0.887
1000	250	=C10*449	=1.5*H10	4	=(F10*G10)/(3960*0.75)	=(G10*H10)/(3960*0.75)	100	480	148	0.888
1000	130	=C11*449	=1.5*H11	2	=(F11*G11)/(3960*0.75)	=(G11*H11)/(3960*0.75)	60	480	89	0.887
1000	200	=C12*449	=1.5*H12	4	=(F12*G12)/(3960*0.75)	=(G12*H12)/(3960*0.75)	100	480	148	0.888
1000	50	=C13*449	=1.5*H13	2	=(F13*G13)/(3960*0.75)	=(G13*H13)/(3960*0.75)	30	480	48	0.876
1000	100	=C14*449	=1.5*H14	2	=(F14*G14)/(3960*0.75)	=(G14*H14)/(3960*0.75)	50	480	77	0.84
1000	70	=C15*449	=1.5*H15	2	=(F15*G15)/(3960*0.75)	=(G15*H15)/(3960*0.75)	30	480	48	0.876
1000	100	=C16*449	=1.5*H16	2	=(F16*G16)/(3960*0.75)	=(G16*H16)/(3960*0.75)	50	480	77	0.84
1000	175	=C17*449	=1.5*H17	4	=(F17*G17)/(3960*0.75)	=(G17*H17)/(3960*0.75)	75	480	110	0.88
1000	400	=C18*449	=1.5*H18	4	=(F18*G18)/(3960*0.75)	=(G18*H18)/(3960*0.75)	175	480	250	0.88
1000	460	=C19*449	=1.5*H19	4	=(F19*G19)/(3960*0.75)	=(G19*H19)/(3960*0.75)	175	480	250	0.88
500	500	=C20*449	=1.5*H20	7	=(F20*G20)/(3960*0.75)	=(G20*H20)/(3960*0.75)	100	480	148	0.888
1000	470	=C21*449	=1.5*H21	2	=(F21*G21)/(3960*0.75)	=(G21*H21)/(3960*0.75)	175	480	250	0.88
500	600	=C22*449	=1.5*H22	7	=(F22*G22)/(3960*0.75)	=(G22*H22)/(3960*0.75)	175	480	250	0.88
1000	100	=C23*449	=1.5*H23	2	=(F23*G23)/(3960*0.75)	=(G23*H23)/(3960*0.75)	50	480	77	0.84
500	800	=C24*449	=1.5*H24	7	=(F24*G24)/(3960*0.75)	=(G24*H24)/(3960*0.75)	175	480	250	0.88
500	700	=C25*449	=1.5*H25	7	=(F25*G25)/(3960*0.75)	=(G25*H25)/(3960*0.75)	150	480	221	0.83
1000	90	=C26*449	=1.5*H26	2	=(F26*G26)/(3960*0.75)	=(G26*H26)/(3960*0.75)	50	480	77	0.84
1000	260	=C27*449	=1.5*H27	2	=(F27*G27)/(3960*0.75)	=(G27*H27)/(3960*0.75)	100	480	148	0.888
23600	560	=C28*449		1	=(F28*G28)/(3960*0.75)	=(G28*H28)/(3960*0.75)	4000	480	5760	0.9
68700	600	=C29*449		1	=(F29*G29)/(3960*0.75)	=(G29*H29)/(3960*0.75)	9300	480	13392	0.9
2020	300	=2020/1.5		1	=(F30*G30)/(3960*0.75)	=(G30*H30)/(3960*0.75)	225	480	324	0.9

Q	R	S	T	U	V	W
		average		average	average	
average	meter	demand		energy	power	cost for
Kv	charge	charge	Kwhr	charge	bill	January
=((N5*O5*P5)/1000)*1.73	=J5*45	=Q5*(L5/M5)*8	=Q5*(L5/M5)*24*30.43	=T5*0.05198	=U5+S5+R5	=V5*0.637
=((N6*O6*P6)/1000)*1.73	=J6*45	=Q6*(L6/M6)*8	=Q6*(L6/M6)*24*30.43	=T6*0.05198	=U6+S6+R6	=V6*0.637
=((N7*O7*P7)/1000)*1.73	=J7*45	=Q7*(L7/M7)*8	=Q7*(L7/M7)*24*30.43	=T7*0.05198	=U7+S7+R7	=V7*0.637
=((N8*O8*P8)/1000)*1.73	=J8*45	=Q8*(L8/M8)*8	=Q8*(L8/M8)*24*30.43	=T8*0.05198	=U8+S8+R8	=V8*0.637
=((N9*O9*P9)/1000)*1.73	=J9*45	=Q9*(L9/M9)*8	=Q9*(L9/M9)*24*30.43	=T9*0.05198	=U9+S9+R9	=V9*0.637
=((N10*O10*P10)/1000)*1.73	=J10*45	=Q10*(L10/M10)*8	=Q10*(L10/M10)*24*30.43	=T10*0.05198	=U10+S10+R10	=V10*0.637
=((N11*O11*P11)/1000)*1.73	=J11*45	=Q11*(L11/M11)*8	=Q11*(L11/M11)*24*30.43	=T11*0.05198	=U11+S11+R11	=V11*0.637
=((N12*O12*P12)/1000)*1.73	=J12*45	=Q12*(L12/M12)*8	=Q12*(L12/M12)*24*30.43	=T12*0.05198	=U12+S12+R12	=V12*0.637
=((N13*O13*P13)/1000)*1.73	=J13*45	=Q13*(L13/M13)*8	=Q13*(L13/M13)*24*30.43	=T13*0.05198	=U13+S13+R13	=V13*0.637
=((N14*O14*P14)/1000)*1.73	=J14*45	=Q14*(L14/M14)*8	=Q14*(L14/M14)*24*30.43	=T14*0.05198	=U14+S14+R14	=V14*0.637
=((N15*O15*P15)/1000)*1.73	=J15*45	=Q15*(L15/M15)*8	=Q15*(L15/M15)*24*30.43	=T15*0.05198	=U15+S15+R15	=V15*0.637
=((N16*O16*P16)/1000)*1.73	=J16*45	=Q16*(L16/M16)*8	=Q16*(L16/M16)*24*30.43	=T16*0.05198	=U16+S16+R16	=V16*0.637
=((N17*O17*P17)/1000)*1.73	=J17*45	=Q17*(L17/M17)*8	=Q17*(L17/M17)*24*30.43	=T17*0.05198	=U17+S17+R17	=V17*0.637
=((N18*O18*P18)/1000)*1.73	=J18*40	=Q18*(L18/M18)*5.15	=Q18*(L18/M18)*24*30.43	=T18*0.0124	=U18+S18+R18	=V18*0.637
=((N19*O19*P19)/1000)*1.73	=J19*40	=Q19*(L19/M19)*5.15	=Q19*(L19/M19)*24*30.43	=T19*0.0124	=U19+S19+R19	=V19*0.637
=((N20*O20*P20)/1000)*1.73	=J20*45	=Q20*(L20/M20)*8	=Q20*(L20/M20)*24*30.43	=T20*0.05198	=U20+S20+R20	=V20*0.637
=((N21*O21*P21)/1000)*1.73	=J21*45	=Q21*(L21/M21)*8	=Q21*(L21/M21)*24*30.43	=T21*0.05198	=U21+S21+R21	=V21*0.637
=((N22*O22*P22)/1000)*1.73	=J22*45	=Q22*(L22/M22)*8	=Q22*(L22/M22)*24*30.43	=T22*0.05198	=U22+S22+R22	=V22*0.637
=((N23*O23*P23)/1000)*1.73	=J23*45	=Q23*(L23/M23)*8	=Q23*(L23/M23)*24*30.43	=T23*0.05198	=U23+S23+R23	=V23*0.637
=((N24*O24*P24)/1000)*1.73	=J24*45	=Q24*(L24/M24)*8	=Q24*(L24/M24)*24*30.43	=T24*0.05198	=U24+S24+R24	=V24*0.637
=((N25*O25*P25)/1000)*1.73	=J25*45	=Q25*(L25/M25)*8	=Q25*(L25/M25)*24*30.43	=T25*0.05198	=U25+S25+R25	=V25*0.637
=((N26*O26*P26)/1000)*1.73	=J26*45	=Q26*(L26/M26)*8	=Q26*(L26/M26)*24*30.43	=T26*0.05198	=U26+S26+R26	=V26*0.637
=((N27*O27*P27)/1000)*1.73	=J27*45	=Q27*(L27/M27)*8	=Q27*(L27/M27)*24*30.43	=T27*0.05198	=U27+S27+R27	=V27*0.637
=((N28*O28*P28)/1000)*1.73	=J28*45	=Q28*(L28/M28)*8	=Q28*(L28/M28)*24*30.43	=T28*0.05198	=U28+S28+R28	=V28*0.637
=((N29*O29*P29)/1000)*1.73	=J29*45	=Q29*(L29/M29)*8	=Q29*(L29/M29)*24*30.43	=T29*0.05198	=U29+S29+R29	=V29*0.637
=((N30*O30*P30)/1000)*1.73	=J30*45	=Q30*(L30/M30)*8	=Q30*(L30/M30)*24*30.43	=T30*0.05198	=U30+S30+R30	=V30*0.637

X	Y	Z	Aa	Ab
cost for February	cost for March	cost for April	cost for May	cost for June
=V5*(4113196/6085620)	=V5*(4226068/6085620)	=V5*(5647366/6085620)	=V5*(6911681/6085620)	=(R5+S5+U5)*(7875800/6085620)
=V6*(4113196/6085620)	=V6*(4226068/6085620)	=V6*(5647366/6085620)	=V6*(6911681/6085620)	=(R6+S6+U6)*(7875800/6085620)
=V7*(4113196/6085620)	=V7*(4226068/6085620)	=V7*(5647366/6085620)	=V7*(6911681/6085620)	=(R7+S7+U7)*(7875800/6085620)
=V8*(4113196/6085620)	=V8*(4226068/6085620)	=V8*(5647366/6085620)	=V8*(6911681/6085620)	=(R8+S8+U8)*(7875800/6085620)
=V9*(4113196/6085620)	=V9*(4226068/6085620)	=V9*(5647366/6085620)	=V9*(6911681/6085620)	=(R9+S9+U9)*(7875800/6085620)
=V10*(4113196/6085620)	=V10*(4226068/6085620)	=V10*(5647366/6085620)	=V10*(6911681/6085620)	=(R10+S10+U10)*(7875800/6085620)
=V11*(4113196/6085620)	=V11*(4226068/6085620)	=V11*(5647366/6085620)	=V11*(6911681/6085620)	=(R11+S11+U11)*(7875800/6085620)
=V12*(4113196/6085620)	=V12*(4226068/6085620)	=V12*(5647366/6085620)	=V12*(6911681/6085620)	=(R12+S12+U12)*(7875800/6085620)
=V13*(4113196/6085620)	=V13*(4226068/6085620)	=V13*(5647366/6085620)	=V13*(6911681/6085620)	=(R13+S13+U13)*(7875800/6085620)
=V14*(4113196/6085620)	=V14*(4226068/6085620)	=V14*(5647366/6085620)	=V14*(6911681/6085620)	=(R14+S14+U14)*(7875800/6085620)
=V15*(4113196/6085620)	=V15*(4226068/6085620)	=V15*(5647366/6085620)	=V15*(6911681/6085620)	=(R15+S15+U15)*(7875800/6085620)
=V16*(4113196/6085620)	=V16*(4226068/6085620)	=V16*(5647366/6085620)	=V16*(6911681/6085620)	=(R16+S16+U16)*(7875800/6085620)
=V17*(4113196/6085620)	=V17*(4226068/6085620)	=V17*(5647366/6085620)	=V17*(6911681/6085620)	=(R17+S17+U17)*(7875800/6085620)
=V18*(4113196/6085620)	=V18*(4226068/6085620)	=V18*(5647366/6085620)	=V18*(6911681/6085620)	=(R18+S18+U18)*(7875800/6085620)
=V19*(4113196/6085620)	=V19*(4226068/6085620)	=V19*(5647366/6085620)	=V19*(6911681/6085620)	=(R19+S19+U19)*(7875800/6085620)
=V20*(4113196/6085620)	=V20*(4226068/6085620)	=V20*(5647366/6085620)	=V20*(6911681/6085620)	=(R20+S20+U20)*(7875800/6085620)
=V21*(4113196/6085620)	=V21*(4226068/6085620)	=V21*(5647366/6085620)	=V21*(6911681/6085620)	=(R21+S21+U21)*(7875800/6085620)
=V22*(4113196/6085620)	=V22*(4226068/6085620)	=V22*(5647366/6085620)	=V22*(6911681/6085620)	=(R22+S22+U22)*(7875800/6085620)
=V23*(4113196/6085620)	=V23*(4226068/6085620)	=V23*(5647366/6085620)	=V23*(6911681/6085620)	=(R23+S23+U23)*(7875800/6085620)
=V24*(4113196/6085620)	=V24*(4226068/6085620)	=V24*(5647366/6085620)	=V24*(6911681/6085620)	=(R24+S24+U24)*(7875800/6085620)
=V25*(4113196/6085620)	=V25*(4226068/6085620)	=V25*(5647366/6085620)	=V25*(6911681/6085620)	=(R25+S25+U25)*(7875800/6085620)
=V26*(4113196/6085620)	=V26*(4226068/6085620)	=V26*(5647366/6085620)	=V26*(6911681/6085620)	=(R26+S26+U26)*(7875800/6085620)
=V27*(4113196/6085620)	=V27*(4226068/6085620)	=V27*(5647366/6085620)	=V27*(6911681/6085620)	=(R27+S27+U27)*(7875800/6085620)
=V28*(4113196/6085620)	=V28*(4226068/6085620)	=V28*(5647366/6085620)	=V28*(6911681/6085620)	=(R28+S28+U28)*(7875800/6085620)
=V29*(4113196/6085620)	=V29*(4226068/6085620)	=V29*(5647366/6085620)	=V29*(6911681/6085620)	=(R29+S29+U29)*(7875800/6085620)
=V30*(4113196/6085620)	=V30*(4226068/6085620)	=V30*(5647366/6085620)	=V30*(6911681/6085620)	=(R30+S30+U30)*(7875800/6085620)

Ac	Ad	Ae	Af	Ag
cost for July	cost for August	cost for September	cost for October	cost for November
=V5*(8897514/6085620)	=V5*(8430348/6085620)	=V5*(7319613/6085620)	=V5*(6802178/6085620)	=V5*(4847517/6085620)
=V6*(8897514/6085620)	=V6*(8430348/6085620)	=V6*(7319613/6085620)	=V6*(6802178/6085620)	=V6*(4847517/6085620)
=V7*(8897514/6085620)	=V7*(8430348/6085620)	=V7*(7319613/6085620)	=V7*(6802178/6085620)	=V7*(4847517/6085620)
=V8*(8897514/6085620)	=V8*(8430348/6085620)	=V8*(7319613/6085620)	=V8*(6802178/6085620)	=V8*(4847517/6085620)
=V9*(8897514/6085620)	=V9*(8430348/6085620)	=V9*(7319613/6085620)	=V9*(6802178/6085620)	=V9*(4847517/6085620)
=V10*(8897514/6085620)	=V10*(8430348/6085620)	=V10*(7319613/6085620)	=V10*(6802178/6085620)	=V10*(4847517/6085620)
=V11*(8897514/6085620)	=V11*(8430348/6085620)	=V11*(7319613/6085620)	=V11*(6802178/6085620)	=V11*(4847517/6085620)
=V12*(8897514/6085620)	=V12*(8430348/6085620)	=V12*(7319613/6085620)	=V12*(6802178/6085620)	=V12*(4847517/6085620)
=V13*(8897514/6085620)	=V13*(8430348/6085620)	=V13*(7319613/6085620)	=V13*(6802178/6085620)	=V13*(4847517/6085620)
=V14*(8897514/6085620)	=V14*(8430348/6085620)	=V14*(7319613/6085620)	=V14*(6802178/6085620)	=V14*(4847517/6085620)
=V15*(8897514/6085620)	=V15*(8430348/6085620)	=V15*(7319613/6085620)	=V15*(6802178/6085620)	=V15*(4847517/6085620)
=V16*(8897514/6085620)	=V16*(8430348/6085620)	=V16*(7319613/6085620)	=V16*(6802178/6085620)	=V16*(4847517/6085620)
=V17*(8897514/6085620)	=V17*(8430348/6085620)	=V17*(7319613/6085620)	=V17*(6802178/6085620)	=V17*(4847517/6085620)
=V18*(8897514/6085620)	=V18*(8430348/6085620)	=V18*(7319613/6085620)	=V18*(6802178/6085620)	=V18*(4847517/6085620)
=V19*(8897514/6085620)	=V19*(8430348/6085620)	=V19*(7319613/6085620)	=V19*(6802178/6085620)	=V19*(4847517/6085620)
=V20*(8897514/6085620)	=V20*(8430348/6085620)	=V20*(7319613/6085620)	=V20*(6802178/6085620)	=V20*(4847517/6085620)
=V21*(8897514/6085620)	=V21*(8430348/6085620)	=V21*(7319613/6085620)	=V21*(6802178/6085620)	=V21*(4847517/6085620)
=V22*(8897514/6085620)	=V22*(8430348/6085620)	=V22*(7319613/6085620)	=V22*(6802178/6085620)	=V22*(4847517/6085620)
=V23*(8897514/6085620)	=V23*(8430348/6085620)	=V23*(7319613/6085620)	=V23*(6802178/6085620)	=V23*(4847517/6085620)
=V24*(8897514/6085620)	=V24*(8430348/6085620)	=V24*(7319613/6085620)	=V24*(6802178/6085620)	=V24*(4847517/6085620)
=V25*(8897514/6085620)	=V25*(8430348/6085620)	=V25*(7319613/6085620)	=V25*(6802178/6085620)	=V25*(4847517/6085620)
=V26*(8897514/6085620)	=V26*(8430348/6085620)	=V26*(7319613/6085620)	=V26*(6802178/6085620)	=V26*(4847517/6085620)
=V27*(8897514/6085620)	=V27*(8430348/6085620)	=V27*(7319613/6085620)	=V27*(6802178/6085620)	=V27*(4847517/6085620)
=V28*(8897514/6085620)	=V28*(8430348/6085620)	=V28*(7319613/6085620)	=V28*(6802178/6085620)	=V28*(4847517/6085620)
=V29*(8897514/6085620)	=V29*(8430348/6085620)	=V29*(7319613/6085620)	=V29*(6802178/6085620)	=V29*(4847517/6085620)
=V30*(8897514/6085620)	=V30*(8430348/6085620)	=V30*(7319613/6085620)	=V30*(6802178/6085620)	=V30*(4847517/6085620)

Ah	Ai	Aj	Ak	Al	Am	An
		Total yearly	Yearly water			
cost for		Energy	production			cost per
December		Cost	millions gallons		well #	acre foot
=V5*(4079389/6085620)		=SUM(W5:AI5)	=(H5*365.25*60*24)/1000000		54018	=AJ5/(AK5*1000000/326000)
=V6*(4079389/6085620)		=SUM(W6:AI6)	=(H6*365.25*60*24)/1000000		54017	=AJ6/(AK6*1000000/326000)
=V7*(4079389/6085620)		=SUM(W7:AI7)	=(H7*365.25*60*24)/1000000		54021	=AJ7/(AK7*1000000/326000)
=V8*(4079389/6085620)		=SUM(W8:AI8)	=(H8*365.25*60*24)/1000000		54016	=AJ8/(AK8*1000000/326000)
=V9*(4079389/6085620)		=SUM(W9:AI9)	=(H9*365.25*60*24)/1000000		54013	=AJ9/(AK9*1000000/326000)
=V10*(4079389/6085620)		=SUM(W10:AI10)	=(H10*365.25*60*24)/1000000		54011	=AJ10/(AK10*1000000/326000)
=V11*(4079389/6085620)		=SUM(W11:AI11)	=(H11*365.25*60*24)/1000000		54012	=AJ11/(AK11*1000000/326000)
=V12*(4079389/6085620)		=SUM(W12:AI12)	=(H12*365.25*60*24)/1000000		54020	=AJ12/(AK12*1000000/326000)
=V13*(4079389/6085620)		=SUM(W13:AI13)	=(H13*365.25*60*24)/1000000		54010	=AJ13/(AK13*1000000/326000)
=V14*(4079389/6085620)		=SUM(W14:AI14)	=(H14*365.25*60*24)/1000000		54009	=AJ14/(AK14*1000000/326000)
=V15*(4079389/6085620)		=SUM(W15:AI15)	=(H15*365.25*60*24)/1000000		54008	=AJ15/(AK15*1000000/326000)
=V16*(4079389/6085620)		=SUM(W16:AI16)	=(H16*365.25*60*24)/1000000		54007	=AJ16/(AK16*1000000/326000)
=V17*(4079389/6085620)		=SUM(W17:AI17)	=(H17*365.25*60*24)/1000000		54006	=AJ17/(AK17*1000000/326000)
=V18*(4079389/6085620)		=SUM(W18:AI18)	=(H18*365.25*60*24)/1000000		54005	=AJ18/(AK18*1000000/326000)
=V19*(4079389/6085620)		=SUM(W19:AI19)	=(H19*365.25*60*24)/1000000		54004	=AJ19/(AK19*1000000/326000)
=V20*(4079389/6085620)		=SUM(W20:AI20)	=(H20*365.25*60*24)/1000000		54026	=AJ20/(AK20*1000000/326000)
=V21*(4079389/6085620)		=SUM(W21:AI21)	=(H21*365.25*60*24)/1000000		54022	=AJ21/(AK21*1000000/326000)
=V22*(4079389/6085620)		=SUM(W22:AI22)	=(H22*365.25*60*24)/1000000		54027	=AJ22/(AK22*1000000/326000)
=V23*(4079389/6085620)		=SUM(W23:AI23)	=(H23*365.25*60*24)/1000000		54023	=AJ23/(AK23*1000000/326000)
=V24*(4079389/6085620)		=SUM(W24:AI24)	=(H24*365.25*60*24)/1000000		54028	=AJ24/(AK24*1000000/326000)
=V25*(4079389/6085620)		=SUM(W25:AI25)	=(H25*365.25*60*24)/1000000		54029	=AJ25/(AK25*1000000/326000)
=V26*(4079389/6085620)		=SUM(W26:AI26)	=(H26*365.25*60*24)/1000000		54030	=AJ26/(AK26*1000000/326000)
=V27*(4079389/6085620)		=SUM(W27:AI27)	=(H27*365.25*60*24)/1000000		54025	=AJ27/(AK27*1000000/326000)
=V28*(4079389/6085620)		=SUM(W28:AI28)	=(H28*365.25*60*24)/1000000		lift 1	=AJ28/(AK28*1000000/326000)
=V29*(4079389/6085620)		=SUM(W29:AI29)	=(H29*365.25*60*24)/1000000		lift 2	=AJ29/(AK29*1000000/326000)
=V30*(4079389/6085620)		=SUM(W30:AI30)	=(H30*365.25*60*24)/1000000		lift 3	=AJ30/(AK30*1000000/326000)
totals		=SUM(AJ5:AJ30)	=SUM(AK5:AK30)			
		10084580.83	yearly production 57,936.77million gals.			
						avg. cost/acft

Ao

acre feet

=AK5*1000000/326000
=AK6*1000000/326000
=AK7*1000000/326000
=AK8*1000000/326000
=AK9*1000000/326000
=AK10*1000000/326000
=AK11*1000000/326000
=AK12*1000000/326000
=AK13*1000000/326000
=AK14*1000000/326000
=AK15*1000000/326000
=AK16*1000000/326000
=AK17*1000000/326000
=AK18*1000000/326000
=AK19*1000000/326000
=AK20*1000000/326000
=AK21*1000000/326000
=AK22*1000000/326000
=AK23*1000000/326000
=AK24*1000000/326000
=AK25*1000000/326000
=AK26*1000000/326000
=AK27*1000000/326000
=AK28*1000000/326000
=AK29*1000000/326000
=AK30*1000000/326000
=SUM(AO5:AO27)
76,063 acre feet
=AJ31/SUM(AO5:AO27)
$132.58 acre foot

Mt. Wheeler Power

Phase IV

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Application #	Basin name	cfs	swl	depth	yield	change in head	average gpm yield	maximum peak demand	# pumps	hp each pump	average hp needed	hp per/pump used	volts	amps	power factor	average Kv
53971	Railroad Valley	3	150	750	1000	150	1347	2021	2	50.51	68.03	60.00	480	91	0.85	64.23
53974	Railroad Valley	3	150	750	1000	180	1347	2021	2	60.61	81.64	60.00	480	110	0.85	77.64
53973	Railroad Valley	3	100	700	500	220	1347	2021	4	37.04	99.78	30.00	480	77	0.88	56.01
53970	Railroad Valley	3	150	750	1000	170	1347	2021	2	57.24	77.10	60.00	480	110	0.85	77.64
53980	Railroad Valley	5	800	1400	500	800	2245	3368	7	134.68	604.71	150.00	480	221	0.83	152.32
53979	Railroad Valley	5	100	700	1000	190	2245	3368	4	63.97	143.62	50.00	480	110	0.84	76.73
53978	Railroad Valley	5	200	800	1000	200	2245	3368	4	67.34	151.18	75.00	480	110	0.88	80.38
53969	Railroad Valley	3	100	700	1000	220	1347	2021	2	74.07	99.78	50.00	480	180	0.84	125.56
53977	Railroad Valley	5	800	1400	500	800	2245	3368	7	134.68	604.71	150.00	480	221	0.83	152.32
53968	Railroad Valley	3	100	700	1000	230	1347	2021	2	77.44	104.31	50.00	480	148	0.84	103.24
53967	Railroad Valley	3	100	700	1000	250	1347	2021	2	84.18	113.38	50.00	480	148	0.84	103.24
53976	Railroad Valley	5	200	800	1000	200	2245	3368	4	67.34	151.18	75.00	480	110	0.88	80.38
53966	Railroad Valley	3	50	650	1000	110	1347	2021	2	37.04	49.89	30.00	480	77	0.88	56.01
53965	Railroad Valley	3	50	650	1000	50	1347	2021	2	16.84	22.68	30.00	480	48	0.88	35.06
53975	Railroad Valley	5	600	1200	1000	610	2245	3368	4	205.39	461.09	225.00	480	324	0.90	242.14
53986	Railroad Valley	3	50	650	1000	50	1347	2021	2	16.84	22.68	30.00	480	48	0.88	35.06
53985	Railroad Valley	3	50	650	1000	180	1347	2021	2	60.61	81.64	30.00	480	110	0.88	80.02
53981	Railroad Valley	3	600	1200	500	600	1347	2021	2	101.01	272.12	30.00	480	250	0.88	181.86
53982	Railraod Valley	3	500	1100	500	500	1347	2021	2	84.18	226.77	30.00	480	48	0.88	35.06
53983	Railroad Valley	5	200	800	500	200	2245	3368	2	33.67	151.18	30.00	480	48	0.88	35.06
53947	Tikapoo	2	800	1400	500	840	898	1347	3	141.41	253.98	30.00	480	48	0.88	35.06
53949	Tikapoo	2	400	1000	500	400	898	1347	3	67.34	120.94	30.00	480	48	0.88	35.06
	Lift Station R7	94			42430	590	28287	42430	1	8429	5619	8500.00	480	12580	0.90	9401.79
	Lift Station R9	90			40410	340	26940	40410	1	4626	3084	4700.00	480	6956	0.90	5198.64
	Lift Station R15	23			10450	210	6967	10450	1	739	493	750.00	480	1110	0.90	829.57
	Lift Station R38	4			2020	270	1347	2020	1	184	122	200.00	480	288	0.89	212.85

carbonate aquifer assumed to yield 500 gpm in unexplored basins

Phase four Mount Wheeler Power rate.

R	S	T	U	V
meter charge	demand charge	Kwhr	energy charge	average power cost
90.00	582.62	53187.80	2764.70	3437.33
90.00	845.13	77151.53	4010.34	4945.46
180.00	1490.34	136052.94	7072.03	8742.37
90.00	798.17	72865.33	3787.54	4675.71
315.00	4912.54	448466.00	23311.26	28538.81
180.00	1763.16	160959.27	8366.66	10309.83
180.00	1296.23	118332.63	6150.93	7627.16
90.00	2004.44	182985.28	9511.57	11606.01
315.00	4912.54	448466.00	23311.26	28538.81
90.00	1723.01	157293.41	8176.11	9989.12
90.00	1872.83	170971.09	8887.08	10849.91
180.00	1296.23	118332.63	6150.93	7627.16
90.00	745.17	68026.47	3536.02	4371.18
90.00	212.03	19355.82	1006.12	1308.14
180.00	3969.83	362405.91	18837.86	22987.69
90.00	212.03	19355.82	1006.12	1308.14
90.00	1741.95	159022.92	8266.01	10097.96
90.00	13196.62	1204719.09	62621.30	75907.91
90.00	2120.26	193558.20	10061.16	12271.41
90.00	1413.50	129038.80	6707.44	8210.94
135.00	2374.69	216785.18	11268.49	13778.18
135.00	1130.80	103231.04	5365.95	6631.75
45.00	49723.18	4539229.01	235949.12	285717.30
45.00	27289.88	2491293.06	129497.41	156832.29
45.00	4358.82	397917.13	20683.73	25087.56
45.00	1042.31	95152.56	4946.03	6033.34

W	X	Y	Z	Aa	Ab	Ac	Ad	Ae	Af	Ag	Ah
cost for January	cost for February	cost for March	cost for April	cost for May	cost for June	cost for July	cost for August	cost for September	cost for October	cost for November	cost for December
2190	2323	2387	3190	3904	4448	5026	4762	4134	3842	2738	2304
3150	3343	3434	4589	5617	6400	7231	6851	5948	5528	3939	3315
5569	5909	6071	8113	9929	11314	12782	12111	10515	9772	6964	5860
2978	3160	3247	4339	5310	6051	6836	6477	5624	5226	3724	3134
18179	19289	19818	26484	32413	36934	41725	39535	34326	31899	22733	19130
6567	6968	7160	9567	11709	13343	15074	14282	12400	11524	8212	6911
4858	5155	5297	7078	8662	9871	11151	10566	9174	8525	6075	5113
7393	7844	8060	10770	13181	15020	16969	16078	13959	12973	9245	7780
18179	19289	19818	26484	32413	36934	41725	39535	34326	31899	22733	19130
6363	6752	6937	9270	11345	12928	14605	13838	12015	11165	7957	6696
6911	7333	7535	10069	12323	14042	15863	15030	13050	12127	8643	7273
4858	5155	5297	7078	8662	9871	11151	10566	9174	8525	6075	5113
2784	2954	3036	4056	4965	5657	6391	6055	5258	4886	3482	2930
833	884	908	1214	1486	1693	1913	1812	1573	1462	1042	877
14643	15537	15963	21332	26108	29750	33609	31845	27649	25694	18311	15409
833	884	908	1214	1486	1693	1913	1812	1573	1462	1042	877
6432	6825	7012	9371	11469	13068	14764	13989	12146	11287	8044	6769
48353	51305	52713	70441	86212	98237	110982	105154	91300	84846	60465	50884
7817	8294	8522	11388	13937	15881	17941	16999	14760	13716	9775	8226
5230	5550	5702	7620	9325	10626	12005	11375	9876	9178	6540	5504
8777	9313	9568	12786	15648	17831	20144	19087	16572	15401	10975	9236
4224	4482	4605	6154	7532	8583	9696	9187	7976	7413	5283	4445
182002	193113	198412	265141	324501	369766	417735	395801	343653	319359	227589	191526
99902	106001	108910	145538	178121	202967	229298	217258	188633	175299	124925	105130
15981	16956	17422	23281	28493	32467	36679	34754	30175	28042	19984	16817
3843	4078	4190	5599	6852	7808	8821	8358	7257	6744	4806	4044

Ai	Aj	Ak	Al	Am	An	Ao
	Total yearly Energy Cost	yearly water production millions of gallons		well #	cost per acre foot	total acre feet
	41247.79	708.47		53971	18.98	2173.22
	59345.36	708.47		53974	27.31	2173.22
	104908.11	708.47		53973	48.27	2173.22
	56108.40	708.47		53970	25.82	2173.22
	342464.58	1180.78		53980	94.55	3622.03
	123717.54	1180.78		53979	34.16	3622.03
	91525.61	1180.78		53978	25.27	3622.03
	139271.73	708.47		53969	64.09	2173.22
	342464.58	1180.78		53977	94.55	3622.03
	119869.05	708.47		53968	55.16	2173.22
	130198.54	708.47		53967	59.91	2173.22
	91525.61	1180.78		53976	25.27	3622.03
	52454.05	708.47		53966	24.14	2173.22
	15697.64	708.47		53965	7.22	2173.22
	275851.42	1180.78		53975	76.16	3622.03
	15697.64	708.47		53986	7.22	2173.22
	121175.19	708.47		53985	55.76	2173.22
	910892.10	708.47		53985	419.14	2173.22
	147256.47	708.47		53985	67.76	2173.22
	98530.98	1180.78		53985	27.20	3622.03
	165337.65	472.31		53985	114.12	1448.81
	79580.78	472.31		53985	54.93	1448.81
	3428596.84	14877.66		lift R7	75.13	45636.98
	1881981.58	14169.36		lift R9	43.30	43464.30
	301049.74	3664.19		lift R15	26.78	11239.84
	72399.86	708.29		lift R38	33.32	2172.68
Totals	9209148.85	18420.17				56504
				avg. cost/acft		162.98

A	B	C	D	E	F	G	H	I
								maximum
						change	average	peak
Application #	Basin name	cfs	swl	depth	yield	in head	gpm yield	demand
53971	Railroad Valley	3	150	=D5+600	1000	150	=C5*449	=H5*1.5
53974	Railroad Valley	3	150	=D6+600	1000	180	=C6*449	=H6*1.5
53973	Railroad Valley	3	100	=D7+600	500	220	=C7*449	=H7*1.5
53970	Railroad Valley	3	150	=D8+600	1000	170	=C8*449	=H8*1.5
53980	Railroad Valley	5	800	=D9+600	500	800	=C9*449	=H9*1.5
53979	Railroad Valley	5	100	=D10+60	1000	190	=C10*449	=H10*1.5
53978	Railroad Valley	5	200	=D11+60	1000	200	=C11*449	=H11*1.5
53969	Railroad Valley	3	100	=D12+60	1000	220	=C12*449	=H12*1.5
53977	Railroad Valley	5	800	=D13+60	500	800	=C13*449	=H13*1.5
53968	Railroad Valley	3	100	=D14+60	1000	230	=C14*449	=H14*1.5
53967	Railroad Valley	3	100	=D15+60	1000	250	=C15*449	=H15*1.5
53976	Railroad Valley	5	200	=D16+60	1000	200	=C16*449	=H16*1.5
53966	Railroad Valley	3	50	=D17+60	1000	110	=C17*449	=H17*1.5
53965	Railroad Valley	3	50	=D18+60	1000	50	=C18*449	=H18*1.5
53975	Railroad Valley	5	600	=D19+60	1000	610	=C19*449	=H19*1.5
53986	Railroad Valley	3	50	=D20+60	1000	50	=C20*449	=H20*1.5
53985	Railroad Valley	3	50	=D21+60	1000	180	=C21*449	=H21*1.5
53981	Railroad Valley	3	600	=D22+60	500	600	=C22*449	=H22*1.5
53982	Railraod Valley	3	500	=D23+60	500	500	=C23*449	=H23*1.5
53983	Railroad Valley	5	200	=D24+60	500	200	=C24*449	=H24*1.5
53947	Tikapoo	2	800	1400	500	840	898	=H25*1.5
53949	Tikapoo	2	400	1000	500	400	898	=H26*1.5
	Lift Station R7	=F28/449			42430	590	=F28/1.5	=H28*1.5
	Lift Station R9	=F29/449			40410	340	=F29/1.5	=H29*1.5
	Lift Station R15	=F30/449			10450	210	=F30/1.5	=H30*1.5
	Lift Station R38	=F31/449			2020	270	=F31/1.5	=H31*1.5

carbonate aquifer assumed to yield 500 gpm in unexplored basins

Phase four Mount Wheeler Power rate.

J	K	L	M	N	O	P	Q
	hp	average	hp				
#	each	hp	per/pump			power	average
pumps	pump	needed	used	volts	amps	factor	Kv
2	=(F5*G5)/(3960*0.75)	=(H5*G5)/(3960*0.75)	60	480	91	0.85	=((N5*O5*P5)/1000)*1.73
2	=(F6*G6)/(3960*0.75)	=(H6*G6)/(3960*0.75)	60	480	110	0.85	=((N6*O6*P6)/1000)*1.73
4	=(F7*G7)/(3960*0.75)	=(H7*G7)/(3960*0.75)	30	480	77	0.876	=((N7*O7*P7)/1000)*1.73
2	=(F8*G8)/(3960*0.75)	=(H8*G8)/(3960*0.75)	60	480	110	0.85	=((N8*O8*P8)/1000)*1.73
7	=(F9*G9)/(3960*0.75)	=(H9*G9)/(3960*0.75)	150	480	221	0.83	=((N9*O9*P9)/1000)*1.73
4	=(F10*G10)/(3960*0.75)	=(H10*G10)/(3960*0.75)	50	480	110	0.84	=((N10*O10*P10)/1000)*1.73
4	=(F11*G11)/(3960*0.75)	=(H11*G11)/(3960*0.75)	75	480	110	0.88	=((N11*O11*P11)/1000)*1.73
2	=(F12*G12)/(3960*0.75)	=(H12*G12)/(3960*0.75)	50	480	180	0.84	=((N12*O12*P12)/1000)*1.73
7	=(F13*G13)/(3960*0.75)	=(H13*G13)/(3960*0.75)	150	480	221	0.83	=((N13*O13*P13)/1000)*1.73
2	=(F14*G14)/(3960*0.75)	=(H14*G14)/(3960*0.75)	50	480	148	0.84	=((N14*O14*P14)/1000)*1.73
2	=(F15*G15)/(3960*0.75)	=(H15*G15)/(3960*0.75)	50	480	148	0.84	=((N15*O15*P15)/1000)*1.73
4	=(F16*G16)/(3960*0.75)	=(H16*G16)/(3960*0.75)	75	480	110	0.88	=((N16*O16*P16)/1000)*1.73
2	=(F17*G17)/(3960*0.75)	=(H17*G17)/(3960*0.75)	30	480	77	0.876	=((N17*O17*P17)/1000)*1.73
2	=(F18*G18)/(3960*0.75)	=(H18*G18)/(3960*0.75)	30	480	48.2	0.876	=((N18*O18*P18)/1000)*1.73
4	=(F19*G19)/(3960*0.75)	=(H19*G19)/(3960*0.75)	225	480	324	0.9	=((N19*O19*P19)/1000)*1.73
2	=(F20*G20)/(3960*0.75)	=(H20*G20)/(3960*0.75)	30	480	48.2	0.876	=((N20*O20*P20)/1000)*1.73
2	=(F21*G21)/(3960*0.75)	=(H21*G21)/(3960*0.75)	30	480	110	0.876	=((N21*O21*P21)/1000)*1.73
2	=(F22*G22)/(3960*0.75)	=(H22*G22)/(3960*0.75)	30	480	250	0.876	=((N22*O22*P22)/1000)*1.73
2	=(F23*G23)/(3960*0.75)	=(H23*G23)/(3960*0.75)	30	480	48.2	0.876	=((N23*O23*P23)/1000)*1.73
2	=(F24*G24)/(3960*0.75)	=(H24*G24)/(3960*0.75)	30	480	48.2	0.876	=((N24*O24*P24)/1000)*1.73
3	=(F25*G25)/(3960*0.75)	=(H25*G25)/(3960*0.75)	30	480	48.2	0.876	=((N25*O25*P25)/1000)*1.73
3	=(F26*G26)/(3960*0.75)	=(H26*G26)/(3960*0.75)	30	480	48.2	0.876	=((N26*O26*P26)/1000)*1.73
1	=(F28*G28)/(3960*0.75)	=K28/1.5	8500	480	=1.48*M28	0.9	=((N28*O28*P28)/1000)*1.73
1	=(F29*G29)/(3960*0.75)	=K29/1.5	4700	480	=1.48*M29	0.9	=((N29*O29*P29)/1000)*1.73
1	=(F30*G30)/(3960*0.75)	=K30/1.5	750	480	=1.48*M30	0.9	=((N30*O30*P30)/1000)*1.73
1	=(F31*G31)/(3960*0.75)	=K31/1.5	200	480	288	0.89	=((N31*O31*P31)/1000)*1.73

R	S	T	U	V
meter charge	demand charge	Kwhr	energy charge	average power cost
=45*J5	=Q5*(L5/M5)*8	=Q5*(L5/M5)*24*30.43	=T5*0.05198	=R5+S5+U5
=45*J6	=Q6*(L6/M6)*8	=Q6*(L6/M6)*24*30.43	=T6*0.05198	=R6+S6+U6
=45*J7	=Q7*(L7/M7)*8	=Q7*(L7/M7)*24*30.43	=T7*0.05198	=R7+S7+U7
=45*J8	=Q8*(L8/M8)*8	=Q8*(L8/M8)*24*30.43	=T8*0.05198	=R8+S8+U8
=45*J9	=Q9*(L9/M9)*8	=Q9*(L9/M9)*24*30.43	=T9*0.05198	=R9+S9+U9
=45*J10	=Q10*(L10/M10)*8	=Q10*(L10/M10)*24*30.4	=T10*0.05198	=R10+S10+U1
=45*J11	=Q11*(L11/M11)*8	=Q11*(L11/M11)*24*30.4	=T11*0.05198	=R11+S11+U1
=45*J12	=Q12*(L12/M12)*8	=Q12*(L12/M12)*24*30.4	=T12*0.05198	=R12+S12+U1
=45*J13	=Q13*(L13/M13)*8	=Q13*(L13/M13)*24*30.4	=T13*0.05198	=R13+S13+U1
=45*J14	=Q14*(L14/M14)*8	=Q14*(L14/M14)*24*30.4	=T14*0.05198	=R14+S14+U1
=45*J15	=Q15*(L15/M15)*8	=Q15*(L15/M15)*24*30.4	=T15*0.05198	=R15+S15+U1
=45*J16	=Q16*(L16/M16)*8	=Q16*(L16/M16)*24*30.4	=T16*0.05198	=R16+S16+U1
=45*J17	=Q17*(L17/M17)*8	=Q17*(L17/M17)*24*30.4	=T17*0.05198	=R17+S17+U1
=45*J18	=Q18*(L18/M18)*8	=Q18*(L18/M18)*24*30.4	=T18*0.05198	=R18+S18+U1
=45*J19	=Q19*(L19/M19)*8	=Q19*(L19/M19)*24*30.4	=T19*0.05198	=R19+S19+U1
=45*J20	=Q20*(L20/M20)*8	=Q20*(L20/M20)*24*30.4	=T20*0.05198	=R20+S20+U2
=45*J21	=Q21*(L21/M21)*8	=Q21*(L21/M21)*24*30.4	=T21*0.05198	=R21+S21+U2
=45*J22	=Q22*(L22/M22)*8	=Q22*(L22/M22)*24*30.4	=T22*0.05198	=R22+S22+U2
=45*J23	=Q23*(L23/M23)*8	=Q23*(L23/M23)*24*30.4	=T23*0.05198	=R23+S23+U2
=45*J24	=Q24*(L24/M24)*8	=Q24*(L24/M24)*24*30.4	=T24*0.05198	=R24+S24+U2
=45*J25	=Q25*(L25/M25)*8	=Q25*(L25/M25)*24*30.4	=T25*0.05198	=R25+S25+U2
=45*J26	=Q26*(L26/M26)*8	=Q26*(L26/M26)*24*30.4	=T26*0.05198	=R26+S26+U2
=45*J28	=Q28*(L28/M28)*8	=Q28*(L28/M28)*24*30.4	=T28*0.05198	=R28+S28+U2
=45*J29	=Q29*(L29/M29)*8	=Q29*(L29/M29)*24*30.4	=T29*0.05198	=R29+S29+U2
=45*J30	=Q30*(L30/M30)*8	=Q30*(L30/M30)*24*30.4	=T30*0.05198	=R30+S30+U3
=45*J31	=Q31*(L31/M31)*8	=Q31*(L31/M31)*24*30.4	=T31*0.05198	=R31+S31+U3

W	X	Y	Z	Aa
cost for January	cost for February	cost for March	cost for April	cost for May
=V5*0.637	=V5*(4113196/6085620)	=V5*(4226068/6085620)	=V5*(5647366/6085620)	=V5*(6911681/6085620)
=V6*0.637	=V6*(4113196/6085620)	=V6*(4226068/6085620)	=V6*(5647366/6085620)	=V6*(6911681/6085620)
=V7*0.637	=V7*(4113196/6085620)	=V7*(4226068/6085620)	=V7*(5647366/6085620)	=V7*(6911681/6085620)
=V8*0.637	=V8*(4113196/6085620)	=V8*(4226068/6085620)	=V8*(5647366/6085620)	=V8*(6911681/6085620)
=V9*0.637	=V9*(4113196/6085620)	=V9*(4226068/6085620)	=V9*(5647366/6085620)	=V9*(6911681/6085620)
=V10*0.63	=V10*(4113196/6085620)	=V10*(4226068/6085620)	=V10*(5647366/6085620)	=V10*(6911681/6085620)
=V11*0.63	=V11*(4113196/6085620)	=V11*(4226068/6085620)	=V11*(5647366/6085620)	=V11*(6911681/6085620)
=V12*0.63	=V12*(4113196/6085620)	=V12*(4226068/6085620)	=V12*(5647366/6085620)	=V12*(6911681/6085620)
=V13*0.63	=V13*(4113196/6085620)	=V13*(4226068/6085620)	=V13*(5647366/6085620)	=V13*(6911681/6085620)
=V14*0.63	=V14*(4113196/6085620)	=V14*(4226068/6085620)	=V14*(5647366/6085620)	=V14*(6911681/6085620)
=V15*0.63	=V15*(4113196/6085620)	=V15*(4226068/6085620)	=V15*(5647366/6085620)	=V15*(6911681/6085620)
=V16*0.63	=V16*(4113196/6085620)	=V16*(4226068/6085620)	=V16*(5647366/6085620)	=V16*(6911681/6085620)
=V17*0.63	=V17*(4113196/6085620)	=V17*(4226068/6085620)	=V17*(5647366/6085620)	=V17*(6911681/6085620)
=V18*0.63	=V18*(4113196/6085620)	=V18*(4226068/6085620)	=V18*(5647366/6085620)	=V18*(6911681/6085620)
=V19*0.63	=V19*(4113196/6085620)	=V19*(4226068/6085620)	=V19*(5647366/6085620)	=V19*(6911681/6085620)
=V20*0.63	=V20*(4113196/6085620)	=V20*(4226068/6085620)	=V20*(5647366/6085620)	=V20*(6911681/6085620)
=V21*0.63	=V21*(4113196/6085620)	=V21*(4226068/6085620)	=V21*(5647366/6085620)	=V21*(6911681/6085620)
=V22*0.63	=V22*(4113196/6085620)	=V22*(4226068/6085620)	=V22*(5647366/6085620)	=V22*(6911681/6085620)
=V23*0.63	=V23*(4113196/6085620)	=V23*(4226068/6085620)	=V23*(5647366/6085620)	=V23*(6911681/6085620)
=V24*0.63	=V24*(4113196/6085620)	=V24*(4226068/6085620)	=V24*(5647366/6085620)	=V24*(6911681/6085620)
=V25*0.63	=V25*(4113196/6085620)	=V25*(4226068/6085620)	=V25*(5647366/6085620)	=V25*(6911681/6085620)
=V26*0.63	=V26*(4113196/6085620)	=V26*(4226068/6085620)	=V26*(5647366/6085620)	=V26*(6911681/6085620)
=V28*0.63	=V28*(4113196/6085620)	=V28*(4226068/6085620)	=V28*(5647366/6085620)	=V28*(6911681/6085620)
=V29*0.63	=V29*(4113196/6085620)	=V29*(4226068/6085620)	=V29*(5647366/6085620)	=V29*(6911681/6085620)
=V30*0.63	=V30*(4113196/6085620)	=V30*(4226068/6085620)	=V30*(5647366/6085620)	=V30*(6911681/6085620)
=V31*0.63	=V31*(4113196/6085620)	=V31*(4226068/6085620)	=V31*(5647366/6085620)	=V31*(6911681/6085620)

Ab	Ac	Ad	Ae
cost for June	cost for July	cost for August	cost for September
=V5*(7875800/6085620)	=V5*(8897514/6085620)	=V5*(8430348/6085620)	=V5*(7319613/6085620)
=V6*(7875800/6085620)	=V6*(8897514/6085620)	=V6*(8430348/6085620)	=V6*(7319613/6085620)
=V7*(7875800/6085620)	=V7*(8897514/6085620)	=V7*(8430348/6085620)	=V7*(7319613/6085620)
=V8*(7875800/6085620)	=V8*(8897514/6085620)	=V8*(8430348/6085620)	=V8*(7319613/6085620)
=V9*(7875800/6085620)	=V9*(8897514/6085620)	=V9*(8430348/6085620)	=V9*(7319613/6085620)
=V10*(7875800/6085620)	=V10*(8897514/6085620)	=V10*(8430348/6085620)	=V10*(7319613/6085620)
=V11*(7875800/6085620)	=V11*(8897514/6085620)	=V11*(8430348/6085620)	=V11*(7319613/6085620)
=V12*(7875800/6085620)	=V12*(8897514/6085620)	=V12*(8430348/6085620)	=V12*(7319613/6085620)
=V13*(7875800/6085620)	=V13*(8897514/6085620)	=V13*(8430348/6085620)	=V13*(7319613/6085620)
=V14*(7875800/6085620)	=V14*(8897514/6085620)	=V14*(8430348/6085620)	=V14*(7319613/6085620)
=V15*(7875800/6085620)	=V15*(8897514/6085620)	=V15*(8430348/6085620)	=V15*(7319613/6085620)
=V16*(7875800/6085620)	=V16*(8897514/6085620)	=V16*(8430348/6085620)	=V16*(7319613/6085620)
=V17*(7875800/6085620)	=V17*(8897514/6085620)	=V17*(8430348/6085620)	=V17*(7319613/6085620)
=V18*(7875800/6085620)	=V18*(8897514/6085620)	=V18*(8430348/6085620)	=V18*(7319613/6085620)
=V19*(7875800/6085620)	=V19*(8897514/6085620)	=V19*(8430348/6085620)	=V19*(7319613/6085620)
=V20*(7875800/6085620)	=V20*(8897514/6085620)	=V20*(8430348/6085620)	=V20*(7319613/6085620)
=V21*(7875800/6085620)	=V21*(8897514/6085620)	=V21*(8430348/6085620)	=V21*(7319613/6085620)
=V22*(7875800/6085620)	=V22*(8897514/6085620)	=V22*(8430348/6085620)	=V22*(7319613/6085620)
=V23*(7875800/6085620)	=V23*(8897514/6085620)	=V23*(8430348/6085620)	=V23*(7319613/6085620)
=V24*(7875800/6085620)	=V24*(8897514/6085620)	=V24*(8430348/6085620)	=V24*(7319613/6085620)
=V25*(7875800/6085620)	=V25*(8897514/6085620)	=V25*(8430348/6085620)	=V25*(7319613/6085620)
=V26*(7875800/6085620)	=V26*(8897514/6085620)	=V26*(8430348/6085620)	=V26*(7319613/6085620)
=V28*(7875800/6085620)	=V28*(8897514/6085620)	=V28*(8430348/6085620)	=V28*(7319613/6085620)
=V29*(7875800/6085620)	=V29*(8897514/6085620)	=V29*(8430348/6085620)	=V29*(7319613/6085620)
=V30*(7875800/6085620)	=V30*(8897514/6085620)	=V30*(8430348/6085620)	=V30*(7319613/6085620)
=V31*(7875800/6085620)	=V31*(8897514/6085620)	=V31*(8430348/6085620)	=V31*(7319613/6085620)

Af	Ag	Ah
cost for October	cost for November	cost for December
=V5*(6802178/6085620)	=V5*(4847517/6085620)	=V5*(4079389/6085620)
=V6*(6802178/6085620)	=V6*(4847517/6085620)	=V6*(4079389/6085620)
=V7*(6802178/6085620)	=V7*(4847517/6085620)	=V7*(4079389/6085620)
=V8*(6802178/6085620)	=V8*(4847517/6085620)	=V8*(4079389/6085620)
=V9*(6802178/6085620)	=V9*(4847517/6085620)	=V9*(4079389/6085620)
=V10*(6802178/6085620)	=V10*(4847517/6085620)	=V10*(4079389/6085620)
=V11*(6802178/6085620)	=V11*(4847517/6085620)	=V11*(4079389/6085620)
=V12*(6802178/6085620)	=V12*(4847517/6085620)	=V12*(4079389/6085620)
=V13*(6802178/6085620)	=V13*(4847517/6085620)	=V13*(4079389/6085620)
=V14*(6802178/6085620)	=V14*(4847517/6085620)	=V14*(4079389/6085620)
=V15*(6802178/6085620)	=V15*(4847517/6085620)	=V15*(4079389/6085620)
=V16*(6802178/6085620)	=V16*(4847517/6085620)	=V16*(4079389/6085620)
=V17*(6802178/6085620)	=V17*(4847517/6085620)	=V17*(4079389/6085620)
=V18*(6802178/6085620)	=V18*(4847517/6085620)	=V18*(4079389/6085620)
=V19*(6802178/6085620)	=V19*(4847517/6085620)	=V19*(4079389/6085620)
=V20*(6802178/6085620)	=V20*(4847517/6085620)	=V20*(4079389/6085620)
=V21*(6802178/6085620)	=V21*(4847517/6085620)	=V21*(4079389/6085620)
=V22*(6802178/6085620)	=V22*(4847517/6085620)	=V22*(4079389/6085620)
=V23*(6802178/6085620)	=V23*(4847517/6085620)	=V23*(4079389/6085620)
=V24*(6802178/6085620)	=V24*(4847517/6085620)	=V24*(4079389/6085620)
=V25*(6802178/6085620)	=V25*(4847517/6085620)	=V25*(4079389/6085620)
=V26*(6802178/6085620)	=V26*(4847517/6085620)	=V26*(4079389/6085620)
=V28*(6802178/6085620)	=V28*(4847517/6085620)	=V28*(4079389/6085620)
=V29*(6802178/6085620)	=V29*(4847517/6085620)	=V29*(4079389/6085620)
=V30*(6802178/6085620)	=V30*(4847517/6085620)	=V30*(4079389/6085620)
=V31*(6802178/6085620)	=V31*(4847517/6085620)	=V31*(4079389/6085620)

Ai	Aj	Ak	Al	Am	An
	Total yearly Energy Cost	yearly water production millions of gallons		well #	cost per acre foot
	=SUM(W5:AI5)	=(H5*365.25*60*24)/1000000		53971	=AJ5/(AK5*1000000/326000)
	=SUM(W6:AI6)	=(H6*365.25*60*24)/1000000		53974	=AJ6/(AK6*1000000/326000)
	=SUM(W7:AI7)	=(H7*365.25*60*24)/1000000		53973	=AJ7/(AK7*1000000/326000)
	=SUM(W8:AI8)	=(H8*365.25*60*24)/1000000		53970	=AJ8/(AK8*1000000/326000)
	=SUM(W9:AI9)	=(H9*365.25*60*24)/1000000		53980	=AJ9/(AK9*1000000/326000)
	=SUM(W10:AI10)	=(H10*365.25*60*24)/100000		53979	=AJ10/(AK10*1000000/326000)
	=SUM(W11:AI11)	=(H11*365.25*60*24)/100000		53978	=AJ11/(AK11*1000000/326000)
	=SUM(W12:AI12)	=(H12*365.25*60*24)/100000		53969	=AJ12/(AK12*1000000/326000)
	=SUM(W13:AI13)	=(H13*365.25*60*24)/100000		53977	=AJ13/(AK13*1000000/326000)
	=SUM(W14:AI14)	=(H14*365.25*60*24)/100000		53968	=AJ14/(AK14*1000000/326000)
	=SUM(W15:AI15)	=(H15*365.25*60*24)/100000		53967	=AJ15/(AK15*1000000/326000)
	=SUM(W16:AI16)	=(H16*365.25*60*24)/100000		53976	=AJ16/(AK16*1000000/326000)
	=SUM(W17:AI17)	=(H17*365.25*60*24)/100000		53966	=AJ17/(AK17*1000000/326000)
	=SUM(W18:AI18)	=(H18*365.25*60*24)/100000		53965	=AJ18/(AK18*1000000/326000)
	=SUM(W19:AI19)	=(H19*365.25*60*24)/100000		53975	=AJ19/(AK19*1000000/326000)
	=SUM(W20:AI20)	=(H20*365.25*60*24)/100000		53986	=AJ20/(AK20*1000000/326000)
	=SUM(W21:AI21)	=(H21*365.25*60*24)/100000		53985	=AJ21/(AK21*1000000/326000)
	=SUM(W22:AI22)	=(H22*365.25*60*24)/100000		53985	=AJ22/(AK22*1000000/326000)
	=SUM(W23:AI23)	=(H23*365.25*60*24)/100000		53985	=AJ23/(AK23*1000000/326000)
	=SUM(W24:AI24)	=(H24*365.25*60*24)/100000		53985	=AJ24/(AK24*1000000/326000)
	=SUM(W25:AI25)	=(H25*365.25*60*24)/100000		53985	=AJ25/(AK25*1000000/326000)
	=SUM(W26:AI26)	=(H26*365.25*60*24)/100000		53985	=AJ26/(AK26*1000000/326000)
	=SUM(W28:AI28)	=(H28*365.25*60*24)/100000		lift R7	=AJ28/(AK28*1000000/326000)
	=SUM(W29:AI29)	=(H29*365.25*60*24)/100000		lift R9	=AJ29/(AK29*1000000/326000)
	=SUM(W30:AI30)	=(H30*365.25*60*24)/100000		lift R15	=AJ30/(AK30*1000000/326000)
	=SUM(W31:AI31)	=(H31*365.25*60*24)/100000		lift R38	=AJ31/(AK31*1000000/326000)
Totals	=SUM(AJ5:AJ32)	=SUM(AK5:AK26)			
	9,209,148.85	18,420.17		avg. cost/acft	

Ao

total
acre feet

=AK5*1000000/326000
=AK6*1000000/326000
=AK7*1000000/326000
=AK8*1000000/326000
=AK9*1000000/326000
=AK10*1000000/326000
=AK11*1000000/326000
=AK12*1000000/326000
=AK13*1000000/326000
=AK14*1000000/326000
=AK15*1000000/326000
=AK16*1000000/326000
=AK17*1000000/326000
=AK18*1000000/326000
=AK19*1000000/326000
=AK20*1000000/326000
=AK21*1000000/326000
=AK22*1000000/326000
=AK23*1000000/326000
=AK24*1000000/326000
=AK25*1000000/326000
=AK26*1000000/326000

=AK28*1000000/326000
=AK29*1000000/326000
=AK30*1000000/326000
=AK31*1000000/326000

=SUM(AO5:AO26)
56,504 acre feet
=AJ33/AO33
$162.98/acre foot

B. LVVWD Monthly Water Demand

C. Power Rate Schedule

MASTER

Large General Service
SCHEDULE LGS

AVAILABLE - Throughout the system from existing facilities of suitable character and adequate capacity.

APPLICABLE - To all uses of electric service where consumption of energy exceeds 3,500 kWh in any one month and where the demand exceeds 299 kW in any one month and for which no specific schedule is provided, all service will be supplied at one point of delivery and measured through one kilowatthour meter. Not applicable to standby, resale, temporary, shared, or mixed class of service. Not applicable to supplemental service unless Customer is a Qualifying Facility under Title 18, Code of Federal Regulations, Section 292.201 through 292.207.

CHARACTER - Alternating current, 60 cycles, single phase, 120/240 volts; or three phase, three wire, 240 volts or greater; or combined single phase and three phase, four wire wye, 120/208 volts or greater; or combined single phase and three phase, four wire delta, 120/240 volts or greater as described in Company's Electric Service Rules.

MONTHLY BILL

RATE

AT SECONDARY DISTRIBUTION VOLTAGE

CUSTOMER CHARGE - $3.50 per Bill

DEMAND CHARGE

Summer On-Peak Period	$ 8.07 per kW
Plus Off-Peak Period	$ 0.11 per kW
All Other Periods	$ 1.10 per kW

ENERGY CHARGE[1,2]

Summer On-Peak Period	$ 0.07085 per kWh
Plus Off-Peak Period	$ 0.03376 per kWh
All Other Periods	$ 0.03973 per kWh

AT PRIMARY DISTRIBUTION VOLTAGE

CUSTOMER CHARGE - $3.50 per Bill

DEMAND CHARGE

Summer On-Peak Period	$ 7.97 per kW
Plus Off-Peak Period	$ 0.11 per kW
All Other Periods	$ 0.97 per kW

[1]Included in all energy rates is a Base Tariff Energy Rate of $0.02586 per kWh.
[2]Included in all energy rates is $0.00020 per kWh for recovery of expenses incurred in developing a plan for resources pursuant to NRS 704.751.

Continued

Issued:

Effective:

January 24, 1992

Advice No: 136 (Amended)

Issued By:
Richard L. Hinckley
Vice President

FILING ACCEPTED
EFFECTIVE
JAN 24 1992
PUBLIC SERVICE COMMISSION
OF NEVADA

Large General Service (Continued)

AT PRIMARY DISTRIBUTION VOLTAGE (Continued)

ENERGY CHARGE[1,2]

Summer On-Peak Period	$ 0.06699 per kWh
Plus Off-Peak Period	$ 0.03302 per kWh
All Other Periods	$ 0.03875 per kWh

AT TRANSMISSION VOLTAGE

CUSTOMER CHARGE - $3.50 per Bill

DEMAND CHARGE

Summer On-Peak Period	$ 7.18 per kW
Plus Off-Peak Period	$ 0.11 per kW
All Other Periods	$ 0.63 per kW

ENERGY CHARGE[1,2]

Summer On-Peak Period	$ 0.06328 per kWh
Plus Off-Peak Period	$ 0.03254 per kWh
All Other Periods	$ 0.03810 per kWh

[1]Included in all energy rates is a Base Tariff Energy Rate of $0.02586 per kWh.
[2]Included in all energy rates is $0.00020 per kWh for recovery of expenses incurred in developing a plan for resources pursuant to NRS 704.751.

DEFERRED ENERGY ACCOUNTING ADJUSTMENT - All service under this schedule will be subject to the Deferred Energy Accounting Adjustment described in P.S.C.N. Sheet No. 29. The adjustment amount shall be the product of the kilowatthours of service rendered times the applicable adjustment per kilowatthour.

TIME PERIODS

SEASON	ON-PEAK	OFF-PEAK
Summer (June - September)	10AM - 10PM Daily	All Other Hours
All Other (October - May)		

MEASURED DEMAND - The customer's average kilowatt load measured during the fifteen minute period of maximum use during the period, as adjusted for Power Factor.

Continued

MASTER

Nevada Power Company
P.O. Box 230
Las Vegas, Nevada 89151
Tariff No. 1-B
cancels
Tariff No. 1-A (withdrawn)

Third Revised P.S.C.N. Sheet No. 17

Cancelling Second Revised P.S.C.N. Sheet No. 17

Large General Service (Continued)

POWER FACTOR - If the average power factor during the month is less than 80% as determined at the Company's option by permanent measurement or by test under normal operating conditions, the measured kilowatt load for the determination of Demand will be adjusted by multiplying by 85% and dividing by the average power factor.

MINIMUM - The Minimum Bill is the customer charge.

LATE CHARGE - The Monthly Bill is due and payable as of the date of presentation. A late charge of 5% on the first $200 of the Monthly Bill, plus 2% of any balance above $200, will be added to the bill if it is not paid within 15 days of date of presentation.

Issued: Effective: January 2, 1984 Advice No.: 46	Issued By: Charles A. Lenzie President	PUBLIC SERVICE COMMISSION OF NEVADA EFFECTIVE JAN 2 1984 ACCEPTED FOR FILING

CUFFLIN & ASSOC.	OVERTON [illegible]
Dept.	Phone # 1-397-2512
Fax # 1-434-1725	Fax # 1-397-2583

RATE S
OVERTON POWER DISTRICT
EFFECTIVE 1 OCTOBER 1991

RESIDENTIAL: RATE 1

CUSTOMER CHARGE	$9.35 PER MONTH
FIRST 500 KWH	$0.032 PER KWH
NEXT 1,500 KWH	$0.039 PER KWH
OVER 2,000 KWH	$0.048 PER KWH

IRRIGATION: RATE 7

CUSTOMER CHARGE	$11.55 PER MONTH
FIRST 300 KWH PER HP	$00.041 PER KWH
ALL ADDITIONAL KWH	$00.035 PER KWH

GENERAL SERVICE: (NON-DEMAND METERED) RATE 3

CUSTOMER CHARGE	$16.50 PER MONTH
ALL KWH	$00.047 PER KWH

GENERAL SERVICE: (DEMAND METERED) RATE 8

CUSTOMER CHARGE	$16.50 PER MONTH
DEMAND CHARGE OF	
FIRST 25 KW OR LESS	$ 8.25 PER KW
ALL KW IN EXCESS OF 25	$ 3.85 PER KW
ENERGY CHARGE	
FIRST 300 KWH PER KW	$00.033 PER KWH
ALL ADDITIONAL KWH	$00.028 PER KWH

A PURCHASED POWER AND FUEL ADJUSTMENT CLAUSE WILL BE ADDED TO THE RATE SCHEDULES.

NOTE: ANY NON-DEMAND METERED CUSTOMER USING 15,000 KWH OR MORE IN ANY THREE CONSECUTIVE MONTHS SHALL HAVE A DEMAND METER INSTALLED AND BE PLACED ON THE GENERAL SERVICE RATE 8.

NOTE: THE FLAT RATE FOR DUSK TO DAWN LIGHTS WILL INCREASE BY 10% TO $2.65 PER MONTH.

Lincoln County
Power District

Lincoln County
Power District

DATE ADOPTED:	1/7/92	ISSUED BY:	William R. Orr - President Lincoln County Power District No. 1
DATE EFFECTIVE:	3/1/92		

LINCOLN COUNTY POWER DISTRICT NO. 1

RATE SCHEDULE

Rate Code: C&I-I

COMMERCIAL & INDUSTRIAL 50 – 1000 KVA

APPLICABILITY: Applicable to all Commercial & Industrial Consumers (50 – 1000 KVA) receiving service from the District's existing facilities, subject to the established rules and regulations of the District.

TYPE OF SERVICE: Commercial & Industrial service shall be provided as three-phase, 60 hertz, and at the available secondary voltage.

RATES:

Customer Charge:
$ 40.00 per meter per month

Energy Charge:
$ .0124 per KWH per month

Demand Charge:
$ 5.15 per KW per month

Minimum Charge:
The monthly minimum charge shall be the "Customer Charge" of $ 40.00 per meter. There shall be no KWH associated with the minimum charge.

POWER FACTOR: The Consumer agrees to maintain a 95% leading or lagging power factor.

SPECIAL CONDITIONS: (*)

Applicable only to consumers that are assessed a "Horsepower Charge", "Capacity Charge", "Facility Charge", "Line Rental Charge", or those which are served under a "Special Contract".

(*) Exhibit attached, if applicable.

DATE ADOPTED: 1/7/92

DATE EFFECTIVE: 3/1/92

ISSUED BY: [signature]
William R. Orr – President
Lincoln County Power District No. 1

Mt. Wheeler Power

LARGE GENERAL SERVICE

RATE CODE LGS

Attn: Chuck Stringer

APPLICABILITY:

Applicable throughout the system from existing facilities of suitable character and adequate capacity to all commercial consumers requiring a minimum of 50 KVA of transformer capacity.

Applicable to all uses of electric service for which no other rate schedule is provided. In the event any consumer's demand exceeds 6,500 kW, Mt. Wheeler Power, Inc. reserves the right to reclassify the service to the consumer to another rate schedule to be established by the Board. All service will be supplied at one point of delivery and measured through one kilowatt hour meter.

TYPE OF SERVICE:

Alternating current, 60 cycles, single or polyphase, of standard distribution voltages available.

RATES:

Customer Charge:

$45.00 per meter per month.

Demand Charge:
$8.00 per kW per month.

Energy Charge per Month:

All kWh $.05198 per kWh

Minimum Charge:

The monthly minimum charge shall be the demand charge plus the "Customer Charge" of $45.00 per meter. There shall be no kWh associated with the Customer Charge.

SPECIAL CONDITIONS:

Billing Demand:

The billing demand for any billing period shall be the greater of the measured demand for the current period or fifty percent (50%) of the highest billing demand established by the customer during the preceding eleven (11) months.

EFFECTIVE DATE: JANUARY 1, 1992

ISSUED BY: John P. Wheeler
John P. Wheeler, General Manager

D. Electrical Infrastructure Cost Analysis

ELECTRICAL INFRASTRUCTURE COST ANALYSIS

The cost to construct an electrical transmission system of sufficient load necessary to operate the system developed in this scenario would be divided by Nevada Power (Builder Services Division), Overton Power District, Lincoln County Power District and Mount Wheeler Power. Each of these electrical utilities were asked to develop a cost estimate based on the well field, pumping lift locations (by Township and Range) and horsepower ratings (minimum 100 horsepower/well) supplied by Mifflin and Associates. With the exception of the Virgin River ground-water applications each well field location conforms to the locations selected by the Las Vegas Valley Water District and members of importation cooperative. It must be stressed that not all of the application locations listed by the district were used in this study scenario, only those deemed of best hydrologic, economic, and quantities necessary to fulfill the cooperatives plan to export 190,800 acre ft/year. Therefore, the electrical purveyors developed cost estimates that parralleled those areas evaluated in this study, *not* all of the water districts application locations.

The cost to construct the electrical support system by Phase:

Phase 1 is estimated to cost $12,753,000.

Overton Power	$4,750,000.	verbal communication, Brandon Fowler
Nevada Power	3,940,000.	verbal communication, Don Knight
Lincoln County Power District	313,000.	written communication, Louis Cole
*Other	3,750,000.	

*Currently, there is not an electrical purveyor servicing the Upper Three Lakes Hydrologic Basin well field areas; therefore, these costs were estimated by Mifflin and Associates. It was estimated that a 69KV line from Indian Springs at $150,000/mile and a 150,000 substation line would be minimal construction.

Phase 2

Lincoln County Power District	$ 33,861.

Included within the construction cost is a new 230 KV main line from Reed Gardner to Pioche at a cost of $250,000/mile.

Phase 3

Lincoln Power	$ 2,252,000.	written communication, Louis Cole
Mt. Wheeler	17,841,250.	written communication, Randy Ewell

Phase 4

Mt. Wheeler	$63,546,500	written communication, Randy Ewell

Appendix VI

Right-of-Way Annual Cost

ESTIMATE OF RIGHT-OF-WAY COSTS

This outlines the total number of acres that would be directly and permanently impacted by the development of this scenario; it includes exploration and production drilling, well maintenance, ground-water monitoring, pipeline construction and maintenance. This analysis does not consider the right-of-way requirements of the electrical support systems (a cost carried out by the vendors).

There are nine basic assumptions used to tabulate the total acres involved:

1. All pipeline right-of-ways are 150' wide.
2. Each production well site and monitoring well site is maintained on 1 acre.
3. Roads to well fields and production well sites would utilize the pipeline right-of-way corridor.
4. Booster Pumping stations V7, V2, M31, M37, R7, R9 and R15 would require a 2 acre right-of-way each.
5. Each exploration well would be converted into a monitoring well, and located within 1/4 mile of the well field production wells.
6. Roads to monitoring well locations would require a minimum right-of-way of 50'.
7. All right-of-way costs are calculated at the BLM general rate of $3.00 per acre per year.
8. Right-of-way within the Desert Game Range and the Nellis Bombing Range is possible.
9. Construction staging areas have been considered temporary and not calculated.

SUMMARY

Phase	Main Pipeline	Accumulation pipeline	Production/ monitoring wellsites	Roads	Lift stations	total acres	Total annual cost
phase1	3346	145	290	348		4129	12388
phase2	3366	218	193	230		4008	4008
phase3	4563	259	240	242		5305	5305
phase4	3844	241	267	291		4643	4643
total	15119	864	990	1112	14	18099	54298

Calculations of right of way cost. Pipeline right of way assumed to be 100 feet.

	Las Vegas Valley	Virgin River	White River
phase one			
	124751	133806	50010
	14234	14913	26892
	24020	28972	79793
	7491	87111	27195
	43827	8807	35255
	6455	29197	5555
	47231	55888	24515
	14117		21796
	9842		3399
	7164		
	32406		
	6903		
	338441 feet	358694 feet	274410 feet

phase two

Meadow Valley		White River	
4807		130276	
93114		19933	
50064		7301	
21683		31993	
74349		19958	
109323		34631	
22017		122700	
25816		4414	
31559		43309	
17745		49004	
450477	feet	3236	
		3118	
		28627	
		14277	
		11670	
		2600	
		527047	feet

phase three

Meadow Valley

128906
41164
28864
35788
83872
30625
36023
44176
3994
28703
14216
19499
5892
4471
43908
19316
12498
13494
88460
22274
5902
11197
72489
12586
18935
10704
12373
22829
9717
7170
15175
6648
5132
5325
12515
9397
12518
2261
16949

975985 feet

White River

128906
41164
28864
35788
83872
30625
349219 feet

phase four

71567
151084
73973
97411
39533
44033
102313
122377
22932
15930
27348
12584
13944
18553
13310
12200
16601
18827
8263
9272
34136
40100
22929
3650
7793
45272
3660
21181
2377
3286
2168
17962
4639
4047
11154
1116409 feet

Appendix VII

Population Projections, Demands for Water, and Water Costs

DEMAND FOR WATER

The demand for water by Las Vegas Valley has been forecast by several groups, including the WRMI Technical Committee and the Planning Information Corporation (for updates of Clark County's 208 Water Quality Management Plan). The Las Vegas Water District water application and development plans latest scenario for water development includes four phases, starting in 2007 and ending in 2026, with 32,561 ac.ft. of pumped water in Phase I (2007-2012), an additional 29,667 ac. ft. in Phase II (2013-2017), an additional 78,148 ac. ft. in Phase III (2018-2025), including a reduction of 4,000 ac. ft. of pumping in Basins 216 and 217 at the end of Phase II, and a final phase, Phase IV. providing an additional 54,269 ac. ft. in 2025. In addition, there are 60,000 ac.ft. of water provided by the development of Virgin River Water.

This water development was compared to the population projections from the REMI model's most recent "run" by the Center for Business and Economic Research at the University of Nevada Las Vegas (R. Keith Schwer - Draft Copy for Review). These estimates increased substantially over the base REMI estimates (2,010,531 population in 2030 as compared to 1,781,348).

Table 1. Population, water demand, filings and shortfalls or overages (Includes consideration of 70,000 ac. ft. of water developed in addition to pumpage).

Variable	1990	1995	2000	2005	2010
Clrk Co Pop (REMI Base)	794,396	901,721	989,881	1,060,549	1,155,190
Clrk Co Pop (REMI Adj)	800,000	950,000	1,120,000	1,240,000	1,410,000
Demand per cap (w/o con)	0.40625	0.423158	0.424107	0.435484	0.41844
Demand per cap (con 1)	0.40625	0.4	0.383929	0.383065	0.368794
Demand per cap (con 2)	0.40625	0.389474	0.366071	0.362903	0.340426
Filings (Pumpage)	0	0	0	0	24500
Shrtfl/ovrg w/o cons*	-157,000	-80,000	-7,000	-58,000	83,500
Shrtfl/ovrg con 1*	-157,000	-102,000	-52,000	-7,000	13,500
Shrtfl/ovrg con 2*	-157,000	-112,000	-72,000	-32,000	-2,000

Variable	1990	1995	2000	2005
Clrk Co Pop (REMI Base)	1,246,880	1,327,830	1,396,472	1,452,320
Clrk Co Pop (REMI Adj)	1,570,000	1,750,000	1,830,000	2,000,000
Demand per cap (w/o con)	0.407643	0.388571	0.396175	0.385
Demand per cap (con 1)	0.350318	0.331429	0.333333	0.3175
Demand per cap (con 2)	0.324841	0.302857	0.297814	0.28
Filings (Pumpage)	44,500	118,000	180,800	180,800
Shrtfl/ovrg w/o cons*	113,500	80,000	62,200	107,200
Shrtfl/ovrg con 1*	23,500	-20,000	-52,800	-27,800
Shrtfl/ovrg con 2*	-16,500	-70,000	-117,800	-102,800

The Shortfalls are positive values (demand exceeds supply), and the overages are negative (demand is less than supply).

Variable	2015	2020	2025	2030
Clrk Co Pop (REMI Base)	1246880	13278301	1396472	1452320
Clrk Co Pop (REMI Adj)	1570000	1750000	1830000	2000000
Water Demand (w/o consv)	640000	680000	725000	770000
Water Demand (cons lev 1)	550000	580000	610000	635000
Water Demand (cons lev 2)	510000	530000	545000	560000
Demand per cap (w/o con)	0.407643	0.388571	0.396175	0.385
Demand per cap (con 1)	0.350318	0.331429	0.333333	0.3175
Demand per cap (con 2)	0.324841	0.302857	0.297814	0.28
Current ContractsAdded	412000	412000	412000	412000
Supply (70k)	70000	70000	70000	70000
Shortfall (w/o con)	158000	198000	243000	288000
Shortfall (con 1)	68000280	98000	128000	153000
Shortfall (con 2)	00	48000	63000	78000
Filings (Pumpage)	44500	118000	180800	180800
Shrtfl/ovrg w/o cons	113500	80000	62200	107200
Shrtfl/ovrg con 1	23500	-20000	-52800	-27800
Shrt/ovrg con 2	-16500	-70000	-117800	-102800
OTHER SCENARIOIS				
Demand w/old pop w/o con	508282.3	515956.8	553247.1	559143.2
Demand w/old pop con 1	436805.1	440080.8	465490.7	461111.6
Demand w/old pop con 2	405037.5	402142.8	415889.2	406649.6
Shrtfl old pop w/o con	26282.29	33956.8	71247.1	77143.2
Shrtfl old pop con 1	-45194.9	-41919.2	-16509.3	-20888.4
Shrtfl old pop con 2	-76962.5	-79857.2	-66110.8	-75350.4
Shrtfl/ovrg olp w/o con	-18217.7	-84043.2	-109553	-103657
Shrtfl/ovrg olp con 1	-89694.9	-159919	-197309	-201688
Shrtfl/ovrg olp con 2	-121463	-197857	-246911	-256150

The use of water under both scenarios (with and without conservation) declines, between 1990 and 2005, from .406 ac. ft. per capita per year at the current rate (or about 362 gallons per capita per day), which is slightly above the LVVWD quoted use rate of .375 ac. ft. per capita per year (at 335 gallons per capitaper day) to, 385 ac. ft. per capita per day, which is very close to the current use rate. At this rate of water use, shortfalls appear in 2005 without pumping and continue to occur, even as pumping increases to the full application level of 180,800 ac. ft. per year. Note that the consumptive use is not a linear function of population, although they fall within a relative narrow range.

Under the conservation scenario, the use rates for Las Vegas fall from the .406 ac. ft. per capita per year to .3175. This use rate is about 300 gallons per capita per day, and still somewhat higher than Phoenix or Albuquerque. The Conservation 2 level of consumption reduces to about .28 ac. ft. per capita per year, which is about 264 gallons per capita per day, and is consistent with Phoenix and Albuquerque. At the Conservation 2 level, the Phase IV stage would probably not be required until after the planning period of 2030.

FINANCING THE COST OF DEVELOPMENT

The cost of development will fall into seven categories: 1) the cost of developing the wells, 2) the cost of pumping the water, 3) the cost to maintain the wells, 4) the cost to construct gathering and main trunk pipelines, 5) the cost of providing the power infrastructure (transmission lines and substations) and 6) the cost to construct an in valley distribution system 7) the cost for general administration. Of these costs, pumping, administration and maintenance are variable with the amount of water delivered. The remaining costs are the fixed costs of developing the delivery system. Estimates of these costs are described in the other Appendices. The task of determining the delivered costs of water to users, and determining the price of that water, is discussed below.

Note that the phasing of the project presents some problems with respect to the staging of water pricing and cost recovery. It was assumed that each phase would require a five-year construction period, followed by a 50-year amortization period (that is, the cost each phase is assumed to be paid off at the end of a 50-year period). Thus, Phase I construction would start in 2002 with water delivered in 2007; Phase II construction would start in 2008 with water delivered in 2013; Phase III construction would start in 2012 with water delivered in 2015, and Phase IV construction would start in 2020, with water delivered in 2025. Cost repayment is assumed to begin with the date of water delivery (that is, a grace period is assumed during construction) and continue to the end of the 50-year period. Thus Phase I would be paid off in 2057; Phase II, in 2063; Phase III, in 2067, and Phase IV in 2075. No present-value (in terms of 1990) was used, because financing was assumed to begin with the start of each phase and end with the end of the 50-year period. An interest rate of 6 percent was assumed, consistent with current yields on tax-free municipal bonds in the bond market. Whether all these assumptions are valid depends on the ability of the Las Vegas Water district to obtain financing for the project.

In addition, three alternatives were used to examine cost recovery and water pricing. First, the water developed in each phase was "priced" only for that phase. Second, during periods in which an overlap of the 50-year periods occurred, the water was priced as an average over all relevant phases. Finally, the water was priced so as to spread the cost recovery for the new development over the total water supply to Las Vegas, including the currently-delivered 270,000 ac. ft. this implies that current users would be charged for a part of the development.

Well and Pump Development Costs

The costs of well development and infrastructure may be found in Appendix IV. In order to examine these costs, the life of both wells and pumps were examined. It was assumed that all exploratory and above ground costs would be one-time, initial costs, but that wells would have to be replaced every 25 years and pumps every 10 years. Not that, since the assumed payoff is 50 years, no cost was estimated for the replacement of either wells or pumps after that 50-year period (that is only 4 pump and 1 well replacement was used to annualize the costs). Thus, the cost included replacement costs and wells during the 50-year life. In each case, the present value of the stream of well and pump cost was determined for the beginning of the 50-year period. That cost was annualized using 6% interest. These costs are found in Table X2.

Table X2. Cost of Wells and Pumps (/acre ft /year)

Phase	Capitol Cost Present Value	Phase Only Amortized /acre ft	All Phases Amortized /acre ft	Total Water Supply /acre ft
I	$77,126,808	$149.63	$149.63	$18.11
II	44,806,083	95.40	123.78	28.53
III	89,821,646	72.60	95.29	32.60
IV	89,768,185	104.49	97.85	40.99

Note that, while the cost spread over all phases declines with the last two phases of the project, as a result of the greater amount of water delivered per dollar cost, the cost over the total supply rises as the new water becomes increasingly dominant in the average cost of total water.

Electric Pumping Costs

As suggested, pumping costs are variable. They have been estimated at $115.00 /acre ft for Phase I water; $25.00 /acre ft for Phase II water; $133.00 /acre ft for Phase III water, and $163.00 /acre ft for Phase IV water. These costs vary with the expected depth to water and the lift required to deliver water from closed basins to the main pipeline. They also include the cost of lifting the water in the pipeline over high terrain. Since these costs are per acre foot whenever delivered, no discounting or amortization is required. Table XI indicates the various cost recovery "prices" for pumping.

Table X1. Electric Pump Costs

Phase	Direct Phase	Total New Development	Total Water Supply
I	$115.00	$114.89	$12.36
II	25.00	72.26	13.54
III	133.00	105.84	34.04
IV	163.00	121.78	51.02

Well Maintenance Costs

The costs associated with the maintenance of the well fields will be variable depending on the time of year and water delivered. The maintenance costs were determined by estimating the current cost of the water district well field. It is estimated that the district spends $29/acre-ft maintaining the wells it operates.

Pipeline Costs

The most expensive part of the project is the development of pipelines to carry the water. The costs include pipeline construction, construction of lifting stations from one basin to another, and the cost of pressure reduction stations. Once again, each phase was treated as a separate 55-year horizon (with construction). The same annualization procedures were used on pipeline costs as on wells and pumps. These costs are listed in Table X3.

Table X3. Pipeline Costs /acre ft /year

Phase	Capital Costs Present Value	Phase Only Amortized /acre ft	All Phases Amortized /acre ft	Total Water Supply /acre ft
I	$378,533,000	$ 734.35	$141.22	$ 17.09
II	616,723,000	1,313.15	699.93	161.33
III	866,920,000	700.74	700.38	239.60
IV	620,777,000	722.57	706.57	295.98

Again, the cost spread over new water declines as the last two phases are built, due to the relatively large amount of water provided. However, the costs over the total water delivered rises, again because the new, more expensive water becomes a larger proportion of the total water delivered. Further, it would be impossible to develop either Phase III or Phase IV first at the costs presented, because the pipeline costs for Phase I and Phase II are, in large measure, necessary to provide transport of water from the wellfields in Phases III and IV to Las Vegas. These alternatives were examined briefly, and the suggested phasing appears to be the least-cost approach.

Transmission Line and Substation Costs

Table X4. Transmission Line and Substation Costs for New Loads /acre ft /year

Phase	Capital Costs Present Value	Phase Only Amortized /acre ft	All Phases Amortized /acre ft	Total Water Supply /acre ft
I	$ 12,753,000	$ 24.74	$ 24.74	$ 2.99
II	33,861,000	72.10	47.32	10.91
III	20,093,250	16.24	30.02	10.27
IV	63,546,500	73.97	42.27	17.71

Valley Infrastructure Costs

The cost of construction of a valley distribution system is estimated by using the current indebtness of the water district as the cost of construction of the existing valley delivery system. This translates into $543.00/acre ft for each acre foot the district delivers. The construction cost when related to total water delivery and amoritized for the life of the project is $34.30.

Table X5. Valley Infrastructure Cost

Phase	Capitol Cost Present Value	Phase Only Amortized /acre ft	All Phases Amortized /acre ft	Total Water Supply /acre ft
I	$17,682,577	$34.40	$34.40	$ 4.15
II	$16,110,961	34.40	34.40	7.91
III	$42,439,053	34.40	34.40	11.74
IV	$29,471,323	34.40	34.40	14.37

General Operational Costs

The general operational costs have been estimated and include, maintenance of structures, purification, administration, transmission and distribution, $112/acre ft..

Environmental Impact Statement Costs

It was assumed that a single, system-wide EIS would be required at 1% of the project costs, or $30,204,334. This cost was annualized over the total water delivered (190,800 ac. ft.), for a cost of $9.79/acre ft /year. These costs are included in the total cost table.

Total Costs

Table X6 summarizes total costs of the project by Phase as above. To arrive at a typical household water fee per month, the values in Table X5 should be divided by 12.

Table X6. Summary of Costs /acre ft /year

Phase	Phase Only Amortized /acre ft	All Phases Amortized /acre ft	Total Water Supply /acre ft	Current Average Income	Average Acre Foot Income
I	$1,209.00	$1,209.00	$146.29	$334.48	$480.77
II	1,738.02	1,461.21	336.81	334.48	671.29
III	1,080.54	1,249.29	427.38	334.48	761.86
IV	1,207.92	1,237.75	518.49	334.48	852.97

Appendix VIII

A. In-Valley Administration and Distribution Costs (estimate)
B. Pumping Supervision and Maintenance (estimate)
C. Virgin River Surface Water (estimate)
D. Comparative Residential Consumption Water Diagrams
E. Miscellaneous

A. In-Valley Administration and Distribution Costs

IN-VALLEY ADMINISTRATION AND DISTRIBUTION COSTS

The cost to distribute water within the Las Vegas Valley Water District service area has been estimated utilizing information supplied by Colorado River commission and the water district. The water district presently obtains water for resale from the Colorado River Commission and from wells operated by the district itself. During the last reported fiscal year, the water district purchased 203,402.1 acre feet of water during its 1990-91 season. This created an available water supply of 238,198 acre feet. The water district used 13,846 acre feet of this water in it artificial recharge program. The total water purchased and produced for immediate resale by the water district during the 1990-91 season was 224,352 acre feet.

The amount of water billed to clients totaled 205,319 acre feet. The operational water loss for the 1990-91 fiscal year was 8.5%.

The distribution costs are all expenses incurred following the initial purchase or production of water from all sources. All the water purchased by the Colorado River Commission is easily accounted for. However, the cost of production from wells is found within several categories in the Las Vegas Valley Water District's annual report (Page B-1). Some basic assumptions were required to arrive at an approximate distribution cost. These assumptions are:

1. The maintenance of reservoirs, settling basins, wells and springs is combined into one line item. It was assumed the cost to maintain existing source wells was 50% of the line total.

2. Supervision and Engineering was also assumed to be 50%.

Power and Pumping

1. Maintenance of structures and equipment: This entire line item relates to maintenance and not to primary production.

2. Operation of wells and booster pumps: This entire line has been considered as a production cost.

3. Supervision and engineering: Fifty-three percent of this line item is assumed to relate to the maintenance of structures and equipment. Forty-seven percent to operation of wells and booster pumps.

4. Energy purchases: It is not clear from the report if the cost to operate the pumps is included in that line item. Therefore, it is assumed that 25% of the energy purchases are used to pump water from the underground aquifers.

5. The entire cost of purification, transmission and distribution, administration and general, and customer accounting and collection are assumed to relate to water delivery and not to the costs associated with supply.

Based on the assumptions listed the cost of delivering water to clients within the district was $25,074,841 for the 1990-91 fiscal year.

The distribution costs have been evaluated at a cost per acre foot in three ways, as it relates to:

1.	Total water available including water banking	$105.26 per acre foot
2.	Total water purchased or produced for Resale	$111.77 per acre foot
3.	Actual water/billed and collected for	$122.13 per acre foot

B. Pumping Supervision and Maintenance

PUMPING SUPERVISION AND MAINTENANCE

The Las Vegas Valley Water District pumps 15.5% of the water utilized by its customers from aquifers located in and around Las Vegas. In addition, 13,846 acre-ft was pumped back in the ground-water system through its artificial recharge system. Therefore, the water district pumped a total of 48,265 acre-ft of water during it's 1990-91 fiscal year. This establishes a basis for estimating supervision and maintenance cost for their total pumping operation. The determined cost per acre-foot has been used in the evaluation of maintenance of the remote well fields associated with the important project. The following data are abstracted from the attached Exhibit B-1*

SOURCE OF SUPPLY	
(50%) Supervision and Engineering	93,532
(50%)Maintenance of Reservoirs, Settling Basins	113,394
Total from Source of Supply	206,926

POWER AND PUMPING	
(41%) Supervision and Engineering	180,161
(100%) Operation of Wells and Booster Pumps	1,229,603
	1,409,764

This does not include maintenance of building or vehicles so it is a minimum cost estimate. However, it should be noted that with the long distances to be traveled to maintain the well field networks, local supply yards, and maintenance offices will be required.

Total of all above cost items	$1,616,690
Water pumped from wells (acre-foot)	34,778
Artificial recharge to wells (acre-foot)	13,846
Total	48,625
Cost per acre-foot for Supervision and Maintenance	$28.99 or ($29.00)

*Las Vegas Valley Water District Annual Financial Report, Year End June 1991

C. Virgin River Surface Water

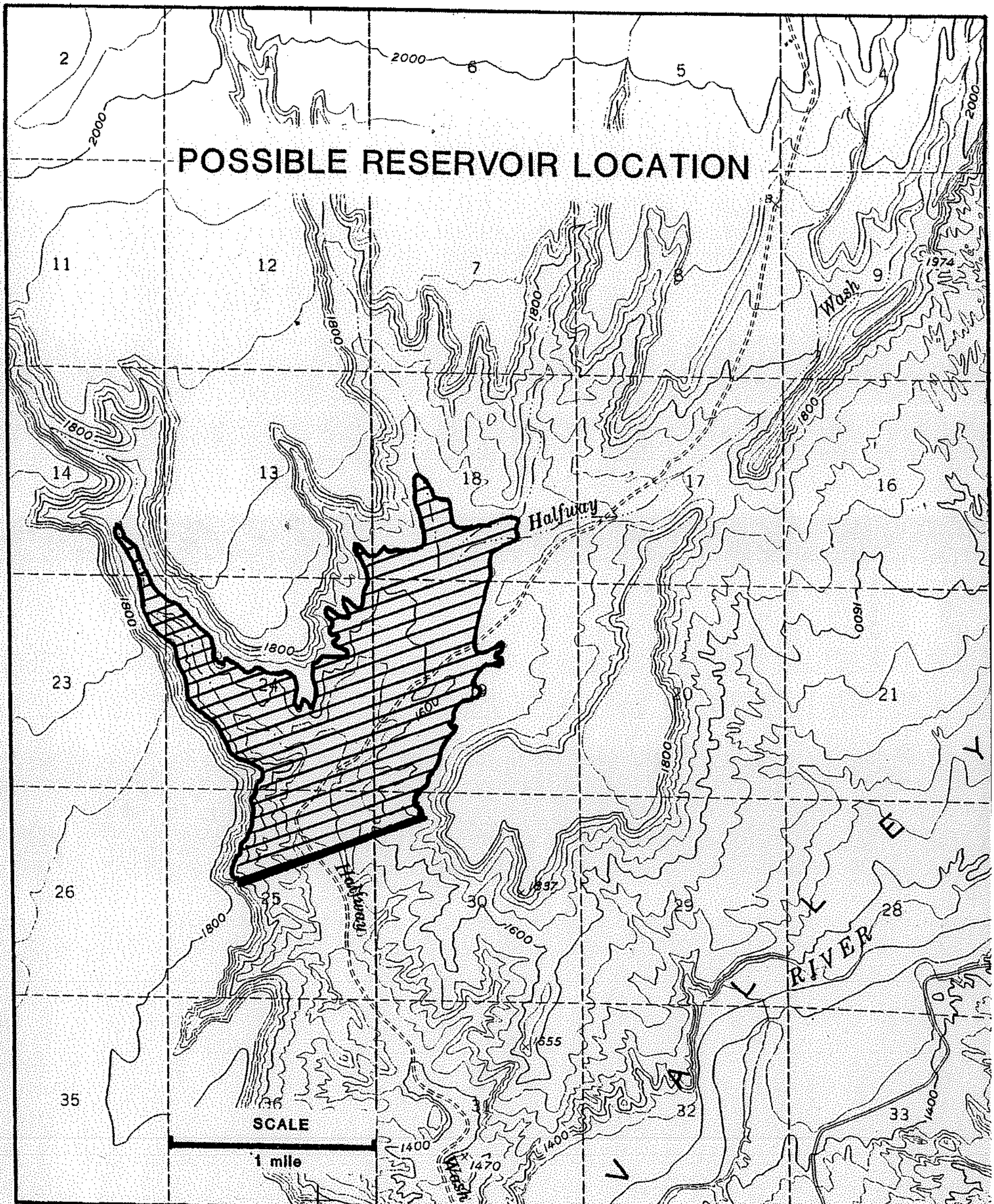
VIRGIN RIVER WATER CAPTURE
HALF WAY WASH DAM SITE/ENERGY REQUIREMENTS

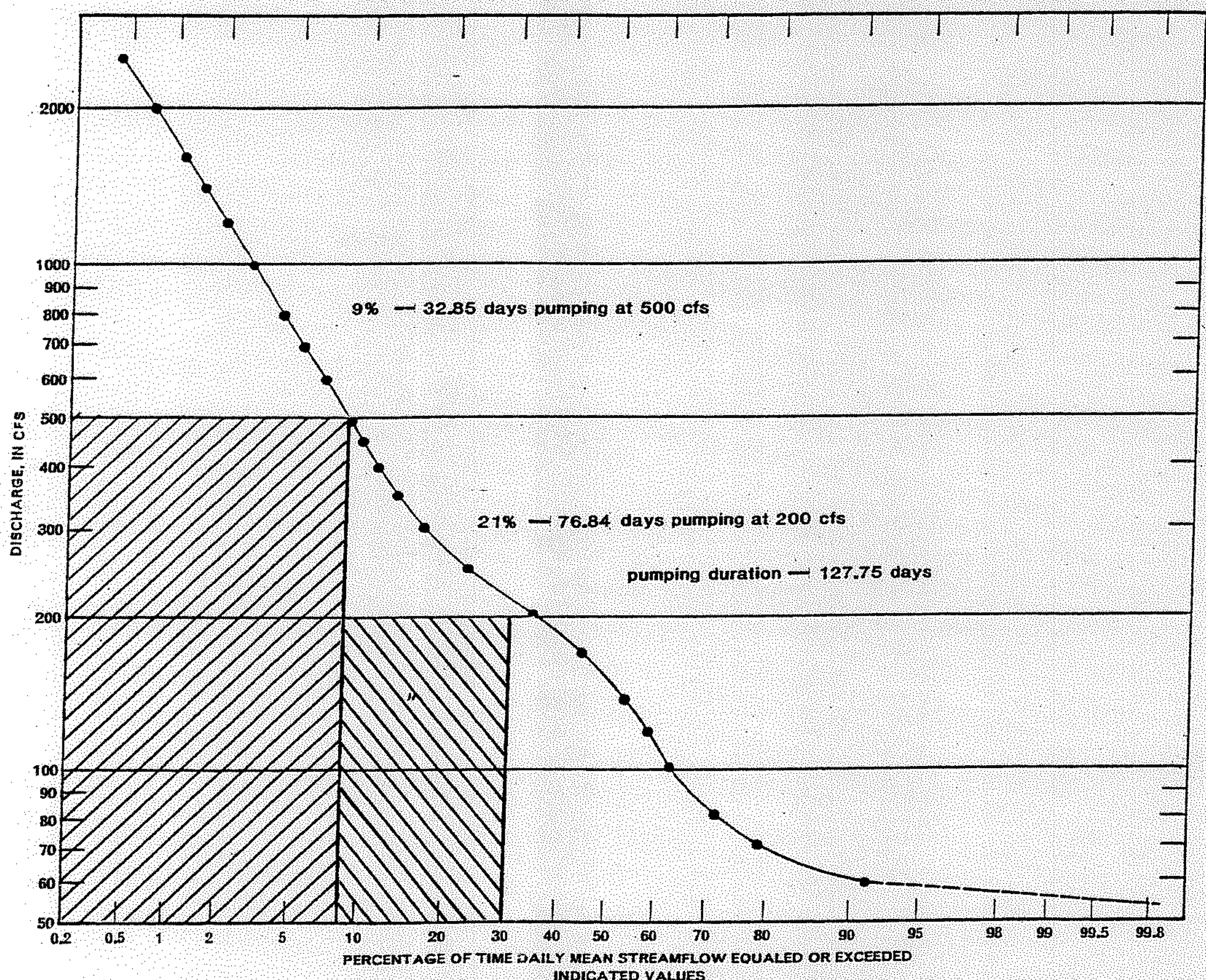
The only possible dam site within Nevada and along the Virgin River with the capacity to store up to 60,000 acre-feet/yr of water lies within Halfway Wash. A dam built within Halfway Wash would need to be at least 160 feet high for the full 60,000 acre-ft of useful storage.

The surface flow in the Virgin River is such that withdrawals can only occur during a 3-4 month period of flow each year. The pumping system from the river to the reservoir would require a design that overcomes 340 feet of head and can deliver up to 224,500 gpm. The estimated horsepower required would be 25,700 hp (at 75% efficiency) using the formula: $hp = \frac{\text{flow X head}}{(3960 \text{ X efficiency})}$

A constant pumping delivery system from the reservoir would lift 37,000 gpm 500 feet from the dam base to Mormon Mesa level, to deliver the water to the California Wash area and a second booster station. The horsepower required would be approximately 6265 (at 75% efficiency). The California wash booster station would pump the water into Las Vegas. The estimated horsepower required to overcome 470 feet of head is 5889 hp (at 75% efficiency). Attached are scoping sources.

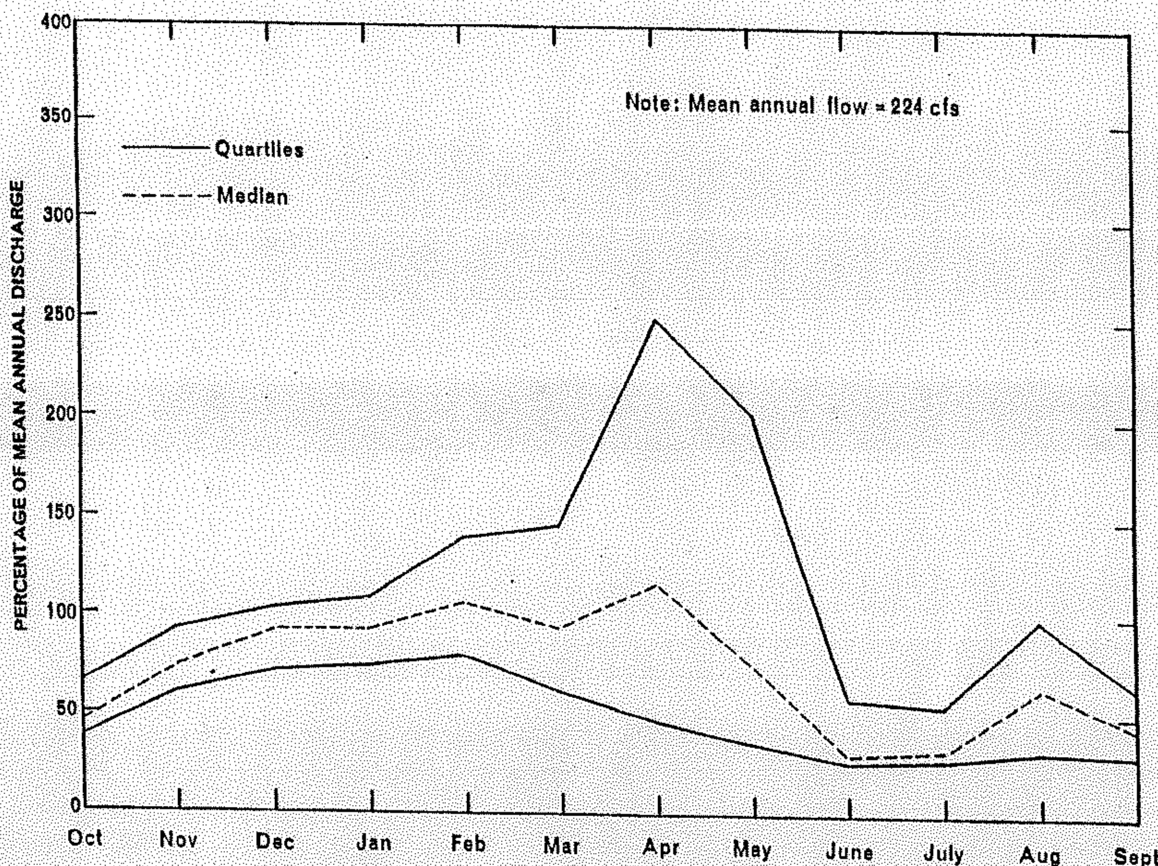
POSSIBLE RESERVOIR LOCATION





Flow duration curve for Virgin River at Littlefield, Arizona, 1931-59

modified from Glancy P. and Van Denburgh A. WATER RESOURES - RECONNAISSANCE SERIES REPORT 51



--Average monthly discharge as a percentage of mean annual discharge for Virgin River at Littlefield, Arizona, 1930-67

after Glancy P. and Van Denburgh A, WATER RESOURES - RECONNAISSANCE SERIES REPORT 51

ESTIMATED HORSEPOWER NECASSARY TO LIFT VIRGIN RIVER SUFACE WATER FROM THE RIVER TO LAS VEGAS.

total AcFt	Average gpm	collection capacity	head river/dam	head dam/booster 2	head booster 2/Las Vegas
60000	37214	224500	340	500	470
hp reqiured			river/dam	dam/booster 2	booster 2/Las Vegas
			25700	6265	5889

D. Comparative Residential Consumption

LAS VEGAS VALLEY WATER DISTRICT

RATE COMPARISON BY CITY FOR 21.3 THOUSAND GALLONS OF WATER

City	Rate
SANTA BARBARA (OC)	$225.43
SANTA BARBARA	$147.82
HOUSTON	$72.46
MARIN COUNTY	$65.36
COLORADO SPRINGS (OC)	$63.36
LONG BEACH	$60.41
SANTA ROSA (OC)	$58.92
SANTA CRUZ (OC)	$58.41
SCOTTSDALE (OC)	$55.34
TUCSON	$53.04
TULSA (OC)	$51.08
NORTH MARIN	$45.07
KINGMAN (OC)	$42.33
COLORADO SPRINGS	$42.23
SAN MARCOS	$41.64
OAKLAND	$41.62
DENVER (OC)	$40.20
IRVINE	$37.01
SCOTTSDALE	$35.97
RENO	$35.50
SANTA CRUZ	$35.05
PHOENIX (OC)	$34.75
KINGMAN	$34.65
DALLAS	$34.63
OKLAHOMA CITY (OC)	$34.47
BEATTY	$34.07
SANTA ROSA	$33.76
PASADENA (OC)	$32.21
LOS ANGELES	$31.75
PHOENIX	$29.26
BOULDER CITY	$28.80
SAN DIEGO	$27.88
TULSA	$27.17
OKLAHOMA CITY	$26.87
EL PASO	$26.69
BARSTOW	$25.70
PASADENA	$24.82
NORTH LAS VEGAS	$24.20
LAS VEGAS	$22.96
HENDERSON	$21.72
ANAHEIM	$20.68
ALBUQUERQUE	$20.33
SALT LAKE CITY	$18.46
DENVER	$18.41

(OC) - OUTSIDE CITY

Excerpts from the
Colorado River Commission of Nevada
Financial Report for the Fiscal Year End
June 30, 1991

COLORADO RIVER COMMISSION
SOUTHERN NEVADA WATER SYSTEM
WATER DELIVERIES AND COSTS

Last Ten Fiscal Years
(Unaudited)

	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91
Water deliveries in acre-feet										
Boulder City	4,067.5	4,442.6	5,698.1	5,259.5	4,736.7	6,507.5	6,257.4	7,273.2	7,257.8	6,421.9
Henderson	4,997.9	5,973.7	7,892.3	9,063.9	9,792.4	11.102.3	13,215.2	16,161.6	23,065.7	22,534.5
Las Vegas Valley Water District	104,931.2	105,139.5	110,915.4	115,066.6	124,006.3	127,089.8	138,211.4	174,712.8	193,790.1	203,402.1
Nellis Air Force Base	2,183.8	1,942.8	2,228.4	2,289.5	1,697.2	1,816.1	883.7	2,672.2	2,867.0	2,811.2
North Las Vegas	8,661.3	7,670.4	10,433.2	10,774.6	13,138.9	13,265.6	14,808.1	17,962.1	23,437.9	24,503.9
Total deliveries	124,841.7	125,169.0	137,167.4	142,454.1	153,371.5	159,781.3	172,575.8	218,781.9	250,418.5	259,673.6
Total diverted	125,627.0	125,879.8	135,776.4	144,970.2	157,595.6	162,422.8	176,147.4	217,363.0	250,608.8	261,913.5
Excess of diversions over deliveries	785.3	710.8	1,391.0)	2,516.1	4,224.1	2,641.5	3,571.6	(1,418.9)	190.3	2,239.9
Costs										
Source of supply	$ 66,101	$ 66,178	$ 72,307	$ 74,501	$ 84,166	$ 85,436	$ 95,015	$ 116,638	$ 125,305	$ 130,957
Power	5,520,318	7,064,043	6,971,932	6,174,319	8,332,678	8,006,504	8,489,202	10,926,720	14,179,468	16,256,609
Other pumping	344,318	477,229	486,502	595,526	722,632	725,613	713,354	833,854	823,675	928,025
Chemicals	320,541	361,718	254,636	262,762	358,583	436,071	224,571	714,743	378,463	439,438
Other water treatment	774,758	941,469	1,079,192	1,182,032	1,213,028	1,432,214	1,684,056	1,653,343	1,820,604	2,033,979
Transmission	157,117	220,528	225,360	463,282	277,538	301,122	351,394	335,659	353,184	381,701
Administrative & general(3)	714,838	1,068,081	1,296,219	1,394,843	1,481,039	1,798,315	2,034,747	2,079,744	2,444,625	2,736,655
Total operation & maintenance(1)	7,897,991	10,199,246	10,386,148	10,147,265	12,469,664	12,785,275	13,592,339	16,660,701	20,125,324	22,907,364
Debt service & reserve requirements	2,745,645	7,884,016	8,854,042	9,783,686	10,395,171	12,434,707	13,221,845	13,739,332	14,201,968	14,998,689
Investment and other income(2)	(440,336)	(805,512)	(1,019,986)	(1,164,695)	(1,212,752)	(1,103,259)	(1,156,589)	(1,457,199)	(1,490,517)	(2,830,019)
Total costs	$10,203,300	$17,277,758	$ 18,220,204	$18,766,256	$21,652,083	$24,116,723	$25,657,595	$28,942,834	$32,836,775	$35,076,034
Costs per acre-foot										
Source of supply	$ .53	.53	$ .53	$ .52	$ .55	$ .53	$ .55	$ .53	$ .50	.50
Power	44.22	56.44	50.83	43.34	54.33	50.11	49.19	49.94	56.62	62.60
Other pumping	2.76	3.81	3.55	4.18	4.71	4.54	4.13	3.81	3.29	3.57
Chemicals	2.57	2.89	1.86	1.84	2.34	2.73	1.30	3.27	1.51	1.69
Other water treatment	6.21	7.52	7.87	8.30	7.91	8.96	9.76	7.56	7.27	7.83
Transmission	1.26	1.76	1.64	3.25	1.81	1.88	2.04	1.53	1.41	1.47
Administrative & general(3)	5.73	8.53	9.45	9.79	9.66	11.25	11.79	9.51	9.76	10.54
Total operation & maintenance(1)	63.28	81.48	75.73	71.22	81.31	80.00	78.76	76.15	80.36	88.20
Debt service & reserve requirements	21.99	62.99	64.55	68.68	67.78	77.82	76.61	62.80	56.71	57.76
Investment and other income(2)	(3.53)	(6.44)	(7.44)	(8.18)	(7.91)	(6.90)	(6.70)	(6.66)	(5.95)	(10.90)
Total costs per acre-foot	$ 81.74	$ 138.03	$ 132.84	$ 131.72	$ 141.18	$ 150.92	$ 148.67	$ 132.29	$ 131.12	$ 135.06

(1)
Excludes depreciation and amortization.
(2)
Cash basis of accounting.
(3)
Unpaid compensated absences are included in administrative & general costs for years 1982-83 and thereafter, and are excluded in all prior years.

E. Miscellaneous Information

Excerpts from the
Las Vegas Valley Water District's
Annual Financial Report -
Year end June 30,1991

Exhibit B-2

LAS VEGAS VALLEY WATER DISTRICT

COMBINED STATEMENT OF REVENUES, EXPENDITURES AND NET INCOME - BUDGET AND ACTUAL
ALL FUND TYPES
YEAR ENDED JUNE 30, 1991

	PROPRIETARY FUND			FIDUCIARY FUND - PENSION TRUST		
	Budgeted	Actual	Over/(Under)	Budgeted	Actual	Over/(Under)
Revenues:						
Water Sales	$73,000,000	$69,356,304	$(3,643,696)	$ -	$ -	$ -
Other	25,000	68,855	43,855	-	-	-
Contributions	-	-	-	1,096,558	973,128	(123,430)
Interest	-	-	-	1,050,155	1,093,154	42,999
Total Revenues	73,025,000	69,425,159	(3,599,841)	2,146,713	2,066,282	(80,431)
Expenditures:						
Payroll and related costs	19,469,534	16,551,803	(2,917,731)	-	-	-
Net Water Costs	26,723,000	26,649,880	(73,120)	-	-	-
Power	5,095,200	5,419,528	324,328	-	-	-
Materials and Supplies	2,790,860	2,147,048	(643,812)	-	-	-
Maintenance and Repairs	1,027,200	883,607	(143,593)	-	-	-
Rent/Lease	101,100	50,702	(50,398)	-	-	-
Other Employee	711,780	461,590	(250,190)	-	-	-
Other Operating	3,085,500	2,775,533	(309,967)	-	-	-
General Expenses	-	-	-	125,000	79,776	(45,224)
Benefits Paid	-	-	-	450,000	658,362	208,362
Total Expenditures	59,004,174	54,939,691	(4,064,483)	575,000	738,138	163,138
Depreciation	8,200,000	9,566,651	1,366,651	-	-	-
Operating Income	5,820,826	4,918,817	(902,009)	1,571,713	1,328,144	(243,569)
Nonoperating Revenue:						
Interest Earned/Operating Funds	3,500,000	3,396,235	(103,765)	-	-	-
Interest Earned/Restricted Funds	1,400,000	2,457,138	1,057,138	-	-	-
Other	12,000	-	(12,000)	-	-	-
Amortization of Gain on Bond Refunding	64,440	42,960	(21,480)	-	-	-
Total Nonoperating Revenue	4,976,440	5,896,333	919,893	-	-	-
Nonoperating Expense:						
Interest Expense	8,800,000	8,349,083	(450,917)	-	-	-
Loss on Sale or Abandonment of property and equipment, net	-	12,258	12,258	-	-	-
Arbitrage Rebate	-	315,870	315,870	-	-	-
	8,800,000	8,677,211	(122,789)	-	-	-
Effect on Prior Years of Change in Accounting Method for Water Recharge Inventory	-	1,414,162	1,414,162			
Add Depreciation of Fixed Assets Acquired by Government Grant	10,000	70,697	60,697	-	-	-
Net Income	$ 2,007,266	$ 3,622,798	$ 1,615,532	$1,571,713	$1,328,144	$(243,569)

Table VI

LAS VEGAS VALLEY WATER DISTRICT

ENTERPRISE FUND
REVENUE ANALYSIS BY CLASS OF SERVICE
FISCAL YEAR ENDING JUNE 30, 1991

Class of Service (1)	Annual Revenue (2)	Annual Consumption Per Billing (1000 gal)	Annual Number of Billings	Average Revenue (1000 gal) (3)	Average Monthly Revenue Per Customer (4)	Average Monthly Consumption Per Billing (1000 gal) (5)	Active Customers 6/30/91
Residential-single units	$32,273,007	29,792,202	1,398,535	$1.083	$ 23.08	21.3	120,272
Res.-duplex/triplex/fourplex	1,387,052	1,285,601	33,809	1.079	41.03	38.0	2,833
Apartments/Condos/Townhouses	10,073,267	10,514,716	45,003	0.958	223.84	233.6	3,800
Residential, Other	948,145	999,582	2,045	0.949	463.64	488.8	175
Hotels	4,561,591	4,873,749	1,714	0.936	2,661.37	2,843.5	147
Motels	937,512	978,561	3,449	0.958	271.82	283.7	286
Community Facilities	2,722,292	2,716,934	9,329	1.002	291.81	291.2	781
Schools	851,888	903,319	1,813	0.943	469.88	498.2	156
Fireline	483,695	67,504	12,925	7.165	37.42	5.2	1,130
Irrigation	5,980,667	6,427,401	17,973	0.930	332.76	357.6	1,614
Commercial/business	7,102,566	7,092,206	54,418	1.001	130.52	130.3	4,607
Recreational	35,098	34,335	206	1.022	170.38	166.7	18
Industrial	946,826	860,459	6,646	1.100	142.47	129.5	775
Other	381,513	387,602	1,837	0.984	207.68	211.0	80
Totals	$68,685,119	66,934,171	1,589,702	$1.026	$ 43.21	42.1	136,674

(1) Industrial and Other reclassified, September, 1990.

(2) Revenue of $671,185 from hydrant permit fees, delinquent charges, and supplemental surcharges not included.

(3) Annual Revenue divided by Annual Consumption Per Billing (1,000 gal.)

(4) Annual Revenue divided by Annual Number of Billings.

(5) Annual Consumption Per Billing (1,000 gal.) divided by Annual Number of Billings.

Exhibit A-2

LAS VEGAS VALLEY WATER DISTRICT
COMBINED STATEMENT OF REVENUES, EXPENSES, AND CHANGES IN RETAINED EARNINGS/FUND BALANCE
ALL FUND TYPES
FOR THE YEAR ENDED JUNE 30, 1991
WITH COMPARATIVE TOTALS FOR THE YEAR ENDED JUNE 30, 1990

	Notes	Proprietary Fund Type Enterprise	Fiduciary Fund Type Pension Trust	Totals (Memorandum Only) June 30, 1991	Totals (Memorandum Only) June 30, 1990
OPERATING REVENUES:					
Water sales	1	$ 69,356,304	$ -	$ 69,356,304	$ 67,084,335
Interest		-	1,093,154	1,093,154	1,056,643
Contributions		-	973,128	973,128	895,097
Other		68,855	-	68,855	87,669
Total operating revenues		69,425,159	2,066,282	71,491,441	69,123,744
OPERATING EXPENSES:					
Source of supply	5	27,063,732	-	27,063,732	26,170,742
Power and pumping		7,622,025	-	7,622,025	6,488,785
Purification		331,720	-	331,720	288,119
Transmission and distribution		7,486,802	-	7,486,802	7,179,047
Administrative and general		7,342,326	79,776	7,422,102	5,746,735
Benefit payments		-	658,362	658,362	201,895
Customer accounting and collection		5,093,086	-	5,093,086	4,212,422
Total operating expenses		54,939,691	738,138	55,677,829	50,287,745
OPERATING INCOME BEFORE DEPRECIATION		14,485,468	1,328,144	15,813,612	18,835,999
DEPRECIATION:					
Depreciation expense	1, 2	(9,582,825)	-	(9,582,825)	(9,115,286)
Depreciation allocated to other accounts		16,174	-	16,174	33,441
OPERATING INCOME		4,918,817	1,328,144	6,246,961	9,754,154
NON-OPERATING INCOME (EXPENSE):					
Interest expense		(8,349,083)	-	(8,349,083)	(8,010,057)
Interest income		3,396,235	-	3,396,235	3,515,251
Loss on sale or abandonment of property and equipment, net		(12,258)	-	(12,258)	(72,442)
Total non-operating income (expense)		(4,965,106)	-	(4,965,106)	(4,567,248)
INCOME (LOSS) BEFORE RESTRICTED EARNINGS AND EFFECT ON PRIOR YEARS OF CHANGE IN ACCOUNTING METHOD		(46,289)	1,328,144	1,281,855	5,186,906
RESTRICTED EARNINGS:					
Interest earned on restricted assets		2,457,138	-	2,457,138	1,697,643
Arbitrage rebate		(315,870)		(315,870)	
Amortization of gain on bond refunding	3	42,960	-	42,960	64,440
Total restricted earnings		2,184,228	-	2,184,228	1,762,083
INCOME BEFORE EFFECT ON PRIOR YEARS OF CHANGE IN ACCOUNTING METHOD		2,137,939	1,328,144	3,466,083	6,948,989
EFFECT ON PRIOR YEARS OF CHANGE IN ACCOUNTING METHOD FOR WATER RECHARGE INVENTORY	1	1,414,162	-	1,414,162	-
NET INCOME - available for asset addition and replacement and for debt retirement		3,552,101	1,328,144	4,880,245	6,948,989
Add depreciation on fixed assets acquired by government grants	1	70,697	-	70,697	70,697
Increase in retained earnings/fund balance		3,622,798	1,328,144	4,950,942	7,019,686
RETAINED EARNINGS/FUND BALANCE BEGINNING OF YEAR		101,175,700	11,807,287	112,982,987	105,963,301
RETAINED EARNINGS/FUND BALANCE END OF YEAR		$104,798,498	$13,135,431	$117,933,929	$112,982,987

The accompanying notes are an integral part of these financial statements.

Exhibit B-1

LAS VEGAS VALLEY WATER DISTRICT

STATEMENT OF OPERATING EXPENSES BY FUNCTION
PROPRIETARY FUND TYPE
ENTERPRISE FUND
FOR THE YEARS ENDED JUNE 30, 1991 AND 1990

	1991	1990
SOURCE OF SUPPLY:		
Supervision and Engineering	$ 187,064	$ 384,832
Maintenance of Reservoirs, Settling Basins, Wells and Springs	226,788	490,662
Water Purchased from Colorado River Commission	26,914,096	25,442,272
Capacity Connection Charges	(264,216)	(147,024)
Total Source of Supply	27,063,732	26,170,742
POWER AND PUMPING:		
Supervision and Engineering	383,322	312,353
Operation of Wells and Booster Pumps	1,229,603	1,120,004
Maintenance of Structures and Equipment	672,842	428,350
Energy Purchases	5,336,258	4,628,078
Total Power and Pumping	7,622,025	6,488,785
PURIFICATION:		
Operations and Maintenance	331,720	288,119
Total Purification	331,720	288,119
TRANSMISSION AND DISTRIBUTION:		
Supervision and Engineering	2,214,180	2,202,508
Fixed Office Salaries and Expense	476,087	430,374
Operation of Transmission and Distribution System	1,669,532	1,661,180
Maintenance of Mains and Reservoirs	731,316	688,460
Maintenance of Services	1,889,756	1,720,252
Maintenance of Meters	505,931	476,273
Total Transmission and Distribution	7,486,802	7,179,047
ADMINISTRATIVE AND GENERAL:		
General Office	3,332,473	2,686,629
General Office Building Expense	1,633,183	1,399,421
Office Supplies and Other Office Expenses	426,333	348,337
Directors' Fees and Expense	-	290
Legal, Auditing, and Other Outside Service Fees	1,374,141	936,221
Employee Benefits	6,549,193	6,081,032
Employee Benefits Allocated to Other Accounts	(6,549,193)	(6,081,032)
Insurance Expense	382,715	248,691
Miscellaneous	193,481	62,305
Total Administrative and General	7,342,326	5,681,894
CUSTOMER ACCOUNTING AND COLLECTION:		
Development Services	1,156,280	1,095,026
Customer Services	1,249,684	791,558
Meter Services	1,150,897	1,117,731
Billing and Accounting	1,452,236	1,150,100
Uncollectible Accounts	83,989	58,007
Total Customer Accounting and Collection	5,093,086	4,212,422
TOTAL OPERATING EXPENSES	$54,939,691	$50,021,009

Excerpts from the
Division of Water Resources
Annual Summary 1991

Table XIII

LAS VEGAS VALLEY WATER DISTRICT

GENERAL STATISTICAL INFORMATION
FOR EACH OF THE FIVE YEARS ENDED JUNE 30

	1987	1988	1989	1990	1991
	...............water production in million gallons				
Wells (ground water)	12,157	12,273	11,652	11,385	11,338
SNWS (surface water)	41,407	44,997	56,953	63,140	66,275
	53,564	57,270	68,605	74,525	77,613
Artificial Recharge	130	244	661	2,194	4,514
Maximum daily production	231.3	254.7	282.4	296.4	311.4
Average daily production	146.7	156.5	187.6	204.2	212.6
Storage capacity[1]	344.0	344.0	373.0	393.0	393.0
Total water billed	50,228	53,508	63,377	66,149	66,934
Active accounts	108,199	113,651	118,936	127,542	136,674
Plant in service before depreciation and amortization	$260,762,111	$299,986,177	$344,362,620	$368,220,922	$395,442,817
Miles of pipe in service	1,439	1,440	1,567	1,653	1,741
Number of employees	380	410	428	505	501
Permanent population served[1]	496,450	504,200	518,800	570,400	592,000

[1] Mid-fiscal year, December 31.

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THE CITY OF BARSTOW, CALIFORNIA (contact: Marie Angel)

THE CITY OF COLORADO SPRINGS, COLORADO (contact: Mr. Harlen)

THE CITY OF DENVER, COLORADO (contact: Chris Colton)

THE CITY OF LONG BEACH, CALIFORNIA (contact: Steve Ehern)

THE CITY OF NORTH LAS VEGAS, NEVADA (contact: John McCetchen)

THE CITY OF OAKLAND, CALIFORNIA (contact: Patty Paul)

THE CITY OF PHOENIX, ARIZONA (contact: Stan Tacks)

THE CITY OF SAN DIEGO, CALIFORNIA (contact: John Harley)

THE CITY OF SANTA BARBARA, CALIFORNIA (contact: Alison Whitney)

THE CITY OF SCOTSSDALE, ARIZONA (contact: Jim Turnbull)

THE CITY OF TUCSON, ARIZONA - Water Conservation District (contact: Linda Smith)

HENDERSON CHAMBER OF COMMERCE

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Economic and Engineering Feasibility of Water Development and Importation to Clark County

Appendix I - VIII Descriptions

(Only copies of Appendix II and References and Information Sources have been provided in this review draft)

Appendix I

A. Abstract of 1989 Filings of Las Vegas Valley Water District
B. State Engineer Letter of February 14, 1992 (with list of withdrawn LVVWD applications)

Appendix II

March 18, 1992 letter to R. Michael Turnipseed from Ross E. de Lipkau with four phase plan of water develop, Las Vegas Valley Water District Cooperative Water Project

Appendix III Pipeline Design and Construction Costs

Las Vegas Water Study (Pipeline Portion) - Draft

Appendix IV Drilling and Well Construction Costs

Exploration/Well Construction

Phase I Costs
Phase II Costs
Phase III Costs
Phase IV Costs

Appendix V

A. Operational Cost- Electricity

Nevada Power Phase I
Overton Power Phase I
Lincoln County Phase II
Mount Wheeler Phase III
Mount Wheeler Phase IV

B. Las Vegas Valley Water District (LVVWD) Monthly Water Demand - Department of Resources

C. Power Rate Schedules

I. Nevada Power
II. Overton Power
III. Lincoln County
IV. Mt. Wheeler

D. Electrical Infrastructure Cost Analysis

Appendix VI

Right-of-Way Annual Costs

Estimate of Right-of-Way Costs
Summary Tables

Appendix VII

Population Projections, Demand for Water, and Water Costs

Appendix VIII

A. In-Valley Administration and Distribution Costs (estimate)

B. Pumping Supervision and Maintenance (Estimate)

C. Virgin River Surface Water (estimate)

Virgin River Water Capture Half Way Wash Dam Site/Energy Requirement
Map - Possible Reservoir Location
2 Diagrams- Water Resources - Report. 51
Estimate Horsepower

D. Comparative Residential Consumption Water Diagrams

Table XIV
Excerpts from Colorado River Commission of Nevada Financial Report for the Fiscal Year End June 30, 1991

E. Miscellaneous Information

Excerpts from Las Vegas Valley Water District (LVVWD) Annual Financial Report - Year End June 30, 1991

Exhibit B-2 - Combined Statement of Revenues, Expenditures and Net Income Budget and Actual All Fund Types - Year End June 30, 1991

Table VI - Enterprise Fund - Revenue Analysis by Class of Service - Year End June 30, 1991

Exhibit A-2 - Combined Statement of Revenues, Expenses, and Changes in Retained Earnings/Fund Balance - All Fund Types for Year End June 30, 1991 with Comparative Totals for Year End June 30, 1990

Exhibit B-1- Statement of Operating Expense by Function - Proprietary Fund Type - Enterprise Fund for Year End June 30, 1991 and 1990

Excerpts from the Division of Water Resources Annual Summary 1991

Table XIII - Las Vegas Valley Water District - General Statistical Information for Each of the Five Years Ended June 30

References and Information Sources