SAN LUIS VALLEY PROJECT
COLORADO
CLOSED BASIN DIVISION
U.S. Department of the Interior
Bureau of Reclamation

FACTS AND CONCEPTS
SAN LUIS VALLEY PROJECT - CLOSED BASIN DIVISION
PUBLIC INFORMATION PACKET

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THE SAN LUIS VALLEY PROJECT - CLOSED BASIN DIVISION

FACTS AND CONCEPTS ABOUT THE PROJECT

U.S. BUREAU OF RECLAMATION

BACKGROUND

In many areas of the west, the start of a modern agricultural economy was the direct result of Federal Government involvement. Agencies like the Bureau of Reclamation (Bureau) built dams, reservoirs, and canal systems and formed a partnership with the private sector to promote the national goals of settling and developing the arid west. In the San Luis Valley of Colorado, however, development was accomplished by individuals and private companies acting almost completely without Federal assistance.

At the present point in time, the San Luis Valley faces a complex and difficult situation. This situation has been described by Colorado State University economists in the following way:

The San Luis Valley stands at the crossroads of its economic future. Because of the existing water distribution system in the Valley and the superimposed legal system and legal constraints, a deep insecurity has arisen among the people. Suspicion and economic fear are facts of life.

Presently, the Valley is a patchwork of local conservancy districts, ditch companies, drainage districts, water users associations, etc., all interested in protecting their own areas of concern at the expense of any other person or group which might be deemed a threat to their interest. The specific conflicting groups primarily break down into the Conejos River surface users vs. the "closed basin" vs. the rest of the Valley, municipalities vs. Valley water users, the (Closed Basin Project) vs. Subirrigators, Colorado vs. New Mexico, Texas and the Republic of Mexico, etc.

With the (Bureau of Reclamation Closed Basin Project) beginning, it is possible that there is enough water present in the Valley to fulfill existing water requirements and interstate commitments, without substantially harming the existing pattern of water use in the Valley. But to approach this objective, a spirit of cooperation and trust must be developed . . . " (quoted from "San Luis Valley Water Problems; A Legal Perspective," by C. E. Radosевич and R. W. Rutz, Colorado State University available as a National Technical Information Service Reprint (Report No. PB 295918) U.S. Department of Commerce/Springfield, VA 22161).
The Radoевич and Rutz report, cited extensively above, provides a concise summary of the tangle of conflicting interest which confound the water situation in the Valley and also explains the Rio Grande Compact about as clearly as that complex document can be explained. Those who are interested in these complicated subjects are referred to that report.

Without intending to oversimplify the San Luis Valley's water situation, it is not an uncommon sort of problem. A critical resource (water) is available in limited supply. It is in every individual's interest to secure as much of that valuable resource as he can for himself. Thus, it follows that it is in no individual's interest to restrain his demands. The small contribution they can make will not be noticed or would be consumed by their neighbors in any case. As every individual maximizes use of the resource, a critical strain is put on it, often to everyone's loss.

After a long series of dry years near the end of the 19th century, farmers along the entire length of the Rio Grande Valley found that the river, which had adequately met their needs for centuries, no longer provided enough water. They looked north to the river's San Luis Valley headwaters. They saw the valley-wide system of irrigation canals which industrious Colorado pioneers had just completed. They complained (not without justice). The complaints of the Republic of Mexico were the first to receive attention. In 1896, the Department of the Interior stopped granting rights-of-way across Federal lands for the construction of reservoirs. In 1906, a treaty providing for the delivery of 60,000 acre-feet per year of Rio Grande water to the Republic of Mexico was signed. A major reason for the 1916 construction of Elephant Butte Reservoir in New Mexico was so that this commitment could be met.

The Federal Government's injunction on right-of-way grants was a response to a problem with international ramifications which could not be solved very quickly (if at all) on the local level. The injunction, when combined with threatened lawsuits from downstream water users, hampered the development of reservoirs needed to serve the San Luis Valley. In spite of this, the Valley managed to privately fund and construct five reservoirs between 1910 and 1913 (Rio Grande/Farmer's Union, Santa Maria, Continental, La Jara, and Terrace Reservoirs). During the same general period, eight major irrigation drains were constructed to reclaim some 90,000 acres of land which were being ruined by becoming waterlogged. Similar attempts were made to save the east central Valley but this proved beyond the means of the private sector. Continued diversion of irrigation water into this area turned much of the soil into adobe and caused alkali to build up on the surface. Agriculture in the Valley has moved continually west since then. Thousands of acres which were once hailed as the best wheatland in Colorado and perhaps the world, became a barren salt waste.

Discussions between the States of Texas, New Mexico, and Colorado on the subject of their respective Rio Grande water rights began in the early part of the century. A temporary compact was agreed to in 1928. The formal Compact was ratified by the States' legislatures in 1939.
One hears a great deal about the Compact, more con than pro. Misinformation about it is plentiful. It is a complicated document. It could not be simple because of the complex situation which is its subject. Perhaps the wisest perspective is to simply view the Compact as a fact of life. It was argued all the way up to the U.S. Supreme Court and stood. In fact, the 1966 U.S. Supreme Court case was "continued" and a formal ruling was not made. The parties essentially settled out of court for the same reasons private individuals faced with a lawsuit would. The States faced a small chance of coming out of court a little better off than they went in, a small chance of coming out a lot worse, the probability of coming out about the same, and a 100 percent certainty that the lawyer's bill would be waiting regardless of the outcome. Colorado promised to meet the annual water delivery requirements of the Compact. However, the State refused to formally acknowledge the 900,000 acre-feet "water debt" which New Mexico and Texas maintained that Colorado has built up by allegedly failing consistently to meet annual deliveries scheduled by the Compact between 1939 and 1966. Colorado did promise to attempt to "pay off" the alleged debt as a gesture of "good will." The other States and the court agreed to put the case "on hold," provided that Colorado did meet its Compact obligation every year.

To return to the "Compact-as-a-fact-of-life" concept; Valley residents who maintain that the Compact is unfair are simply wrong. Those who say that it is a darned nuisance have a pretty good point. Things would be simpler if the Valley could just use all the water it wanted to without worrying about whether any water at all flowed downstream. That would not be fair. The fact that some water must flow downstream is not even an open question. How much and how that "how much" is to be accomplished are what the arguments are all about. A few facts about the compact may advance the goal of "living with it."

The overall purpose of the Compact is to assure that the relationship of annual flows across State boundaries which had developed by the early 20th century is maintained. This does not mean that the same fixed absolute quantity is supposed to flow across each State's boundaries every year. The terms of the Compact are flexible. They recognize variations in natural flows from year to year and anticipate that new sources of water for the Rio Grande Basin would develop over the years. It is worth remembering that Colorado has the most difficulty meeting its delivery requirement in years when the river's flow is high. In years of low to average flow, the requirements are so small that they can be met almost without being noticed. The Compact also has provisions which let the States accumulate water credits and debts, but it does prevent any State from accumulating so much "credit" that it could shut off riverflow to the downstream State for 1 or several years. Such action would ruin thousands of farmers. Both the Compact and the Treaty with Mexico are negotiated agreements, one probably hears about as much complaining about them on every side of the various borders. A basic rule of international diplomacy appears to apply. If all of the parties to an agreement are unhappy with it, the agreement is almost surely a fair one.
The fact remains that meeting the Compact requirements does pose some problems for Colorado and the San Luis Valley. The continued Supreme Court case and alleged debt situation mean that every year's scheduled delivery must be met. Until some progress is made paying off the alleged debt, Colorado and the Valley have no "breathing room." Failure to meet the requirement for just one year, even for a very small amount of water and regardless of the reasons, would allow Texas and New Mexico to reopen their suit. Knowledgeable sources believe that what would probably come out of that action would be the appointment of a River Master to the Rio Grande. The River Master would be responsible only for seeing that the terms of the Compact were met. This would remove the administration of many water-related issues from local control. Government management of small scale irrigation systems often doesn't work out very well for the local users. It is in the Valley's interest to work out a system on the local level which allows the Compact to be met and to avoid having a system imposed on it from "above."

For the short term, the Colorado State Engineer's office is responsible for the difficult and thankless task of making sure the compact is complied with. Like most holding actions, the effort has to be undertaken piecemeal and year to year. Almost every attempt by the State Engineer's office to regulate the flow of water in the river or even to try to develop the guidelines of a system to accomplish this has met vigorous resistance. The response of those who see their vital interests threatened is completely reasonable. The response is always, "Why me?" To which the State Engineer responds, "We have to start somewhere." To which the individual responds, "See you in court." Each individual's act is reasonable and no one would argue with his right to bring his own complaint before the law. The net result, however, has been conflict, the polarization of various interest groups, and the "climate of economic fear" which was mentioned earlier. Until a system is established which will assure a source of water to reliably meet the annual compact requirement and to make progress in "paying off" the alleged debt, this situation will continue. It is a situation which is causing the Valley real economic hardship. The hardship is not related to the quantity of water required. The hardship is the result of the failure to define a system for providing the water and the uncertainty which this has caused. Farmers have quite enough risks to take in the course of a normal year's business. The weather, markets, the economy in general, and many other things make farming a gamble under the most secure conditions. An additional area of uncertainty, whether or not adequate water will be available at the needed time in the growing season, has direct economic consequences. It affects the decisions of individual farmers on whether or not to put a crop in the field and their ability to secure the financial backing to run their businesses for a year. The attempts to remove that area of uncertainty by actual or threatened legal action drains large amounts of money out of the Valley, too.

In 1966, Texas and New Mexico brought the Compact dispute to the Supreme Court. Valley residents realized that the terms of the Compact might actually be enforced. The need was recognized for a local organization to protect the Valley's water rights and to develop programs which would allow the historically established framework of Valley agriculture to continue
while still providing room for new economic development. At the urging of Valley residents, the State Assembly established the Rio Grande Water Conservation District. The District is a duly constituted entity of local government. Its board consists of members appointed by the commissioners of each Colorado county which contributes water to the Rio Grande (except for Costilla County which chose not to participate). Its job is to promote water resource development within the San Luis Valley, determine water policy, own water, coordinate legal and engineering matters affecting the San Luis Valley, and assist in developing projects with the Colorado Water Conservation Board and the Federal Government.

The District is the primary sponsor of the San Luis Valley Project - Closed Basin Division (Closed Basin Project) which the Bureau is now in the process of constructing.

The Bureau's involvement is not in the nature of a program imposed from "above" by the Government. The Bureau acts as an engineering firm providing planning, design, and construction expertise for water projects which would be difficult or impossible for the private sector to accomplish by itself. Typically, Bureau projects are sponsored by local organizations (irrigation districts and/or municipalities). Most of the cost of a project is repaid directly to the U.S. Treasury by the sponsors and beneficiaries through a long-term repayment contract. However, Valley residents will not have to repay the costs of building the Closed Basin Project directly. This is because one of the needs to which the Project is a response is to provide water to meet a national obligation (the Treaty with Mexico).

The District is the Project's local sponsor. The Project is a response to the Valley's need to develop a reliable source of water which: (1) can serve to keep the Valley unencumbered by downstream lawsuits and (2) be developed without significantly disturbing the existing local pattern of water use.

The Project (which is described more fully in the following section) is designed to achieve a delivery of about 104,000 acre-feet of water annually. The Project is being built in stages over the course of the next 10 years. Initial deliveries will be less than the above amount. Every drop of water delivered to the river will help, however. Each drop will provide the Valley with that much more maneuvering room to develop a regular valley-wide system of water allocation which is fair, recognizes established historic patterns of use, allows room for growth, and gets the Valley out of the yearly scramble and uncertainty about meeting the Compact. It is important to remember that all the Bureau is responsible for is building the Project (subject to the constraints discussed below) and putting the water in the river. What will be done with the water once it gets there and what kind of a Valley-wide system of water allocation might be developed as a result of the Valley having more water to work with are not decisions the Bureau is even allowed to make. These decisions will be made by the State of Colorado and local San Luis Valley organizations.
In addition to providing a reliable supply of water, the Project is
designed to fulfill the following objectives and responsibilities:

1. To build the Project with absolutely minimum adverse social and economic
effect,

2. Without damage to the environment,

3. Without damage to important archeological and historic sites, */

4. To enhance recreational opportunities, and

5. To provide wildlife benefits.

The Project is designed to salvage water presently being lost to evaporation processes from the Closed Basin area of the northern Valley. Thus, the primary means of securing water without affecting historic use is for the Project to tap into a source of water which is not being beneficially used. The Project design calls for a network of between 150 and 180 shallow wells spread out over an area of 130,000 acres (less than 1 well per section of land on the average). The 130,000 acres within the formal Project boundaries consist of the sump area of the Closed Basin. This area is the lowest point in the Valley other than the bed of the Rio Grande itself. Water which reaches this part of the Valley, either on or below the surface, has quite literally no place to go but up. Most of the water which reaches the Closed Basin sump comes from the Sangre de Cristos on the east side of the Valley. The Project salvage well system does not depend on the very small amount of water which flows through the developed farmland to the west of the Project area. The salvage well system is designed so that it cannot "suck the water out from below" the lands surrounding the Project.

The law authorizing the Project (Public Law 92-514) provides further assurance that effects to historic local water use will be inconsequential. By law, the Project wells cannot tap into the first widespread artesian aquifer. At a depth between 90 and several hundred feet below the surface of the whole Valley floor, layers of impermeable clay seal off an enormous reserve of water. When a pipe (an artesian well) is inserted into the lower levels, the pressure causes water to flow naturally to the surface. Some of the first artesian wells which were drilled in the Valley sent geysers of water over 50 feet in the air. The thousands of artesian wells which have been drilled since then have relieved so much of the pressure on the artesian aquifer that many Valley artesian wells flow less and in some cases no longer flow at all. Because the artesian aquifer is of such great importance to the economy of the Valley and because a new artesian well can affect the flow of older artesian wells miles away, the Project is prevented by law from contributing to the problem by tapping into the artesian aquifer (for more details concerning this question see section VI and questions 2 and 3).

*/One could perhaps object to items 2 and 3. The Project is designed to minimize disruption of the environment and archeological sites. Mitigation procedures are planned for those minimal effects. The net result will be no damage.
Above the layers which confine the artesian aquifer, the sands and gravels also bear water. This "unconfined" aquifer can be conceived of as a large sponge on the surface of the Valley. The "sponge" is kept moist by spring runoff from the mountain slopes, irrigation diversions, and to a small degree by upward leakage from the artesian aquifer. Like a dry sponge left on a wet kitchen counter, capillary action slowly distributes water through the whole system. The sponge becomes evenly damp. In the sump area of the Closed Basin, the effect of the sun on the surface of the land is like a heat lamp being focused on our "sponge." The top surface feels dry but, in fact, water moves through it all the time and evaporates into the atmosphere. The Project is, quite simply, designed to capture some of this water before it evaporates.

A pipe appropriately slotted below the water table, which is inserted into the unconfined aquifer, will fill up with water to about the level of the water table. If the water is to reach the surface, it must be pumped. The Project wells are designed to work this way. Project effects to the unconfined aquifer are limited to the area within the Project boundaries. This is the second way that the Project will minimize local economic effect. By law, the operation of the Project cannot lower the water table more than 2 feet outside the Project boundaries. Observation wells have been established around the periphery of the Project area. Except for about 30 minutes a year to clear out sediments, these wells are not pumped at all. They are strictly there for allowing monthly measurements of the water table to be made. These measurements are a public record. The Project salvage wells inside the boundaries work by creating a drawdown in the water table (see figure 8-1). The design calls for them to be spaced and pumped at a rate so that over the whole 130,000-acre Project area the water table will be lowered by an average of 4 to 8 feet while not dropping more than 2 feet at or beyond the boundaries. The water below and the vegetation on top of all land outside of the Project boundaries will not be significantly affected by the operation of the Project.

Some people find the scale of some of the Project's statistics to be alarming (150 to 180 wells, 130,000 acres of Project area, 104,000 acre-feet of yearly salvaged water). In fact, these statistics should be reassuring. The Project design calls for an average of less than one well per section. Virtually no place else in the Valley are wells so widely spaced. The Project's planned 104,000 acre-feet annual yield is tiny when compared to the water produced by only the new center pivot systems introduced in the Valley for any one year in the 1970's (see section VI, question 2). The reason that there are so many wells is because they will be widely spaced and each one will recover only relatively small amounts of water. This is the aspect of the Project's design which allows only the amount of water to be salvaged which would evaporate naturally.

The third aspect of the Project which relates to minimizing local economic effects has to do with the character of the land which is within the 130,000-acre Project boundaries. Water has continuously evaporated from the surface of the Closed Basin sump for centuries. The minerals dissolved in
that water are left behind on the ground surface. As a result, much of the
land surface is thickly covered with alkalai, little useful vegetation
grows, and most of the area cannot be productively farmed. Of the
130,000-acre Project area, only 2,000 acres are irrigated farmland. The
rest is poor to very poor rangeland. Almost half of the area is in the
public domain (State of Colorado or Bureau of Land Management). This is
because the land is of such low value that it was never worthwhile for
anyone to claim it. There is no other part of the Valley where the Project
could be built and cause so little disruption of the private sector (see
section III-B).

To summarize the aspects of the Project's design which assure that its
operation will not harm the established economy of the Valley:

1. The Project is designed to salvage water which is not being beneficially
used. Without the Project, a source of water which can benefit the
Valley evaporates.

2. The effects of the Project are rigorously confined to the area within
the Project boundaries. Land and subsurface water outside those bound-
daries will not be significantly affected by the operation of the
Project.

3. The area within the Project boundaries where some effects will be
visible is one of the least developed areas in the Valley. Those
effects will, accordingly, cause minimal disruption.

The primary purpose of the Project is to provide a source of water which will
help Colorado meet its legal obligations to downstream water users and
relieve the San Luis Valley from the annual strain and uncertainty which is
the result of meeting those obligations under the current system. Federal
law and regulations discourage single-purpose construction projects. These
rules are designed to make sure that projects are designed to achieve all of
their potential benefits. Benefits which can be achieved at little or no
additional cost are strongly encouraged. The Project's recreation and fish
and wildlife aspects are of this nature.

The fish and wildlife aspects of the Project are in part related to the
stringent Federal laws protecting wetlands and endangered species. The law
recognizes that wetlands are particularly important to wildlife and are
often critical habitat for rare or endangered species. Projects which
destroy or disturb wetland areas are required to replace the disturbed
habitat. The project Fish and Wildlife Enhancement Plans are in part a
response to these mitigation requirements. Those plans include the deli-
very of Project water to the Alamosa Wildlife Refuge and the Blanca
Wildlife Habitat Area. A waterfowl management area in the Russell Lakes
vicinity will also be established. Russell Lakes will not use Project
salvage water. The Bureau plans to acquire the land and appurtenant water
rights for Russell Lakes from willing sellers. This water is for wildlife
enhancement only and will make no contribution to the rest of the Project
system.
With the State of Colorado, the Bureau plans to develop Head and San Luis Lakes into a recreation and wildlife area. Before San Luis Lake silted up and became foul smelling and brackish in the late 1950's, it was a very popular recreation area. The plans call for the delivery of enough water to stabilize a higher water level in the lakes. Water will be periodically pumped through the system so that the lakes will not stagnate.

There are other Project benefits which are not formally identified as purposes justifying the Project. These "spin off" benefits are mostly related to requirements of Federal laws. Extensive studies of the Closed Basin's ecology, archeology, and history have been done (see section III). These studies are required to identify possible Project effects to these resources and to develop mitigation plans. The results of these studies are available to the public. Scientists and interested local residents can use this information to learn about these unique and interesting aspects of the San Luis Valley.

Perhaps the most important of the "spin off" benefits are the engineering, water table, and geological studies which are required for the Project to be designed properly. The results of these studies (section III) are also available to the public. Radosevich and Rutz' report, which was cited at the beginning of the section, concludes with some advice. The Valley's economic/water interest groups are counseled to negotiate with each other rather than hale each other before courts of law. The purpose of such negotiation would be to develop a Valley-wide system of water allocation which would be both fair and clearly understood. No restraint on individual constitutional rights to seek redress in the courts is intended. The point is, quite simply, that the Valley's present course of defining a system of water rights piecemeal, individual court case by court case, will have negative results. Defining the relationship of Valley water rights to each other in the courts will result in a huge body of individual rulings and decrees. Some rulings will probably be contradictory. Regardless of the outcome, legal fees will be enormous.

It will not be easy to negotiate a fair and legally binding system outside of the courts. The work should be done by people whose vital economic interests are directly involved. The information the Bureau has collected should help. No one can be expected to make a decision which may directly affect his livelihood without some solid facts about what the results of that decision will be. Information has been collected by the Project on how water tables are related, what happens with different kinds of water-pumping operations, and on how those things affect vegetation. These data should help individuals make informed decisions.

In the long run, the information provided by the Project may be a greater benefit than the water it is being built to salvage. The completed Project can be logically viewed as a closely watched gage on the terminal end of the whole northern Valley's ground water system. Like a measuring instrument, the Project will not directly affect the rest of the system. The Project's network of observation wells will show whether or not the northern Valley's water supplies are being used to the full potential allowed by nature. The Bureau should not and cannot take any direct action with that information. The Bureau will make that information available to local groups. They can use it and work together to plan a fair and secure long-term future for the San Luis Valley.
COMMONLYASKEDQUESTIONSABOUTTHE CLOSED BASINPROJECT

Question:

Official statements say that about 13,000,000 kilowatts of electrical power will be needed to operate the project each year. This power will be furnished by local utility companies. Why isn't some form of alternative energy part of the project plan? How will local utilities meet this new demand for a large amount of power? Who will pay for these powerlines?

Answer:

The federal government has an alternative energy program which is active in the San Luis Valley. Automatic wind measuring stations have been installed at a number of locations in the Valley. They are collecting information to determine if this energy source is feasible. The Department of Energy is designing a solar energy system which will be installed at a project well. This program will help the Bureau find out if solar energy technology can be used for the project.

The fact that the project is currently designed to run off "conventional" energy sources reflects the decision of the U.S. Congress to authorize a water salvage project, not an experimental program in alternative energy. The positive steps that are being taken to make sure that project alternative energy options are not closed does not mean that the utility companies will not be able to meet long term project energy needs. The project was originally planned to operate with hydropower from Government facilities. The distribution system was to have been built and operated by the Government. Numerous citizens asked if private landowners would be able to get electrical service from the Closed Basin Project System. These requests and the other factors noted below prompted the Bureau to find out if local utility companies could provide the power needed to run the project. The utility companies firmly state that project power requirements have been included in their plans to keep the San Luis Valley supplied with power. That assurance means that project power needs will be included with the power needs of a growing San Luis Valley in the utility companies' long range planning. Part of that planning is the design and operation of power plants to meet all applicable laws and regulations protecting the air and environment.

Energy costs of new development must be very carefully evaluated. These costs were carefully weighed in the studies which found that the Closed Basin Project is economically justified. Talks with the utility companies began in earnest in 1978. The utility companies knew about
the project's energy needs five to ten years before demands would be put on the system. This allows ample time for the necessary planning to make sure that the project's needs do not conflict in any way with those of other Valley Power users.

The Bureau of Reclamation's decision to contract with private utility companies instead of construct its own power facilities reflects the following factors:

1. The utility companies assured the government that project needs could be met.

2. The underlying philosophy of the American system is that private sector development is apt to be more efficient than direct government action. A choice was seen between the government building its own power system versus acquiring the necessary power from the private sector. Under the American system, there is a strong bias in favor of the private sector option.

3. If the government built the system, it could only be used for providing power for the Project. Contracting with the utility companies means that the transmission system will be the property of those companies and that service can be provided to private individuals. The approximately 150 miles of new transmission lines can provide electrical service to a large area which is now without easy access to existing utility lines. A number of individuals should benefit from this directly.

The project power delivery system will be built by and remain the property of the utility companies. However, the federal government does retain some control of the form the system will take. This control is mostly related to environmental concerns. For instance, the system will have a mix of above and below ground power lines. This is to reduce visual impact. The above ground parts of the system will be designed to reduce the possibility of wildfowl injuries.

The Bureau will contract with the utility companies and will pay for the cost of the power distribution system. This will be done in about the same way that a private individual in a remote area would get electrical service. The funds which were originally allocated for the government's own system will cover the costs of contracting with the utility companies. The government will pay for the project system directly. The costs of the project system will not be "tacked on" to the utility bills of the general public.
Question:

Will the Closed Basin Project turn San Luis Valley into a dust bowl?

Answer:

No, the operation of the Closed Basin Project will not turn the Valley into a dust bowl.

The fears which many people have expressed on this subject are based on misunderstanding. This misunderstanding focuses on two official statements about the project. These official statements are: (1) "the Project will salvage water now being lost to evapotranspiration . . .,", and (2) "decreased plant vigor may result (from the operation of the project) in some areas. . . ." Some people have interpreted these statements to mean that operation of the project will result in the loss of existing vegetation from a vast part of the valley. That is not what the statements say, and it is not reasonable to believe this will happen.

In the Closed Basin sump area, the water table is generally 2 to 6 feet below the surface. A large amount of water evaporates from the project area every year. Project facilities are designed to salvage some (not all) of this evaporated water by lowering the water table in the Closed Basin sump area (only within the project boundary). A lower water table will reduce the amount of water transferred from the soil surface and from some of the vegetation to the atmosphere.

Water is transferred to the atmosphere from leaves of growing plants (transpiration) and from the soil surface (evaporation) by a process called evapotranspiration. Plants in the San Luis Valley and the area of the Closed Basin (not including wetlands) are well adapted to low rainfall and moisture levels; however, they can and do use large amounts of water when it is available. The efficiency with which a plant uses soil moisture often decreases with too much available water. A point can often be reached where high moisture levels reduce plant growth and survival. Where there are always very high water tables, the rate of plant growth will likely be less than if the water table and available water were lower. Lowering high water tables within project boundaries will not automatically result in the death of all existing vegetation. Some plants will be adversely affected by lowering water tables. Others will be helped and increased plant growth will occur. Evaporation of soil moisture can be very high when water levels are near or at the soil surface. The evaporation rate from a wet soil surface generally exceeds that transpired by plants under the same climate conditions. Reducing water levels will decrease total water lost from the soil surface and will often maintain greater plant growth rates.
Both upland and wetland vegetation in the San Luis Valley and the Closed Basin have been studied for many years. A 3-year growth study was conducted by the Bureau of Reclamation on basically upland vegetation. The study area was located where the water table was lowered by a pilot salvage well. The study has shown that shrubs right around project salvage wells will be adversely affected. Most of the shrubs within several hundred feet of the well will be smaller in size and fewer in number after several years of project operation. Younger shrubs will most likely survive even near the wells. These shrubs have the ability to follow the water table down as they continue to utilize surface precipitation. Older shrubs do not respond to rainfall as well.

The reaction of saltgrass and wiregrass to a lowering water table is a little more complicated. Where the water table is more than 5 feet down, most grasses depend on direct rain and snowfall for annual growth. In these areas, project pumping and lower water tables will not affect the grasses. In areas where a very high water table does support stands of grass, lowering the water table will result in fewer grass plants. Lower water tables and fewer saltgrass plants will allow other grass species native to the area to increase. Grasses coming into the area will be more valuable to livestock grazing. These grasses will be able to compete because of decreased surface salt accumulations. Less desirable forage plants (saltgrass and wiregrass) will share space with more desirable grasses (alkali sacaton, blue grama, and western wheat).

There will be some reduction in plant vigor in wetland areas as a direct result of project pumping. Federal law requires the replacement of affected wetlands. The project will deliver water to the existing Blanca Wildlife Habitat Area and Alamosa Wildlife Refuge. A new wildlife habitat area will be developed in the Russell Lakes vicinity. A recreation area will be established in the San Luis and Head Lake area. These steps will maintain both the overall quality and extent of wetlands in the San Luis Valley and the Closed Basin sump area. These steps will more than compensate for any wetland vegetation loss resulting from project pumping.

Preliminary studies suggest that a program of establishing stabilizing vegetation around salvage wells and the main canal should greatly reduce long-term project maintenance costs. Shelter belts of trees and starting stands of native grass in bare areas are being studied for inclusion as part of the project design. Applying small amounts of project salvage water for a short time after planting should allow native plants to get well started. This program should result in a significant increase in vegetation over preproject conditions in the areas of the salvage wells and main canal.

To sum things up, the direct effects of the project operations on plants will be neither widespread nor severe. Vegetation effects will occur only within the project boundaries. Visibly less vegetation may result within 1,000 feet of some salvage wells. At distances farther away from the wells, the change in vegetation (if there is any) will only show up in careful scientific studies.
It may seem contradictory to state that a program designed to salvage water by "taking it away" from existing growing plants will eventually result in an area with more total value to the whole valley. The contradiction is superficial. Any successful San Luis Valley farmer knows that sheer quantity of water is not the only aspect of getting plants to grow and obtaining good production. With careful management and controlled application, more desirable plants can be grown with less water. In this sense the Closed Basin Project can be viewed as a water management program for the Closed Basin sump area.

One could argue that the valley has as much "chico brush" as it needs and that water is more valuable than chico. If this were the case, it would be logical to salvage all the water now being used by the brush in the project area. Even if this were desirable, it is not physically possible to salvage all the water and kill all shrubs.

Some individuals have suggested that operation of the project will result in a vast extension of the Great Sand Dunes. In fact, the project will, to an extent, counteract the environmental damage of 100 years of overgrazing and diversion of salt-laden irrigation runoff into the Closed Basin. Lowering the water table and decreasing the amount of salt in the soil will eventually create an environment closer to what was there 100 years ago.
INFORMATION FOR LANDOWNERS AFFECTED
BY
THE CLOSED BASIN DIVISION
SAN LUIS VALLEY PROJECT
COLORADO

1. What is the Closed Basin Division, San Luis Valley Project?

The Closed Basin Division, often called the Closed Basin Project, is a multipurpose water resource development in southern Colorado. It was authorized by Congress on October 20, 1972, under Public Law 92-514 and is to be constructed by the Bureau of Reclamation, Department of Interior.

2. What is the Bureau of Reclamation?

The Bureau is an agency of the United States Department of the Interior created by Congress in 1902 to develop water resources of the 17 Western States in cooperation with local interests. During the last 79 years, the Bureau has developed over 150 multipurpose water projects. These projects furnish water to over 11.4 million acres of irrigated land plus municipal and industrial (M&I) water for urban areas with an aggregate population of nearly 39 million. Generating plants at 50 Bureau dams are capable of furnishing more than 10.4 million kilowatts of electrical power. In addition, these same projects provide flood control benefits, public recreation areas, and protection and enhancement of fish and wildlife resources.

3. What Purpose Will the Closed Basin Project Serve?

It is designed to salvage a portion of the groundwater now mostly wasted by evaporation. The water will be pumped and delivered by conveyance channel for discharge into the Rio Grande southeast of Alamosa, Colorado. Delivery of this water will assist the State of Colorado in meeting its commitments for water deliveries to the States of New Mexico and Texas under the Rio Grande Compact and will also assist the United States in meeting its commitments to Mexico under the Rio Grande Convention of 1906. The project will also provide fish and wildlife enhancement by water deliveries to the Alamosa National Wildlife Refuge, establishment of an additional Wildlife Refuge and stabilization of the water level in San Luis Lake.

4. What are the "Vital Statistics" of the Project?

The project is scheduled for development in stages over a 10-year period. During this time, about 170 water wells will be drilled with an estimated 100 miles of buried pipeline delivering water to the conveyance channel. The conveyance channel will be approximately 42 miles long and has the capability to deliver approximately 100,000 acre-feet of water annually to the Rio Grande.
5. **How Many Acres of Land Will be Purchased for the Project?**

   It is estimated that 11,400 acres of privately owned land will be required for the project. Of that area, approximately 10,700 acres will be acquired in fee title, and approximately 700 acres will be acquired by permanent and temporary easement.

6. **Who Will Acquire These Necessary Lands?**

   The Bureau, acting for the United States Government through its local project office in Alamosa, Colorado.

7. **When Will the Lands be Purchased?**

   Consistent with available funds, the Bureau will acquire lands and rights-of-way to conform to construction schedules. Those areas within Stage 1-2 will be acquired first with the remaining areas acquired as time and funds permit through the 10-year construction period.

   Unless needed immediately for construction purposes, owners may retain possession of acquired lands long enough to permit the orderly harvesting of crops, shifting of livestock, and completion of permanent moves to new locations.

8. **Will Landowners and/or Tenants be Paid Moving Expenses?**

   Under provisions of the Uniform Relocation Assistance and Land Acquisition Policies Act of 1970 (Public Law 91-646), both owners and tenants may be entitled to certain reimbursements incurred for certain moving expenses resulting from the project. In addition, relocation assistance and advisory services will be provided for displaced persons as a result of the project. Complete information regarding such payments or reimbursements can be obtained from the Bureau's right-of-way agents or from the local project office.

9. **Must a Landowner Remove All Improvements from His Land?**

   This decision is usually left to discretion of the landowners. If he wishes to retain all or part of his improvements at the appraised salvage value, he may do so provided that they are moved from the land within a prescribed period of time; otherwise, he will be paid the appraised value of permanent improvements remaining on the land. These arrangements should be made with the right-of-way agent during negotiations and properly documented in the purchase contract.

10. **How Much Will be Paid for the Lands Acquired for the Project?**

    The current value of all land and landrights required for the project will be determined by professional appraisers following a careful inspection of each individual property based on market value at the time the appraisal is made. Market value has been interpreted by the State and Federal courts to mean the price agreed upon between a willing buyer and seller, neither being obligated to buy or sell. The law contemplates an "open, arm's-length" transaction, fair and reasonable to all parties.
11. **What Happens if No Purchase Contract is Signed?**

In the event an acceptable purchase contract cannot be agreed upon between the landowner and the right-of-way agent, the Bureau will request the Department of Justice to acquire title through the Federal Court for the District of Colorado. The purpose of condemnation actions is to determine the amount of fair compensation or to clear "cloudy" titles. In any event, the landowner will be given full opportunity to support his values in the same manner as will the Government.

12. **Does the Landowner Have to Provide an Abstract of Title?**

It is not necessary to purchase an abstract of title or to bring one up to date; however, if an abstract is available for the Bureau's use, it might help reduce costs and expedite payment to the owner. The Government will acquire, at its expense, such evidence of title as might otherwise be deemed necessary by its legal counsel. In like manner, the Government will pay fees involved in recording purchase contracts and deeds in the proper county records.

The landowner might be required to obtain and record instruments such as affidavits of heirship necessary to show good clear title.

13. **How and When Will Payment be Made?**

After the owner and the Bureau's right-of-way agent have agreed on a purchase contract, the Government's attorneys will draft the warranty deed instrument. After the title has been reviewed and accepted by the Government, the owner will sign the deed. After the deed is recorded in the county land records, a United States Treasury Draft will be drawn in favor of the seller in the full amount of the purchase price.

14. **Will Landowners be Required to Pay Income Tax on Money Received from the Sale of Land?**

The responsibility for administration of the United States tax law rests with the Internal Revenue Service (IRS) of the Department of the Treasury. Present tax laws and regulations contain special provisions regarding gains or profits from the sale of real property interests including sales made to Government agencies.

It is suggested that owners conveying land or real property interests to the Government for project purposes contact local representatives of IRS for complete information concerning these tax matters.

15. **What About the Rights of Owners on Lands Adjoining Those Purchased by the United States?**

A fence will be constructed around portions of the Government-owned land with access restricted to established public roads. The use of grazing of livestock on Government lands will not be permitted except in rare instances when short-term leases will not interfere with project purposes.
16. What is the Policy Regarding Clearing on Project Lands?

Ordinarily, all fences, buildings, and improvements will be removed from lands acquired by the United States for the project. Certain areas will be left in their natural state for fish and wildlife habitat.

Existing roads, utilities, and pipelines will be relocated where necessary. Such relocations will be handled by separate and special contracts with owners of the involved facilities and do not ordinarily affect individual landowners.

17. Who Should be Contacted for More Information About Closed Basin Project?

The Bureau's project office in Alamosa, Colorado, located at 10900 Highway 160 E. The mailing address is, United States Bureau of Reclamation Closed Basin Division, San Luis Valley Project, Post Office Box 449, Alamosa, Colorado 81101. (Telephone No.: 303-589-5855).
<table>
<thead>
<tr>
<th>Lab Number</th>
<th>SW-33 - 269</th>
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<tbody>
<tr>
<td>Conductivity</td>
<td>1.45E+02</td>
</tr>
<tr>
<td>pH</td>
<td>7.80E+00</td>
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<tr>
<td>TDS/180C</td>
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<tr>
<td>Potassium</td>
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<td>6.05E+00</td>
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<td>Carbonate</td>
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<td>Magnesium</td>
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<tr>
<td>Bicarbonate</td>
<td>1.34E+00</td>
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<tr>
<td>Magnesium</td>
<td>8.17E+01</td>
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<td>Sulfate</td>
<td>1.30E-01</td>
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<td>Magnesium</td>
<td>1.58E+01</td>
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<td>Chloride</td>
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<tr>
<td>Magnesium</td>
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<tr>
<td>Nitrate</td>
<td>0.00E+00</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.00E+00</td>
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<tr>
<td>Cations + Anions</td>
<td>1.36E+02</td>
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</tbody>
</table>
REPORT OF WATER ANALYSES

USBR - SAN LUIS VALLEY PROJECT
FIELD ENGINEERING DIVISION - CHEMISTRY LABORATORY

FROM: CLOSED BASIN
SHIPPED: 9-22-82
RECEIVED: 9-17-82
ANALYST: EV VIGIL
REPORTED: 09/22/82

SAMPLE IDENTIFICATION DATA

SW-33 - 269  SW-33  9-17-82
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<tr>
<th>SAMPLE NUMBER</th>
<th>ERROR</th>
<th>K*E6/ANIONS</th>
<th>K*E6</th>
<th>TDS (PPM)</th>
<th>CATIONS + ANIONS</th>
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<tbody>
<tr>
<td>A- 269</td>
<td>2.26</td>
<td>83</td>
<td>145</td>
<td>88</td>
<td>136</td>
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</table>
VISUAL LOG AT PILOT WELL

- Surface Casing
- Water Table 10'
- Grout
- 20'
- Claysand
- 30'
- Pump Chamber Casing
- 40'
- Sand
- 50'
- Gravel Pack
- 60'
- Well Screen
- 70'
- Clay
- 80'
- Concrete Plug
- 90'
- Sand
- 100'
- Clay
- 110'
- Sand
- 119'
- Clay
- 120'

NATURAL GROUND

UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION SAN LUIS VALLEY PROJECT-COLORADO CLOSED BASIN DIVISION STAGE 1-2 SALVAGE WELLS S.W. 4 - PILOT WELL GAMMA LOG - T.C. = 4
# GEOLOGIC LOG OF DRILL HOLE

**FEATURE:** Salvage, Nifikasi, Stage 1-2  
**PROJECT:** San Louis Valley - Closed Basin  
**LOCATION:**  
**HOLE NO.:** ECE  
**COORDS. M.:** E.  
**GROUND ELEV.:** 757'  
**DIP (ANGLE FROM HORIZON):** 36°  
**TOTAL DEPTH:** 150.0'  
**BEARING:**  

<table>
<thead>
<tr>
<th>DEPTH AND ELEV. OF WATER LEVEL AND DATE MEASURED</th>
<th>Not Determined</th>
<th>LOGGED BY: K. Adams</th>
<th>LOG REVIEWED BY: R. Z. Neal</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>NOTES ON WATER LOSSES AND LEVELS, CAVING, AND OTHER DRILLING CONDITIIONS</th>
<th>PERCLOSATION TESTS</th>
<th>CLASSIFICATION AND PHYSICAL CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drilled under speciications SIMOF 55S</td>
<td></td>
<td>0.0'-7.2' Silty Sand; Approximately 85% medium to predominantly fine, sub-rounded sand; approximately 15% non-plastic fines; quick dilatancy; maximum size, medium sand; light brown. (SH)</td>
</tr>
<tr>
<td>Buchholz Construction Co., Honein, CO. SLOVSKY</td>
<td></td>
<td>7.2'-36.0' Clayey Sand to Lean Clay; Approximately 60% medium to predominantly fine, sub-rounded sand; approximately 40% fines; medium sand; greyish-black; some thin clay lenses. (SC-CL)</td>
</tr>
<tr>
<td>Drilled 5'' hole for observation well 5.0' to 20.0'; Installed 15'' PVC, 10' backfill; slotted 6.0' to 19.0' using a Porta-drill 522, water, and a 3-part cement. Gamma logged hole. Sealed confining clay with 2 sacks of Type II cement. Backfill to surface.</td>
<td></td>
<td>36.0'-45.0' Poorly Graded Sand; Approximately 90% coarse to medium to fine, subangular to subrounded sand; approximately 5% fine, medium sand; very fine; maximum size, 3'' gravel; greyish-black. (SF)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45.0'-55.0' Clayey Sand; Approximately 80% coarse to medium to fine, subangular to subrounded sand; approximately 15% fine, medium sand; approximately 5% plastic fines; maximum size, 3'' gravel; brown; some thin clay lenses. (SC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>55.0'-65.0' Poorly Graded Sand; Approximately 85% coarse to predominantly medium to fine, subangular to subrounded sand; approximately 5% fine, hard, subrounded gravel; approximately 10% non-plastic fines; maximum size, 3'' gravel; brown. (SP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>65.0'-70.0' Clayey Sand; Approximately 80% coarse to medium to fine, subangular to subrounded sand; approximately 20% slightly plastic fines; maximum size, coarse sand; brown. (SC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70.0'-82.0' Interbedded Brown Clay and Gravelly Sand; Sand layers are 40% coarse to predominantly medium to fine sand and 10% fine, hard gravel; clay layers are very plastic and brown. (CL &amp; GP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>82.0'-87.0' Lean Clay; Approximately 80% very plastic fines; approximately 20% fine sand; approximately a trace of fine gravel; no dilatancy; maximum size, 0'' gravel; brown; gravel in thin lenses. (CL)</td>
</tr>
</tbody>
</table>

**EXPLANATION**

<table>
<thead>
<tr>
<th>Type of hole</th>
<th>Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>C</td>
<td>C</td>
</tr>
</tbody>
</table>

**CORE LOSS**

**CORE RECOVERY**

**FEATURE:** Salvage, Nifikasi, Stage 1-2  
**PROJECT:** San Louis Valley - Closed Basin  
**STATE:** CO  
**SHEET:** 1 of 2  
**SCALE:** 1" = 20'  
**SCALE:** 1:2400  

---

**Shade of Petrocalcium**

**DARKER SHADE**

**LIGHTER SHADE**

---

**DEPTH:** 0.0' to 150.0'  
**ELEV:** 575.0' to 150.0'  
**BEARING:** 36°  
**LOGGED BY:** K. Adams  
**LOG REVIEWED BY:** R. Z. Neal  

---

**SHEET:** 1 of 2  
**SCALE:** 1" = 20'  
**SCALE:** 1:2400  
**FEATURE:** Salvage, Nifikasi, Stage 1-2  
**PROJECT:** San Louis Valley - Closed Basin  
**STATE:** CO  
---
## GEOLeGIC LOG OF DRILL HOLE

**FEATURE:** SALVAGE WELLS STAGE I-2  |  **PROJECT:** SLV-CLOSED BASIN  |  **STATE:** CO

**HOLE NO.:** P112  |  **GROUND ELEV.:** 1940  |  **DIP ANGLE FROM HORIZON:** 90°

**BEGIN:** 9-2-87  |  **FINISHED:** 9-3-87  |  **DEPTH OF OVERBURDEN:** 130.0′

<table>
<thead>
<tr>
<th>DEPTH AND ELEV. OF WATER LEVEL AND DATE MEASURED</th>
<th>NOT DETERMINED</th>
<th>LOGGED BY: R. Adams</th>
<th>LOG REVIEWED BY: R. Neal</th>
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</thead>
</table>

### NOTES ON WATER LOSSES AND LEVELS, CASING, CEMENTING, CAVING, AND OTHER DRILLING CONDITIONS

<table>
<thead>
<tr>
<th>TYPE AND SIZE OF HOLE</th>
<th>CORE RECOVERY</th>
<th>DEPTH (FEET) FROM</th>
<th>TO</th>
<th>LOSS</th>
<th>PRESSURE</th>
<th>D.C.E.</th>
<th>DEPTH</th>
<th>LOGGED</th>
<th>CLASSIFICATION AND PHYSICAL CONDITION</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(FEET OF CASING)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0′-99.0′ Glay Sand</td>
<td>100</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Approximately 80% medium to fine, subrounded sand; approximately 20% slightly plastic fine; brown. (SC)</td>
</tr>
<tr>
<td>99.0′-106.0′ Blush-White Lean Clay</td>
<td>110</td>
<td>110</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Approximately 80% very plastic clay; approximately 20% fine sand; approximately a trace of fine gravel; maximum size, 1/8″ gravel; blush-white; thin gravel lenses; some brown clay. (CL)</td>
</tr>
<tr>
<td>106.0′-116.0′ Sandy Clay to Lean Clay</td>
<td>120</td>
<td>120</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Approximately 60% very plastic clay; approximately a trace of fine, hard gravel; approximately 40% medium to predominantly fine sand; maximum size, 1/8″ gravel; grey. (SC-CL)</td>
</tr>
<tr>
<td>116.0′-121.0′ Fat Clay</td>
<td>140</td>
<td>140</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Approximately 90% very plastic clay; approximately a trace of coarse to fine gravel; approximately 5% fine sand; maximum size, 3/16″ gravel; no dilatancy; blush-white; mixed with thin lenses of brown lean clay and coarse to fine gravel. (CH)</td>
</tr>
<tr>
<td>121.0′-140.0′ Glayet Sand</td>
<td>150</td>
<td>150</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Approximately 70% medium to predominantly fine sand; approximately a trace of coarse to fine, subrounded, hard gravel; approximately 30% low plasticity fine; maximum size, 1/8″ gravel; greyish green. (SC)</td>
</tr>
<tr>
<td>140.0′-150.0′ Fat Clay</td>
<td>150</td>
<td>150</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Approximately 85% very plastic clay; approximately a trace of coarse to fine, subrounded, hard gravel; approximately 15% fine subrounded sand; no dilatancy; maximum size, 3/16″ gravel; blush-white gravel in thin lenses; some grey, green, and brown clay lenses. (CH)</td>
</tr>
</tbody>
</table>

### EXPLANATION

- **Type of hole:** D = Diamond, H = Heavy medals, S = Shale, C = Chert
- **Hole sealed:** P = Packer, Cm = Casing, Bs = Bottom of casing
- **Approx. size of hole (in mm):** Ex = 1-1/2″, Ay = 1-1/4″, Br = 2-3/8″, Ns = 3″
- **Approx. size of core (in mm):** Ex = 7/8″, Ay = 1-1/4″, Br = 1-1/4″, Ns = 3-1/8″
- **Outside dim. of casing (in mm):** Ex = 1-13/16″, Ay = 3/16″, Br = 2-7/8″, Ns = 3-1/2″
- **Inside dim. of casing (in mm):** Ex = 1-1/2″, Ay = 1-29/32″, Br = 2-3/8″, Ns = 3″

**FEATURE:** SALVAGE WELLS STAGE 1-2  |  **PROJECT:** SLV-CLOSED BASIN  |  **STATE:** CO  |  SHEET 2  |  OR: 2  |  HOLE NO. P112