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Oral Histories

AN INTERVIEW WITH

LE VAL LUND

Interviewed by Dick Nelson

One of a series of oral interviews covering the growth and development of the Los Angeles Department of Water and Power as seen by the participants - its employees.

Produced By

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One sister, Ethel Hallie (Lund) Pattison

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This is to certify that I have reviewed this transcript and attest that it is true and accurate. Also by my witnessed signature below, I grant the Los Angeles Department of Water and Power, or its designee(s), sole right to use this material in any way, and for any purpose, it deems appropriate.

Le Val Lund — 1 June 1993
Le Val Lund — date

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TAPE NUMBER: 1, SIDE ONE

LE VAL LUND

GIVEN MONDAY, MAY 4, 1992

AT

HIS HOME IN LOS ANGELES, CALIFORNIA

THE INTERVIEWER IS DICK NELSON

NELSON: OK, Val, why don't you fill us in on your early years, where you were born, growing up, etc.

LUND: I was born in Los Angeles, California, at the Angeles Hospital, which was located at Washington Boulevard and Trinity Street in the downtown area (demolished in the 1980s and presently a shopping center). The first two years my father and mother lived with his parents on Crown Hill, which is currently near the site of the Union Oil Company (UNICAL) headquarters and will

soon become a part of the Central City West area, just west of the Harbor Freeway, between Fourth and Fifth streets. My grandparents had a tri-plex and we lived with them.

My father, Le Val (originally Le Valley) Lund, came from Medina, New York, with his parents when he was four years old. My mother came from New York City. My father met my mother when he was attending the Brooklyn Eye and Ear Hospital as a post-graduate student. They were married and he brought her west to Los Angeles to his parents home and that's where I lived for the first two years of my life.

My parents decided they would live in their own home and they moved to this location on Lowry Road in East Hollywood, sometimes referred to as the Los Feliz District in the City of Los Angeles. I have lived here all my life and I plan to live here for some time to come. It is a very convenient location to everything here in Southern California.

I attended the local elementary school, Franklin Avenue School, Thomas Starr King Junior High School and graduated from John Marshall High School, all within the local community. My desire in my early years was to become a truck driver or do something in construction. I always was interested in seeing projects being built. I didn't know much about design in those days but later on I discovered that you needed to take a technical course in high school in order to go to college.

While in high school I took the acadamic curriculum which provided the entrance at that time to the University of California

system which seemed to me to be leaning towards the things I liked. So I took the math and science courses and language courses required for entrance to the University of California.

When I graduated from high school I was a winter graduate and most colleges started in the fall so I went to UCLA and took the English "Subject A" course, which I thought was excellent because I had failed the "Subject A" examination, and other college courses.

"Subject A" was a good background in English compositon. English, as you know is a somewhat complicated language. I learned English through "Subject A" and foreign languages. I attended UCLA for one semester to place me on a normal college schedule which began in September through May. I went to Occidental College in Eagle Rock for two and one half years and took the pre-engineering math and science major.

About that time World War II was in progress so I joined the U.S. Navy V-12 program. This program was an engineering program which allowed you to complete some basic engineering courses before you entered active service. I entered active service with the Navy in the V-12 program; first at Occidental College, then for engineering they transferred me to California Institute of Technology (Cal Tech) in Pasadena. I completed the minimum Navy engineering requirements and was transferred to Camp Endicott in Rhode Island for officer training at the U.S. Naval Construction Battalion Training Center at Davisville, Rhode Island.

The several month course prepared you to be an Ensign in the Civil Engineering Corps (CEC), more particularly the naval

construction battalion's, or "Seabees." I reported to active duty overseas at a "Seebee" unit in Okinawa, Japan and served there for approximately one year. Then I was released, as a Lt (JG) to inactive duty in the U.S. Navy CEC reserve.

Since I had not graduated from Cal Tech I returned to finish my engineering courses and graduated in 1947 with a BS in engineering.

I looked for opportunities to work in civil engineering and I walked the streets to interview with various organizations. At that time companies did not have an active college recruitment program on campus as is the norm today. Now, the Department of Water and Power (DWP) recruits many of its engineers direct from the campus.

A friend of mine who was working for the Power System of the Department suggested that I take the civil service exam for Civil Engineering Assistant and Structural Engineering Assistant. It would be of no harm and I could see what happens. So I did that and went to Hollywood High School where most of the civil service exams are given and took both exams which happened to be given the same day. I suspect there was a common session and then separate sessions for civil engineering and structural engineering.

I took a temporary vacation replacement job in the Field Engineering Division (FED) of the Water System in July of 1947. I reported to work for Ralph Proctor, who is known as the father of modern soil mechanics because of his developemnt of the "Proctor Needle" and other methods for determining the compaction of soil

in the field using the Proctor method which is still used today by the American Society for Testing and Materials, although it has been modified.

NELSON: Val, let me go back and pick up a couple of things. Was your father a doctor?

LUND: Yes. My father was an University of Southern California (USC) Medical School graduate and he practised general medicine, first with his father in downtown Los Angeles, and then specialized in eye, ear, nose, and throat. He narrowed that to the eye in his later career.

My mother worked in a medical office in New York City and through the doctors she worked for developed an association with the Brooklyn Eye and Ear Hospital where she met my father.

NELSON: In the V-12 Program, were you in uniform at that time? Did you come home in the evenings or were you stationed somewhere and attend classes as a naval person?

LUND: On July 1, 1943, I was officially placed on active duty in the V-12 Program and we wore sailor uniforms and followed all Navy procedures that would be typical of a "boot camp," but we were located on the Occidental College campus in Eagle Rock. We had our drills, physical training, Navy rules and regulations, Navy pay, Navy chow and all the activities related to the Navy were complied with and we also attended the regular college courses. So in effect, we were in a Navy training school and it was officially known as a U.S. Navy Training School, Occidental College.

NELSON: Were there civilian students on campus too?

LUND: There were a few civilians attending and also some Army Reserve Officers Training Corps (ROTC). It was the same thing at Cal Tech which was a U.S. Navy training school, but, there were some civilians and some Army and Navy officers who were taking meteorological training. We had military commanding officers and administrative directors, but we took the classes from civilian professors. We lived in regular school "dorms," but they doubled the sleeping capacity for us through the use of the standard Navy steel double bunkbeds.

NELSON: You went to work for the Department in 1947 working under Ralph Proctor. What was his title at that time?

LUND: He was the Engineer in Charge of the Field Engineering Division. This division was responsible for field surveys, dam design and surveillance, engineering geology, construction inspection, and the Materials Testing Laboratory at Second and Rose.

At that time the Department was involved in the construction of the Baldwin Hills Reservoir. So my duties were really related to monitoring the contractors activities relative to the reservoir construction. Ralph Proctor was very instrumental in instituting his soil mechanics, or as we now call it, geotechnical engineering, in the field on that project.

At Baldwin Hills, he used his methods for determining soil compaction to monitor the activities of the contractor who would be

compacting the reservoir's earth-fill using the now more famous "Sheep's Foot" roller. The Department actually designed and built some of these first rollers, which are now used by everyone doing soil compaction in earthfill construction. It was important to monitor the contractors compliance with the Department's contract specifications.

NELSON: You say monitoring. Was that in effect a lot of inspection and contract compliance?

LUND: Yes. As far as the monitoring my particular activity was not in the field. I only got to go to the field once or twice. I was really monitoring the contractor's quanities, concrete pavement and compacted materials placed. I took the field reports prepared by the field inspectors and put them into the appropriate form so that the contractor could be paid for under the contract provisions.

NELSON: Where were you located at that job?

LUND: When I came to the Department I was located on the eighth floor of the Hill Street Building, 222 South Hill Street. This building was a part of a DWP tee-shaped complex which fronted on Broadway, Second Street and Hill Street. Field Engineering Division was located on the eighth floor.

NELSON: I've heard that Ralph Proctor was really one of the leaders in soil mechanics, on the cutting edge so to speak with his "Proctor Needle." Can you describe some of the techniques that Proctor or the Department pioneered in soil mechanics?

LUND: Ralph Proctor was instrumental in developing what is called the field method for determining the condition of soils, whether they would meet the contract specifications. The "Proctor Needle" was a device that looked somewhat like a tire pump. Probably the original version was a tire pump that he had modified. Instead of having the hose to connect to your tire there was a needle at the end. The needle had certain specified cross section areas or diameters so that, in effect, when you put it into a soil area that you wanted to monitor you could determine by pressing down on the handles like you press down on a tire pump. You press down and see how far that needle would penetrate into the soil. By reading a gage on the side, almost like a tire gage, you could determine from previous tests that had been made on laboratory samples, the amount of soil compaction (percent of relative compaction) in the field.

It was a method of obtaining a quick identification of the density of the soil to determine if the contractor had made enough passes with the "Sheeps-Foot" roller to get the desired contract specifications for density. In effect it was a type of tire pump with various sized needles that you would press into the soil. There was a marker ring that would move up and down depending upon how far you could push it in. If you pushed it in easily you knew that your density was very low. If it would only go a short distance you knew you had good density or soil compaction. You'd measure this pounds per-square-inch from a table you had previously prepared on the basis of laboratory sample analysis.

The needle was called the "Proctor Needle" and its purpose was

to determine the field density of soils at the time the construction was in progress.

In the old days they would collect an undisturbed sample, transport it to a laboratory, do the necessary tests (weighing and comparison with the test sample) and transport the information back to the field before the inspector could tell the contractor, "You didn't meet specifications. You have to remove two feet of soil here before we can proceed." The "Proctor Needle" expedited the process. Periodic laboratory tests were made to verify it's findings.

Mr. Proctor was involved in developing the laboratory analysis methods. In the old way you would take a sample of material from the construction site and densly compact it to say one hundred pounds per-cube-foot in the laboratoy and compare it with an actual field "undisburbed" sample which was different and say, weighed fifty pounds per-cubic-foot. Then you knew you had fifty percent relative compaction or density. Usually you would want ninety percent or more for dams. We would like ninety five to ninety seven percent relative compaction

Mr. Proctor also developed a method to make field density tests. At a location where the contractor had compacted the soil, a sample of that material would be taken by just shovelling out several shovelfuls of the material and placing it into a sack for return to the laboratary for drying and weighing. You determine the volume of material by filling the hole with fine concrete sand. This was a uniform-grained sand which came from a location in Ottawa, Illinois. You would fill the hole with this

sand which would determine the volume of material removed.

The container which held the sand was graduated so if you placed one cubic foot of sand into the hole you would know you excavated one cubic foot of material from the hole. You had the volume of the soil. Then you took the sample to the laboratory and had it weighed so you would have both the weight and volume. Then you take the sample and compacted it as densely as possible into a cylinder. The cylinder was approximately six inches in diameter and eight-ten inches high. You would tamp soil in, maybe three or four layers, so you would have uniform tamping. Then you would again weigh that sample and you know the volume of the cylinder so you could figure what the maximum laboratory density was and you have the volume and weight so you can compare it with the field density resulting in a percent of relative compaction or density.

The "Proctor Needle" was used for a quick determiniation of relative compaction. The Proctor field density method also could be done in the field because you would have a little building beside the construction inspectors office where you could store the field samples, determine the volume, dry and weigh and do the laboratory work to determine the relative compaction.

This was another quick way. The "needle" was the quickest way. To verify the "needle" you would want to do a field laboratory density test. In that way you could be right on top of the contractor so that he could be notified immediately that he was not meeting specifications as far as relative density was concerned and that he would not have to remove so many layers of

soil in order to get down to the appropriate density.

NELSON: Was the "needle" method accurate enough to get you up to that 90 - 95 percent relative density?

LUND: No. It was just an indicator. To my knowledge today not many people still use the "Proctor Needle." However the Proctor field density method is a regular part of soil mechanics (geotechnical) testing of compacted earth fills. It's a part of the ASTM testing procedures.

NELSON: How long was the "needle" used?

LUND: Guessing, I would say 10-15 years. Why I know that is because I worked in the Dams, Geology and Materials Section, Water Engineering Design Division, where I was directly in charge of the activities that Mr. Proctor was in charge of, but many years later.

Looking back on some of the old reports you can see where they worked on some of the reservoirs and did use the "Proctor Needle" method. Probably the first project that I can think of might have been the work on modifying the dams and dikes at Chatsworth Reservoir where I saw evidence of his methods being used and I would guess that was in the 1930s.

NELSON: This temporary vacation replacement job that you took in July of 1947. It only lasted a month?

LUND: Three weeks, then I was discharged. I was a vacation replacement for a person in the Field Engineering Division, in the Inspection Group. When he came back from vacation the Chief Clerk

said they would hire me back as a permanent employee as a Civil Engineering Assistant.

So I continued to work in generally the same area monitoring the contractor's activities, in the office, on the construction of the Baldwin Hills Reservoir.

NELSON: How long did you stay in Field Engineering?

LUND: About four months. Two months in inspection and two months in what we now call, the Reservoir Surveilance Group. This group was a part of the Field Engineering Division. It was responsible for monitoring the performance of our 30 to 35 dams that were under the jurisdiction of the State of California Division of Safety of Dams.

I was in the office. I did no field work. But field inspectors would go to the different dams to measure seepage and water levels in the observation wells. Any unusual conditions at the dam were observed, including erosion or excessive vegetation. They would bring the data back to me and I would put it into graphic forms by hand (this was prior to any computer data processing). I maintained the records which were reviewed by the State when State engineers made their periodic inspections, quarterly, semi-annually or annually, depending upon the size and more critical nature of the dam.

In the Inspection Group I worked for Bill Simon. He was in charge of Inspection and Surveys. In the Reservoir Surveilance Group I worked for Ralph Ridenour and I also worked for Bob Wilson. Bob was the first engineering geologist hired by the Department.

This was all within the Field Engineering Division under Ralph Proctor.

Since I was really interested in structural design and my major was structural design and the Structural Design Group of the Water Design Division was right across the hall, on the 8th floor, Hill Street Building, I got to know the people very well.

The Engineer in Charge was William J. Wilkinson, Bill Wilkinson. His assistant was Sam Evans. I requested a transfer (1947) to Structural Design Group and did move across the hall as a Civil Engineering Assistant.

I worked for Carl King, Harold Bird, Eldridge Lowery and Walter Clayberg who were the associates in preparing the structural and architechual specifications and design of a number of Water System pumping and chlorination stations and structures related to the different reservoirs, yards and pipelines.

At that time the Water Design Division was a separate division under the charge of Charles J. Itter. He was the Engineer of Design. The Field Engineering Division was under Ralph Proctor. When Mr. Proctor retired, I guess in the early '60s, the two divisions were merged into what is now the Water Engineering Design Division under Charles Itter.

NELSON: What were your duties at that time?

LUND: The Structural Design Group headed by Messrs. Wilkinson and Evans had the three Civil Engineering Associates: King, Lowery and Bird. We also had an Architectual Associate, Clayberg.

We were divided into "squads" and worked on various projects from Water Design Division work orders.

I would work with one of the Associates, but not always the same one. In those days we did not have the Civil Engineering Draftsman, or as they call them today, Civil Engineering Drafting Technician. The CE Assistants did the drafting. So if we did some design we did the drafting and we had to make the final (ink on vellum) drawings and we also did the drafting for the Associates. They would rough draft their plans for the structures, but I would do the actual ink drawings that would be used for construction. We were beginning engineers and also the drafting personnel.

NELSON: So in the Department there are some vellums that have the name L. Lund on them?

LUND: There are many drawings that have L. Lund the draftsman, the assistant, the supervisor and the Engineer in Charge. In fact today, I visit the Department quite often, people say, "We came by one of your projects." I say, "Oh, which one was that?" Then they relate to me what that was. Yes, My name does appear in many places on DWP documents.

NELSON: You were still stationed in the Second Street Building?

LUND: No, this was the Hill Street Building, 222 South Hill Street which was the location of the Department garage which was the first two floors and two sub-basements. The Field Engineering Division was on the eight floor. On the same floor and across the hall was the Structural Engineering Group of the Water Design

Division. The division headquarters was on the eighth floor of the 316 West Second Street Building where the Planning, Project Design and Distribution Design sections of the division were located. Most of the division was located just below the cafeteria which was on the ninth floor. I remember several times when there were leaks in the kitchen plumbing directly above and we would get water on our desks occasionally. I remember the location because it was below the cafeteria.

NELSON: Did you have hard hats at that time?

LUND: Construction used hard hats that were made of fiberglass. They did not have metal hats and they didn't look like the one's in use today. They were reinforced fiberglass same as used in the manufacture of skis and pole vaulting poles. It's layer upon layer of material impregnated with plastic resin. They usually were brown in color unless painted.

NELSON: During this period did you have the opportunity to come in contact with Water System "brass?"

LUND: Yes, because the Water System was smaller at that time. I joined the American Society of Civil Engineers (ASCE) as a student engineer. When I graduated I because a "junior" member - which is now called an associate member.

The Los Angeles Section of ASCE is one of the largest sections in the U.S. Sam Nelson, who was the head of the Water System, was the section secretary and I was appointed assistant secretary. So I got to work with him on ASCE activities. Sam had

assigned one of his secretaries, Joy Chenowith, to be fulltime ASCE secretary. Now the L.A. section has a paid fulltime administrator to do the work. It used to be that the bigger agencies spread the secretaries duties around, such as DWP, MWD, CalTrans, etc.

I got to work with Mr. Nelson and came to know him very well. Sam was a very friendly person who would talk to anyone in the hallway. He didn't need to know their name but he would have a word of greeting for them. He was the most friendly person I have ever met at the Department.

Another interesting contact with a higher level person was while I was still in Structural Design Group, Water Design Division and I was designing anchor blocks for the First Los Angeles Aqueduct. At the time the Engineer of the Los Angeles Aqueduct was Jack Cowan. He came down and personally monitored my design for these anchor blocks. He was not being a hindrance to me but advising me how to design it so it would be kind of a turn-key operation so in the field they could be constructing at the same time. I was turning out the design along with the assistance of one of my associates, probably Carl King.

I remember him leaning over my drawing table and in those days they were the large metal pipe frame, probably ten feet by twelve feet in area. A huge desk with a high, bar stool, type chair. Jack would come in and help me. So I remember a very close relationship with Jack Cowan.

After I left the Structural Design Group I worked in the Planning Section, but this was very unique job. This was a special

project calling for the planning and design of the Eagle Rock-Hollywood Conduit Project. Kenny (Kenneth G.) Wilkes, Waterworks Engineer was in charge of this project, which would take water from Metropolitan Water District of Southern California (MWD) in the Eagle Rock area, store it in the small reservoir and transport it in the large diameter pipeline to the Hollywood Reservoir to provide for the distribution of the MWD Colorado River Aqueduct supply to the central city area.

Mr. Wilkes took me, as a Civil Engineering Associate along with several others into the Planning Section, away from the Structural Design Group. We worked on the planning and ultimately the contract design and specifications for the project, now known as the Eagle Rock-Hollywood Trunkline - probably ten miles long with pipes in the range of sixty-eight inches in diameter. We did the planning, design and specifications, and also monitored construction completely separate from the existing Trunkline and Structural Design groups, which was unique in itself. Mr. Itter who was in charge of the Water Design Division, wanted to carry this project through as a project oriented from planning to construction by one organization.

I'm sure that Kenny Wilkes, who was very strong in his desires, had an influence on Mr. Itter that he could do the job and had people who could do it. So we proceeded with that project.

NELSON: Val, was the project's purpose one of reliability?

LUND: It was both for reliability and to augment water supply. As the city was growing it was depending more on the need for MWD

supplemental water. At that time, and this was before the State Water Project, the Colorado River was the sole supplemental source. There needed to be a way to bring water from the Eagle Rock area which was our closest point to the MWD system on the northeastern side of the city to more central and westerly sections of the city. We did have the existing Palos Verde "feeder" which could serve Eagle Rock, Highland Park, Boyle Heights and the East Los Angeles areas and even the Harbor area. So that did exist, however, it had limited capacity to supply the central and western areas of the city

We wanted to bring the MWD system to the central city and by making a connection to MWD at Eagle Rock and having a small regulating Eagle Rock Reservoir of two hundred acre-feet and a large diameter pipeline bringing it across Hollywood to the Hollywood Reservoir, it allowed the water to flow into the central city area by connections to the existing distribution pipeline. It was planned not only to augment the supply but also provide a redundancy in the supply from Hollywood Reservoir to the central area.

Let me back up a little bit here because I was relating to activities with top management. We worked closely with Ralph Proctor who still headed the Field Engineering Division, Dams and Tunnel Design Group, especially in coordinating the design of the Eagle Rock Reservoir. It was a high profile project, Kenny Wilkes and the group worked with Dan Bundy, Supervisor, Planning Section, who was the Senior Planning Engineer. At that time the project was under the direction of Charles Itter, Engineer of Design.

The top management people who were in Water System administrative office at that time were probably Sam Nelson and Max Socha (Chief Engineer of Waterworks and Assistant Chief Engineer of Water Works).

Another activity related to top management occurred when I was promoted to a Water Works Engineer in the Planning Section. I became the Supervisor of the Pump System Design and Master Plans Group still under Dan Bundy amd Charles Itter.

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LE VAL LUND

LUND: I worked very closely with one of the Senior City Attorneys (Russell B. Jarvis), in the DWP Legal Division. It was related to a tax determination case for the value of city lands under the jurisdiction of the DWP in the Owens Valley and Mono Basin.

We were required to develop in a three-week timeframe a cost-estimate and a preliminary plan for a Mono Basin aqueduct that would only transport Mono Basin water to Los Angeles. This estimate would be used for tax purposes in determining the value of our lands that we lease in Mono County for grazing. I worked very closely with the Assistant City Attorney and our Senior Planning Engineer, Dan Bundy. We did accomplish the project within the timeframe.

Another interesting project I worked on while still in the Planning Section, still in charge of the Pump System and Master Planning groups, was a project for Sam Nelson who was the Chief Engineer of Waterworks and Assistant General Manager at that time.

This was in response to a request from the then U.S. Secretary of the Interior, Stewart Udall, who had put out a plan for providing water to the Pacific Southwest region of our country. His plan was to supplement the flow of water in the Colorado River and as to how water might be appropriately distributed among the western states.

Mr. Udall invited others to develop and present alternatives to his Pacific Southwest Water Plan. Sam Nelson came up with the idea of diverting water from the Snake River in Idaho to the Colorado River in Nevada to supplement Colorado River flows. We developed what we called The "Snake-Colorado Plan". The plan called for diversion of about one million acre-feet of Snake River water near Twin Falls, Idaho, through conduits, tunnels and pumping stations to the Colorado River at Lake Mead behind Hoover Dam.

We developed a plan and cost estimate for the proposal. There was some pumping required but also some hydroelectric production opportunities at the terminus. However, the proposal would require outside energy to meet all of the pumping requirements.

The plan was submitted to the Secretary of Interior. There were other plans submitted, the most elaborate being the North American Water and Power Alliance which was done by a consultant. This would take water from the major rivers in western Canada and divert them down through the western states and also into the Midwest.

There were approximately a dozen plans developed, including a plan to bring icebergs from Alaska.

NELSON: Were these serious proposals?

LUND: Yes, they were serious I believe. They were preliminary of course. They were all feasible. But certainly in the 1960s we did not have the environmental concerns we have today. There were some concerns of "Don't take my water " and one of the Senators from the State of Washington, "Scoop" Jackson, actually got a congressional moratorium for ten years for any plans by the U. S. Government to divert water from the Snake River. That moratorium was extended several times so the federal government could not study diversions from the Snake River, or Columbia River basins.

It probably would have been a good plan because the Snake River flows down and joins the Columbia River to flow on to the Pacific Ocean. In terms of total flow, 100 million af/year, and we were talking about taking only one million, a drop in the bucket so to speak. So it was a feasible project but the climate was "Don't take any water from our Snake or Columbia rivers." I worked very closely with Sam Nelson on the project. Again it was almost his hands on the drafting table on a daily basis to develop the proposal under a very short timeframe, weeks instead of months.

NELSON: Who worked with you on that project?

LUND: I believe Paul Lane was probably a part of it. Dee Lynch was involved in it, maybe even Duane Georgeson as I think about it. He came in about 1960. In the Planning Section we had this little group to work on this within a two to three week period.

NELSON: When Baldwin Hill Reservoir failed in the early 1960s where were you and what were you doing when you heard the news?

LUND: The event happened on December 14, 1964, and I was attending a football game in the Rose Bowl. At that time they brought together the nation's top junior college teams. One was from Southern California, either Pasadena or Compton, and a team from probably Oklahoma, Kansas or Texas. It was called the Little Rose Bowl.

I didn't hear anything about it at the game since we didn't have a portable radio. When I turned on the car radio they were talking about an incident that was occuring in Baldwin Hills. Since I was not in the Water Operating Division, I did not get actively involved.

I did become quite involved in the litigation related to Baldwin Hills Reservoir. At the time our insurers engaged the General Adjustment Bureau (GAB) which was an insurance companies created organization to handle all claims from an incident rather then having each insurance company set up an individual effort. We probably had a half dozen insurance companies involved.

We worked with the GAB and they paid all the individual claims right away. The litigation that followed was against the half-dozen or so oil companies for oil-pumping in the Inglewood Oil Field in Baldwin Hills. I worked with our Legal Division in the resolution of our claims. The case never went to court. It was resolved by the oil companies agreeing to settle out of court.

The total insurance we had at that time was about $15 million. I think that we had used about $14 million to settle the individual claims so we were right at our limit. We had a $1 million deductable so we had filed a suit against the oil companies to recover that amount plus the physical loss of our reservoir. The companies paid us about 30 cents on a dollar without admitting their guilt.

The final settlement was based on the oil companies extraction of the oil and gas and the repressurizating of the Inglewood Oil Field which caused movement on known faults beneath the reservoir. This caused seepage and cracking of our drain monitoring system which we had installed and subsequent erosion of the bottom of the reservoir and eventually erosion of the abutment which caused water to flow through a residental area adjacent to the dam, and eventually down Ballona Creek, but didn't cause flooding in other areas downstream.

NELSON; To your knowledge was the proximity of that oil field and the possibility of future subsidence a pre-planning consideration?

LUND: Yes. In the design and planning of the reservoir it was very well known that there was subsidence in the area. We had good records indicating subsidence. As a matter of fact, those records were so good we monitored the subsidence with the oil pressure records of the oil companies and we saw that at any time the oil pressure was high the elevations changed so we could get an exact match between oil pressure at, say, 600psi (pounds per square inch) to change in ground elevations.

We knew about subsidence and we knew the oil field existed because there were derricks all over. We also knew that we had somewhat erodable soil. We designed a very sophisticated drain system under the reservoir. We monitoried the entire reservoir bottom and the areas where the dam was located so we could tell instantly when seepage would occur. That's how they did find out that there was damage because the famous reservoir caretaker, Revere Wells, was on an inspection and he heard the noise, water running down the spillway chamber which was actually one of the outlets for the drains. He checked the drains and that's how he discovered the problem - well before anything was happening in the reservoir.

In those days we did not have telemetering or the means of electronically transfering a signal to a headquarters that could be monitored 24-hours a day, to pick up the seepage sooner. But, Revere was pretty much on the spot and happened to be there at the right time in the morning.

NELSON: Was the cause of the failure pretty quickly determined?

LUND: It took quite a long time to come up with the cause. Mainly we had so many records - the Department is known for records. We keep good records. The Department has records and records; we never throw anything away. We had lots of records and sifting through those records took quite some time. There were certainly on-going negotiations between the attorneys.

We had hired an outside attorney, Wendall Tyler, to assist us.

He is now the Chief Assistant City Attorney for the Port of Los Angeles. At that time I think our Chief Assistant City Attorney was Gilmore Tillman. The Department had an outside consulting board who reviewed the incident at Baldwin Hills Reservoir. One of the consultants was Tom Leps, who formally worked for Southern California Edison Copmany and was very knowledgable in the performance of dams and subsidence due to the extraction of oil and gas.

He came up with the idea of, "let's plot the records." He got another consulting engineering geologist (Hamilton) to work with him. We plotted very detailed elevations, to one thousands of a foot. Some of the field survey books actually show that detailed dimension. The elevations around the reservoir were plotted very carefully. We were able through the court process, where the oil companies were required to release their data, to obtain the oil reservoir re-pressuizing records. The matching of the change in elevations with the oil pressurizing records clearly showed that ground movement was caused by the pressurizing of the oil reservoir beneath the Baldwin Hills Reservoir.

Ground movement occurred along known faults, with subsequent damage to the drain system. Erosion of the foundation soil commenced which caused the failure of the the bottom of the reservoir.

Althought they never officially admitted responsibility, I believe these records became the chief factor in making the oil companies decide to settle out of court. You would never hear

that from an oil company attorney or official.

There was a very good article in "Science" magazine that described the failure in detail that was probably published in the mid-60s at the time the case was settled.

NELSON: You were not involved in the post-failure cleanup, etc?

LUND: No. I have previously described my work in the construction of the reservoir. After the incident, I worked with our Legal Division in developing our case against the oil companies so I never had any involvement directly in the cleanup. However, I was directly involved in the replacement for Baldwin Hills Reservoir because I was in the Water Engineering Design Division. The purpose of the reservoir was to provide regulatory, or daily storage, for peak flows to serve the Westchester area and the "shoestring" area of Southwest Los Angeles.

The water was transported from Lower Franklin Reservior which was only one thousand af, quite small, through the Franklin/ Baldwin Trunk Line, a 57-inch diameter pipeline, and then into the reservoir and then released to the service area, Westchester, Venice, Southwest Los Angeles through the Baldwin Outlet Line, which was a 60-inch pipeline.

We needed to see how best we could provide some regulatory storage. We looked at some alternatives. One was to build a tank farm on the bottom of the old reservoir. We were looking at a dozen or so large diameter tanks. But because the area was known for subsidence and did have fault fissures we knew we would have

to build a base for those tanks that could withstand substantial displacement in the event of future events.

When we reached a stage where we were ready to design the tanks the reinforced concrete base needed became so expensive it was determined not to proceed that way. The alternative was to build another pipeline from Franklin Reservoir to our Stone Canyon outlet line so we could then provide water to the area through the Franklin-Venice Trunk Line and that pipeline was constructed.

Baldwin Hills Reservoir site was abandoned and it now serves as a part of the state park system and is known as the Baldwin Hills State Recreational Area.

I have not actually been into the reservoir area recently myself but if you drive south on La Cienga Boulevard there is a new overcrossing and offramp that goes up into a picnic and play area not occupied by oil wells and then proceeds over into the bottom of the former reservoir. The plan was to construct soccer and baseball fields in that area. The city no longer own the Baldwin Hills property. Although we have reserved some property for pipelines, a pumping station and an elevated tank to serve the area.

NELSON: One final question on Baldwin Hills. Did the Department Water Planning Section plan for possible disasters?

LUND: The question here is whether we planned for reservoir disasters and did we apply it at the time of the Baldwin Hills incident. The answer is yes and yes. The original design of the reservoir was to prevent disasters with full knowledge of the oil

drilling activity and subsidence. The sophisticated drain monitoring system and compacted earth lining didn't anticipate the ground displacement by the repressurizing of the oil reservoir.

After the Baldwin Hills event the State of California required that all agencies who own and operate dams shall prepare an inundation map showing the area to be flooded in the event of a total collapse of the dam. So all reservoirs in the state over a certain size have those maps. They are available, a part of the General Plan of the city of county, and also available in the emergency response organization of the city or county and also available in the agency of the dam owner/operator.

Interestingly enough, at the time of the Baldwin Hills incident some DWP people, LAPD and others got together looked at a map and roughly outlined an area they thought might be the enundation area. This was used by the Los Angeles Police Department to cordon off the area.

However, it was unfortunate that five people died, not directly related to the failure of the dam, but who entered the area after they had been told to stay out or refused to leave the area and died by the secondary effects. Their lives could have been saved if they had of paid heed to the public safety officers.

NELSON: Did you do the inundation calculations that morning or was there one on the books?

LUND: That was just done at the time. Probably all we did was

look at a street map and say we were going to do this and this. There was probably never a plan on a piece of paper. So it was done orally and spontaneously at the time.

NELSON: This helped tremendously years later when the 1971 earthquake crippled the Lower Van Norman Reservoir.

LUND: I have to think back now. Maybe the state inundation plan requirement came out of the 1971 earthquake. So we probably did the same thing - looked at a map outlined the areas of possible inundation and told the police department. So I have to correct myself and say that I believe the inunduation maps were a state requirement after 1971.

NELSON: How long did you stay in Planning?

LUND: I was in charge of the Pump System Design and Master Planning Section Group for eight to ten years. Then I promoted to Water Executive where I became the Water System Executive Engineer. I worked for Max Socha, who was Chief Engineer of Waterworks and Jack Cowan, who was the Assistant Chief Engineer of Waterworks. I was their engineer person in the office to directly assist them in a number of activities. I assisted them in budget planning, administrative functions and meeting distinguished visitors. I was a member of the city's Planning Commission Board for Annexations and Detachments from the city. I represented, as the Water System Executive Engineer, our General Manager, Sam Nelson, on the board which was composed of general managers of other city departments.

I did miscellaneous things for the Water System Chief Engineer and Assistant Chief Engineer. I was their executive staff, supported by a clerical unit.

NELSON: How long were you in that position?

LUND: I was there until 1965. At that time I was involved in the planning of the move from the seventh floor of the 207 South Broadway Building to our new General Office Building at 111 North Hope Street. I was involved in all the activities related to the move.

Shortly thereafter I was assigned as Senior Waterworks Engineer in charge of Dams, Geology and Materials Section in Water Engineering Design Division.

NELSON: This was kinda going back to an old section, except you are now in charge?

LUND: Yes. I was now in charge of the Inspection Group where I worked when I first began with DWP. I was in charge of the Reservoir Surveilance Group where I had formally worked. I was also in charge of the Engineering Geology, Dam and Tunnel Design, the Materials Testing Laboratory and the plant inspection activities. In that period of time I worked on a number of existing and proposed reservoir projects but probably more directly were activities directly related to the Second Los Angeles Aqueduct (SLAA) construction.

All the tunnel designs, the bypass for Haiwee Reservoir and modification to the reservoirs were done in our section

supplimenting the work that was done by what was called "The Second Barrel" design group, which was under the direction of Roland "Rolo" Triay, who later became the Engineer of Design.

We did all the engineering geology reports for the SLAA. We did the SLAA tunnel design and Haiwee Bypass design and some of the geo-technical aspects of the project itself. All of the SLAA plant fabrication inspection and the testing of materials was done by the section. We continued to do some reservoir design activity that was going on at the same time.

NELSON: What were the major design differences between the first and second aqueducts?

LUND: The First Los Angeles Aqueduct was a fantastic project. To complete it in five years and at less than $25 million was fantastic bearing in mind that we had to do a lot of things ourselves, like building our own cement mill, power plants and worker camps. We minimized the use of contractors. We hired our own forces. We developed some innovative equipment like the electric dredge to dredge the canal sections in the Owens Valley and one of the forerunners to what we know today as the caterpillar tractor for travel across the sandy Mojave Desert.

The main difference between the two aqueducts is at the time of the construction of the first aqueduct (1908-13) labor was inexpensive and materials were very expensive. You will see a lot of tunnel construction (100+) in the first aqueduct which was labor intensive with a very minimal pipe work. All the steel pipe had to be shipped around the tip of South America because I

don't believe the Panama Canal was operational at that time. All the steel fabrication facilities were located on the East Coast so the pipe for the inverted siphons (sag pipes) had to be shipped to the Port of Los Angeles, then by railroad to Mojave, then hauled across the soft desert floor with 52-mule teams to the site. They minimized the cost by less use of steel pipe and other expensive manufactured items.

In the case of the Second Los Angeles Aqueduct which was built in the 196Øs you had a complete reversal. Labor was very expensive so we mimimized labor intensive activities and maximized on pipelines which could be fabricated in an assembly facility in Southern California and hauled to the site by truck on good highways.

We used prefabricated pipe and covered concrete conduit aqueduct sections. The difference in the economic picture between high cost of labor and the high cost of materials made those two projects completely different as far as their layout and design was concerned.

The other difference was that the Second Aqueduct is only about one-half the capacity of First Aqueduct. It was planned to obtain its water; one-third from runoff in the Owens Valley, one-third from the Mono Basin, and one-third from the groundwater basin in the Owens Valley. The aqueduct was built prior to the National Environmental Protection Act of 1969. We were not involved in any environmental regulations at that time. It took six to seven years to construct the project and it moved along

on a contract by contract basis. Under the direction of Rolo Triay, like William Mulholland, who was the father of the First Los Angeles Aqueduct, I feel Rolo was the father of the Second Los Angeles Aqueduct. He was involved in the planning, obtaining the Board of Water and Power Commission approval, design, and construction of the project to its completion.

NELSON: There were some innovations with the Second Aqueduct, for example the adding of "sidewalls" to the existing First Aqueduct open canals.

LUND: Yes, In the Owens Valley, from the Intake to Haiwee Reservoir is, for about one-half the distance, an unlined earth canal and the remainder is a trapizoidal shaped concrete canal. In order to increase the capacity of the concrete canal to provide for the Second Aqueduct flow we added a two-foot wall to each side of the canal to provide for the additional capacity for the Second Aqueduct. Then the canal had a capacity of about 900 cubic-feet per-second.

The unlined earth canal did not require any modification. We did provide a by-pass canal around South Haiwee Reservoir. Where both the first and second aqueduct went through the Elizabeth Lake Tunnel - that tunnel was designed for 1000 cubic-feet per-second. Its large capacity provided for peaking power at the San Francisquito Power Plant No. 1, so we did not have to enlarge the tunnel to accommodate the increased aqueduct flow. Otherwise, the SLAA paralleled from South Haiwee Reservoir all the way to Los Angeles with a separate conveyance facility, mostly pipe and

conduit, two tunnels and with about 50 percent of the capacity of the First Aqueduct. The SLAA as well as the First Aqueduct was a gravity-flow aqueduct without any valving from Owens Valley to Los Angeles.

TAPE NUMBER 2, SIDE ONE

LE VAL LUND

NELSON: You were talking about the Elizabeth Tunnel in regard to not having to be enlarged to accommodate the additional capacity of the Second Los Angeles Aqueduct. Since the San Andreas Fault runs through it how has it fared over the years?

LUND: Yes, the San Andreas Fault does pass through the five-mile long tunnel and I've been through the tunnel several times and there is absolutely no evidence of distress from any movement along the fault zone.

The last movement recorded was in 1857, the Fort Tejon Earthquake before the tunnel was constructed. It doesn't mean that there won't be something in the future, but as far as the situation now, it shows no stress. From time to time when the Power System takes their San Francisquito Power Plants (No. 1 and No. 2) out of service the Water System takes the opportunity to make inspections and check a survey line through the tunnel to monitor any movement.

We have not identified any stress up to this point in time. But we know sometime there could be activity and that we would need to have access to the tunnel for repair. At the North Portal in the vicinity of Fairmont Reservoir No. 1 which currently is dry

and out of service we constructed an incline shaft which intercepts the tunnel at an angle and provides an access where we could rapidly move personnel and equipment into the tunnel which is large enough to drive an auto, tractor or concrete-hauling equipment. A small diameter access hole has been constructed near the fault zone in Leona Valley for utility lines access to the tunnel.

Since Fairmont Reservoir No. 1 has been replaced by Fairmont No. 2, we also have another access. We can enter the tunnel through the old Fairmont No. 1 outlet tower by removing a heavy concrete bulkhead. At the South Portal there is access when it comes to grade before joining the Power System penstock above San Francisquito Power Plant No. 1. Entry would only be made after thorough evaluation of aftershocks.

The Aqueduct Division has stockpiled steel tunnel ribs and other material in case we need to do tunnel repair work. Our people in the Southern District, Aqueduct Division, have been working for the last five years on tunnel repair on the First Aqueduct. We have taken advantage of the drought and left the First Aqueduct dry so we have accomplished a lot of tunnel reconditioning. Aqueduct Division has trained personnel and equipment to repair tunnels at a rapid pace in case the San Andreas should move and cut off the flow through the Elizabeth Lake Tunnel.

NELSON: You say you have been through that tunnel four or five times. How do you transit through it?

LUND: To travel through and inspect the five-mile tunnel we have a small tunnel tractor that pulls a couple of flat-bed trailers. You sit on the trailer and it goes very slow. You sit lengthwise so that some people are looking at one wall and the others are looking at the opposite wall. There are lights on the trailer but we also carry individual flashlights. We also get out and walk for closer examination. The visual inspection is in addition to the instrument survey.

Now I don't want to say that there is no cracking in the tunnel, there is normal cracking, but it appears not due to tectonic movement.

NELSON: What are the conditions inside that tunnel?

LUND: The last time I went through was seven or eight years ago. It is concrete lined, not reinforced concrete, however there are some tunnel sets exposed. In those days (1907-1911) the tunnel sets were made of wood timbers, today there are steel. Essentially unreinforced. It is an inverted "U" shaped with a flat bottom with the top a "U" curve. The tunnel lining has been trowelled so it is rather smooth. It does have a mossy lining on it. The condition was excellent.

There are some small hairline cracks and there are some cracks at what we call the spring line, or the juncture of the curved section of the top to the vertical walls. This is usually related to pressure of the load on top for those cracks to appear. But generally the condition is very good.

NELSON: How long does it usually take you to transit through

the tunnel?

LUND: Tunnel inspection is a full-day activity because we go very slowly and stop to look at things along the way. There are interesting things on the wall where previous people came in and did some work and you can see where they have made repair patches. There's usually a small flow in the bottom so you need to walk the bottom to see if there are any holes. You might spend four-six hours to do the inspection.

NELSON: No "Grafitti" on the walls?

LUND: There are some places where workers have marked their names on the wall and the dates. We usually like that because we know where a patch has been made and we can see this patch was made by so-and-so on such a date. We know that repair work was done at that time. Also we do have the survey station marked on the tunnel soffet on the ceiling so you can see your horizontal location. We also glue little plastic station markers to the wall to indicate, say, Station 200+00. We usually have 100-foot stations so when we see something we want to monitor then we'll measure from that station and say that at that point we saw something.

NELSON: OK, you were heading Dams, Geology and Material Section of the Water Engineering Design Division. I imagine the dams section took on more importance and attention with the regulations coming down because of earthquake concerns.

LUND: Yes, but a little history prior to my involvement in the

dams. In 1971, I was transferred to become the Assistant Engineer of Water Operating Division to "Gerry" (Gerald W.) Jones who headed the division. On February 9, 1971, the San Fernando Earthquake occurred. At the time I was vacationing in Switzerland and read about the failure of the upstream slope of Lower San Fernando Dam (Lower Van Norman Reservoir) in a Swiss newspaper in French.

I immediately called the office and they said that I didn't need to report back. But when I returned I was heavily involved in the earthquake recovery activities of the water distribution facilities related to the earthquake.

Following my three years with Water Operating Division, I was appointed Assistant Chief Engineer of Waterworks directly reporting to Paul Lane, Chief Engineer of Waterworks and Assistant General Manager. This was a different job than what had existed many years in the past.

There was a civil service title of Chief Engineer Waterworks and Assistant Chief Engineer Waterworks. Paul Lane did not want to fill the civil service position of Assistant Chief Engineer of Waterworks. He took Principal Waterworks Engineers and made them the Assistant Chief Engineer of Waterworks and rotated them back and forth between the divisions and the Water System administrative office. I was the first to occupy this new position. I was his assistant and administratively acted on his behalf. This activity lasted until 1976. I was transferred from the Water Executive Office to the position of Engineer of Design, Water Engineering Design Division, in 1976. The regulations relating to

dam and reservoir design were being upgraded at that time as the result of the 1971 earthquake. We were required by the State Department of Water Resources, Divison of Safety of Dams, to review certain reservoir facilities, especially our hydraulic-fill dams that we had constructed.

We were given specific timetables by the state for the seismic studies of about fifteen dams. We initiated a program which required a more sophisticated laboratory testing. In the past we had used static testing, which meant testing samples under static load. Now we were required to look at dynamic soil testing where we would test samples under equipment that we had to acquire using a dynamic load to see how they would perform in a simulated earthquake. This dynamic testing was required because of the potential for liquifaction, as to what happened to the upstream face of the Lower San Fernando Dam, the liquifying of soils that were saturated. We needed to test soils that were saturated to see how well they would perform in our existing dam modifications.

Also we used a sophisticated finite element method, a computer analysis, to calculate the stresses in the dam caused by specific earthquakes. The seismicity for each dam site was obtained from our consultants, either Dames and Moore, Woodward Clyde, or Lindvall, Richter and Associates.

We worked very closely with our DWP Consulting Board on Dams and Reservoirs, Charles Richter, seismologist; Paul Bauman, formerly with the Los Angeles County Flood Control District in charge of dams; C. Martin Duke, Professor of Civil Engineering,

UCLA; and Wally Pentigoff, Engineering Geologist. We did have lots of things to do to complete the seismic review of fifteen dams in a period of about ten years. The review of each each dam was to determine how they would perform under the maximum credible earthquake that might occur in their vicinity. During this period we were designing, obtaining state approvals and constructing improvements to these dams.

While serving as Engineer of Design I worked on the analysis of existing dams but I also worked on the trials and tribulations of the design and construction of the new Los Angeles Reservoir, the terminal reservoir of the Los Angeles Aqueduct System. The Los Angeles Reservoir replaced the earthquake-damaged Lower Van Norman Reservoir.

NELSON: As I recall, the Los Angeles Reservoir is about one-half the capacity of the former reservoir.

LUND: Yes, The Lower Van Norman Reservoir was 20,000 af. The Upper Van Norman Reservoir was about 2,000 af. The new Los Angeles Reservoir is about 10,000 af.

Just to clarify the nomenclature, the dams that contained the water for the Upper and Lower Van Norman Reservoirs were known as the Upper and Lower San Fernando Dams in the eyes of the State of California. The body of water in the reservoirs was named by the Board of Water and Power Commissioners as the Upper and Lower Van Norman Reservoirs (in honor of DWP water pioneer Harvey Van Norman).

At that same time the Board also named our Legal Division library the William B. Matthews Library, in honor of a man who helped with the original developemnt of the Colorado River Aqueduct. Matthews was Los Angeles City Attorney and later attorney for MWD. Los Angeles was the founder and creator of the Colorado River Aqueduct and the Metropolitan Water District of Southern California (MWD). DWP did the original planning, design and construction design surveys. At the time it was believed the job of constructing the Colorado River Aqueduct was too big for Los Angeles to attempt alone. Since the project could also benefit surrounding cities, Los Angeles and ten other Southern California cities joined together to form the MWD.

Also at that time we were in the process of planning a storage reservoir in the West San Fernando Valley, near Woodland Hills. We were going to call it the Shoop Reservoir. It was on the extension of Shoop Avenue. Shoop being the name of a labor official. I guess the Board didn't like that name so they decided they should name it after J. B. Lippincott, who was a consulting engineer to William Mulholland in the construction of the First Los Angeles Aqueduct. It was called the Lippincott Reservoir; However, for various reasons it was never built.

We now call the old reservoir the Lower San Fernando Storm Water Detension Basin behind the reconstructed Lower San Fernando Dam. The Upper San Fernando Dam technically still is there and we use it for the sludge drying basin from the Los Angeles Aqueduct Filtration Plant. We call the new facility located about

one-half mile North of the old Lower San Fernando Dam the Los Angeles Dam and Reservoir.

NELSON: Because of these regulatory situations we now have reservoirs out of service or operating at reduced capacities. This means less storage in Los Angeles than in the past. Does this cause a concern?

LUND: The review of the reservoirs as required by the state did require the lowering of water levels or removing some reservoirs from service. Yes, the total storage in Los Angeles is less than in the past. This is certainly a concern to people in the Water Operating Division. But the cost and the environmental activities related to reservoir construction were so trememdous it appeared that we could do other things with pipelines using existing reservoirs, or by pumping from the groundwater basin, which is a large reservoir in itself, or or calling upon MWD to suppply water from the Colorado River Aqueduct. And of course by 1970 the State Water Project was completed to Southern California providing an additional supply from Northern California.

MWD is pursuing an Eastside Reservoir (Domenigoni Valley) at the present time of about 800,000 af. This will be one of the first reservoirs to be constructed in California in the last ten to fifteen years. But they were able to environmentally mitigate the site and received support from the community. It is not on a stream. It's an off-stream reservoir so they're not concerned about stream flow. They are providing mitigation lands and proceeding with the final design and construction of their new reservoir in

Riverside County. This would add to the storage that is available to MWD which will also be available to Los Angeles since we are a member of MWD.

NELSON: OK, You're heading Water Engineering Design. How many people were in the division at that time?

LUND: We had probably close to 250 at that time. There was the Planning Section; Project Design Section; Distribution Design Section; Water Services (New Business) Section; Inspection and Survey Section; and Dams, Geology and Materials Section. So I had six Senior Engineers or equivalent. Ron McCoy was my assistant. I had replaced Rolo Triay when he retired

NELSON: With the completion of the Second Aqueduct you continued in those duties until?

LUND: The completion of the Second Los Angeles Aqueduct was essentially completed when I went to Water Engineering Design Division (WEDD), except for the design and construction of the South Haiwee Reservoir Bypass. The major project we had going on in WEDD was the design and construction of the Los Angeles Reservoir. Other projects included the reconstruction of Silver Lake Reservoir: The analysis of various dams to determine seismic stability: Beginning of the work on the reconstruction of Lower Franklin Reservoir, and we did some preliminary analysis on some other reservoirs that we knew would have to be replaced, lowered or modified in the future. We also did the preliminary

design for the Los Angeles Aqueduct Filtration Plant and the Los Angeles Water System -Data Acquisition and Control (LAWS-DAC) supervisory control system.

NELSON: This was a lot of planning for retrofit.

LUND: You might call it that. Interestingly, there were two reservoirs prior to the 1971 earthquake that we thought we would be building; an improved Chatsworth Reservoir and a new Dry Canyon Reservoir. We did preliminary work for providing drainage and water quality improvement facilities at Chatsworth Reservoir which consisted of five dams or dikes. However, after 1971 it was determined Chatsworth was just too low an elevation to provide a benefit and the large surface would create great evaporation and water quality problems so we never did anything at that location.

We continued to say that the land was being preserved for water and electric facilities but in essence it has become an open space, somewhat of an unofficial game preserve.

Another reservoir where we had prepared the final plans and specifications and we had actually received the bids for construction and the bids were excellent in January 1971. This was for the Dry Canyon Reservoir reconstruction. This was a regulating reservoir for the San Francisquito Power Plants.

We thought we could get started on it but the earthquake came along and because of the new seismic criteria and the need to do other earthquake recovery, we cancelled the contract and did nothing. The existing Dry Canyon Reservoir still sits bare and empty.

The Power System has from time to time come up with ideas to increase the capacity of the two hydroelectric plants and also considered a pumped-storage project in that area. But nothing has happened so far. We still own the property and the Aqueduct bypasses the dry reservoir and we have a few people who work out of there in the Southern District, Aqueduct Division - operations and maintenance personnel.

NELSON: Where did you go next?

LUND: After Water Engineering Design Division, I was appointed Engineer of the Los Angeles Aqueduct probably in 1982. There were about 300 people in the Division with about 30 in the LA office. About 60 at Mojave, at the Southern District headquarters, and about 200 in Independence/Bishop, which was the Northern District. Other people were scattered along the 300-mile Aqueduct length, in the Antelope and Owens valleys and Mono Basin.

In that position I was in charge of many things. I almost felt like it was a separate little water system because in addition to the operation and maintenance of the Aqueduct I was involved in the management of the 300,000 acres of land owned by the City of Los Angeles and managed by the Department. I was also involved in the operation, maintenance and commerical billing of three of the four water systems in the Owens Valley, and also a town sewer system. We also collected the electric bills for the Power System.

We also had heavy equipment and maintenance shops in Mojave, Independence and Bishop. And we provided our own general services activities. We had a real estate section, separate from the DWP

Real Estate Division, which coordinated with the Real Estate Division in the General Office Building. We did our own real estate activities (sales, leases, permits, easements, etc.) in the Northern District.

There was involvement with the Environmental Impact Report on Owens Valley Groundwater Pumping and with litigation with Inyo County and with the Mono Lake Committee and others in the Mono Basin. It was like operating a completely separate water system. There were all the activities you might find in a water system except we relied on the Legal Division in the GOB for our legal services. Everything else we did on our own somewhat independently from the other parts of the Department.

We even had our own public relations person who worked out of the Public Affairs Division at the GOB but was stationed in Bishop to respond to media-type activities.

NELSON: Who was the head of the Water System at that time?

LUND: Duane Georgeson was the Chief Engineer of Water Works while I was Engineer of the Los Angeles Aqueduct. The person who was the Assistant Chief Engineer which was a rotating position which I occupied first, at that time was probably Ron McCoy or Walt Hoye or Larry McReynolds.

NELSON: How often did you find your duties taking you up to the Owens Valley?

LUND: While based in Los Angeles, on average, I probably made one trip a month when you put them all together. Especially when we

were working with the Inyo-LA Owens Valley Standing Committee on groundwater pumping we would fly up on a chartered aircraft. Go up and back in one day. Most of the time for my normal business activities I would drive up. I have gone up in a single day and come back the same day. It's a long drive and a long day.

NELSON: Who was your Northern District Engineer?

LUND: First it was Jim Wickser. Then when he came down to take over General Services Division it was Duane Buchholz. (Helicopter noise) The helicopter base for the Los Angeles Police Department is located on the North side of Griffith Park which is just around the hill from here. Rather then going over the top they will come around the hill and fly over my home to go on patrol.

NELSON: We have heard a lot over the years about the dislike for anything having to do with Los Angeles. How did you find your relations with the people of the Owens Valley?

LUND: My relations with the people in the Owens Valley were excellent. When you talk to the people on a one-on-one basis you really find really nice people. I think there are two perceptions. One, probably the perception from newly arrived people to the valley who are development oriented. They want to buy and sell land, see businesses established. They are anxious to see that more DWP land is made available for development purposes. They are probably more vocal. When you hear about people who have comments about the Department probably the majority of them are new or recent arrivals.

Two, the other people are the old timers and certainly there

was some concern about the Department purchasing their land but all of the lands were purchased at very fair market values. In fact, higher than market value. There was no condemnation of lands in the Owens Valley to acquire city lands. Some were certainly concerned that the lands were acquired, but most of those who's lands were acquired were happy about it because they got good money for them and some leased back for their original use.

Probably one of the most significient things to affect the City-Owens Valley relationship existed at the time (1910s) - was called the Watterson Bank. There was a large Watterson family living in the Valley. Two of the brothers got together and created the Watterson Bank. They took the deposits of these former landowners who had received payment from the City. They invested the funds in ways that were not appropriate for banking institutions. So a lot of people lost money in the bank created by their local people and became very upset which indirectly affected their perceptions of the city.

My experiences in talking to the Owens Valley people is that I have had good relationships. Of course there is a lot of kidding that goes around. But if you would ask the question of the people in the Owens Valley on a one-on-one basis, "Would you like to have the Department divest itself of its lands and let this land be opened up for development, or do you like the Department owning the land so that it somewhat restricts development and leaves lots of open space?" The majority of the people would say they, "like the Department being there. We like the open space; however, we are not

about to publicly say that."

You won't find anyone saying anything good about the Department publicly because it doesn't gain them any points, especially politicians. They cannot say anything good because that doesn't get them anywhere.

In discussions with Inyo County Supervisors and other officials they recognize the benefit of the Department presence. The Department is part of their economic base, and provide them with the open space. It gives them a number of activities that they would not otherwise have resources or funds to take on themselves.

We have done a good job and we're doing a better job with all of our enhancement and mitigation projects. We are in agreement with the Inyo County government on the plans for the groundwater pumping in the Owens Valley. We have implemented the plan for almost ten years. If we can only get the pumping agreement and plan through the Third District Court of Appeal, which seems to have a very strange philosphy, they do not even see when two parties agree on settlement they are not about to say, "OK, you two guys go ahead and do your thing." They are just obnoxious from the point of view of resolving the litigation.

NELSON: The Department, as you indicate, is a major player in the Owens Valley because you are a major employer and provide a substantial portion of the tax base. I assume the local people look to you as people do to big corporations for charitible contributions of one kind or another in which the Department cannot really take credit for. Is this true?

LUND: Yes. Like all large organizations the community expects certain community activities, however, we cannot contribute in a monetary form. We have allowed some of our equipment to be used during non-working hours using our volunteer operators to clear sites for baseball fields, or provide tables and chairs, and similar community activities. We have also developed some parks and recreational facilities. We do the grading and put in the irrigation system and provide the capital facilities. Then the local people operate and maintain them.

We do a lot of in-kind services. And of course, with our informal agreement with Inyo County which has been in existance now for almost ten years we have developed about twenty or so enhancement/mitigation projects in which we have developed pasture lands, alfalfa fields, streams through parks, recreational facilities, woodlots, water flows for fish and wildlife enhancement and we got their approval to pump some additional groundwater for these projects.

We have completed a number of enhancement/mitigation projects and will probably do more, however, they are in a "hold" situation at the moment pending resolution of our groundwater agreement/ settlement with the Third District Court of Appeal. Until that is settled we are holding off on any new projects and we're just maintaining the one's we have.

We desire to continue pumping the Owens Valley groundwater basin and we have developed a cooperative arrangement with Inyo County where we meet in April each year, they're doing it right

now, to develop a groundwater pumping plan for the year based upon the expected runoff from the Owens Valley-Mono Basin. Our runoff this year (1992) will probably be about seventy percent of normal which is the sixth year of below average runoff, so technically we're not out of the drought yet. There are other sources of water available from the MWD's Colorado River Aqueduct.

We will develop a pumping plan based upon the snowpak which existed on April 1. We have worked very well with Inyo County on this. We have a good relationship. We've been pumping water for the needs of the people in Owens Valley and the city, but not for all our needs because of the drought.

NELSON: You continued as Aqueduct Engineer until your retirement?

LUND: Yes. I was involved in several activities with top management and the Board of Water and Power Commissioners. One was the Inyo-Los Angeles Standing Committee, of which I was a member. This committee was created in 1983. It consists of two members of the Inyo County Board of Supervisors, two members of the Board of Water and Power Commissioners, and administrative staff for both. This was a joint effort in attempting to resolve our problems in the Owens Valley. It has worked very well.

I was also a member of the UCLA-Mono Lake Committee, a public policy committee that was created by a workshop that was held at UCLA on the Mono Basin water issues. One of the workshop recommendations was we should develop a continuing dialoge between the Mono Lake Committee and the Department. People from the

UCLA Public Policy Program were the facilitators. We agreed on common communication so we wouldn't be coming up with news releases that would be detrimental to each other. We agreed on conducting a common annual Mono Lake bird count. We put on several Mono Basin research seminars. One was at the University of California at Santa Barbara. Another was at the University of Nevada, at Reno. We did many joint research studies. The Department has probably spent several millions of dollars in research on migratory birds, plankton, algae (there's no fish in Mono Lake), and other wildlife in the Mono Basin.

The UCLA Public Policy Committee and the Inyo-LA Standing Committee is still in existence.

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LE VAL LUND

NELSON: In a career that spanned over forty years, what was the most satifying time during those years?

LUND: I did work over forty-two years for the Department and I counted up one time there were over a dozen individual jobs. This would be like working for a dozen different companies. I had variety in my work in planning, design, construction, operation, maintenance, supervision, administration, and management. All aspects of the Water System.

I don't think there was any aspect of the Water System that I wasn't involved. Of course the key thing, and its said by many people is working with people. The people in the Department were fantastic! I came to the Department only because of a friend of mine who said, "Why don't you take the Civil Service Exam for DWP?"

It was never my intention to work for the Department. But when I got here I saw that it was an public service that was needed by the people. It was probably not prone to layoffs and I liked it! It was civil engineering which I liked and I could get my experience in structural design which was my major. I also had a minor in hydraulics so I got my hydraulics portion of it.

The opportunity to work with different people and I can't ever say really that there was any particular highlight person because they all had different characteristics. So I'll just run through a few of them.

Ralph R. Proctor was my first division head. Although I never really had a close connection with him, I thought he was really a famous person because of his innovative things in soils mechanics and the fact that he was internationally known. Here the Department was a civil service organization so you don't have to be in a university or college or in a government position - he was a division head, but not top management and still he was internationally known in Civil Engineering.

Dan (Daniel E.) Bundy, who was the Senior Planning Engineer and also Kenny (Kenneth G.) Wilkes, my group supervisor, were both in the Planning Section, WEDD. Dan was really tremendous and likable, but he was probably not a dynamite-type person. Where Kenny Wilkes, who worked for him was drive, drive, drive-person. Eventually Kenny left the Department and became heavily involved in the design of the State Water Project. He was a driver while Dan was not, but they worked together well.

Rolo (Roland) Triay, Engineer of Design, WEDD, was a very detail-minded and methodical person. He was willing to receive your idea on things. He really pushed the activities for the Second Los Angeles Aqueduct. It is, in my mind, really his creation. I remember whenever he checked a drawing or report he got out his red pen. His notes were always in red. I kept in contact

with him after his retirement - he's now passed away. He was an outstanding person.

Bill (William J.) Simon and Horace (H.) DeWitt, Supervisor, Field Engineering Division, I worked with mainly in the area of dams. Their knowledge of how dams perform, especially compacted earth-filled dams was tremendous. I think a lot of my knowledge came from that and the fact I became in charge of dam design was because of the training I received from them.

Gerry (Gerald W.) Jones, Engineer of Water Operating Division, was the practical sort of person . He started with the Department as, I think, a well drillers assistant. He worked his way up and became the head of the Water Operating Division. He had also had experience in the operation and maintenance of the Los Angeles Aqueduct. He was down-to-earth and I always remember him saying, "Let's make it of steel, because you can always repair it by heating, bending and welding it - heat it, hit it with a hammer and weld it." If you did it in concrete it wasn't as easy so he was always interested in putting steel pipe in locations where there might be a potential for modfication or damage. You could "heat and bend" to make the repairs. He was very practical and interesting.

I do remember for about two months I was in charge of the Water Operating Division because Gerry had gone to a DWP Speaker's Club holiday dance and had injured his back and was on leave so I had to run the division which had about 1,300 employees.

I liked working with Paul Lane in Water Executive. He was very easy going and he allowed me to make my own assignments.

Prior to that time the person I replaced did very little to assist the Water System administrative office so I was really a pioneer in that new rotating Assistant Chief Engineer of Waterworks position.

Duane Georgeson was my last supervisor in Aqueduct Division when he was Chief Engineer of Waterworks. He was innovative in thinking beyond the normal concepts. He would look beyond what normally people would do to resolve situations. Particularly, I give him credit for bringing Inyo County and the Department together. He had been working on, and I had been assisting, in all kinds of agreements to see if we could get water from the Owens Valley. We would provide for town lot sales or county facilities, or land, provide enhancement/mitigation projects for Inyo County. We could never come to an agreement because of public concerns. Everything Inyo County did had to go to the public because the Board of Supervisors was a public organization.

It seemed we never got anything done. Finally, Duane came up with the idea we put together an MOU (Memorandum of Understanding) that would just state that we would agree to meet. That's all it said. It had no conditions. We just agreed to meet. We described how we were going to meet. We are going to meet and have an Inyo-LA Standing Committee, which includes the county supervisors and commissioners, representatives of the City Council and Mayor's office, and staff people from both organizations. And we would just meet.

If there were some technical problems that we needed to resolve we would have a Inyo-LA Technical Group meet. We started

meeting monthly. We alternated the meetings between the Owens Valley and Los Angeles. This brought the people together. They got to know each other. We got to know the Supervisors on a first name basis and they got to know our Commissioners. Once in a while we would have our City Council member attend. We would always have a representative from Mayor Tom Bradley's office. We came up with ideas and things to do. The thing we were under court order (Third District Court of Appeal) to do was to prepare an Environmental Impact Report (EIR) on Owens Valley groundwater pumping.

We had prepared an EIR in 1975, which the court rejected. We prepared a second one which was rejected in 1981. We were getting nowhere because Inyo County would always object to our EIR. We needed to get them on board in order to come up with an EIR that would satisfy the court.

By agreeing to meet, under the MOU, we could begin to formulate ideas of how we would manage the pumping. We set up the concept for the pumping plan. We developed a five-year plan where we set the pumping plan by meeting and basing the pumping on the expected runoff (snowpak survey). We agreed on enhancement/mitigation projects which now total twenty. We agreed on lot sales to provide more land around the valley towns and other public facilities things that may be neccessary.

Finally, we agreed to get a consultant to prepare our EIR We also agreed to get the U.S. Geological Survey to come and do some studies on the groundwater basin and vegetation studies. We funded the drilling of observation wells and groundwater vegetation

studies.

We probably now have a half-dozen people in Aqueduct Division involved in land management related to fish and wildlife and vegetation in the Owens Valley. Dave Babb is our Manager of Wildlife Activities. Duane Georgeson was instrumental in coming up with unique ideas for bringing people together outside the normal realm to resolve difficult issues. I really appreciated that approach. Sometimes they would be detrimental and you would think, gee there's no way we going to be able to do it, but we'd follow along and most of the time it would work. There would be times where it didn't, but in most cases things worked out quite well and we are where we are today with Inyo County because of his creation of the Inyo-LA Standing Committee and agreeing in a MOU just to meet.

NELSON: What about members of our Board of Water and Power Commissioners. Over the years you saw a number of them come and go. Which impressed you the most?

LUND: I did have a lot of contact with the Board, probably more than most people in my different levels. In fact, as a Senior Waterworks Engineer in the 1960s, I sat as the Water System representative at the Board meeting. Both my superiors in Water Executive were absent so I sat in for them.

In dealing with Owens Valley issues I met with the Board many times. I say, generally speaking, in my era, the Boards have been quite good. I look to certain members of the Boards who I liked as probably the most outstanding ones at this time is Rick

Caruso, who of course is still a member of the Board - the Vice President. He was very instrumental in keeping us together in our Inyo-LA negotiations.

I also liked, although he did some strange things, Jack Leeney. He was somewhat vocal in some areas and you were concerned with what he would say. Jack would take the position of the "bad guy" and step out and object to something Inyo County would be pursuing. He would provide the counterbalance to our normal ways of negotiating. So he became very effective in the negotiations.

Another person I liked was Walter Zelman. Although he came from the Common Cause organization and people were concerned about what his attitude towards DWP might be. He became one of the strongest supporters of the Department. He was one that looked at both sides of the issues. I think he is a very level-headed person.

Looking back in history I think the Board member that I would recall is Katherine Dunlap. She later became a Director of MWD and is now a member of the California Water Commission. She was very easy to work with and looked at both sides of an issue.

NELSON: You were active outside the Department in water industry organizations and activities. Can you relate some of that involvement?

LUND: As part of the professional activities I was a member

of the American Society of Civil Engineers (ASCE). I went through different chairs in the local section of ASCE. I started as Assistant Secretary, Secretary and Vice-President.

Because of my activities with dams, Professor C. Martin Duke, UCLA, and the San Fernando Earthquake in 1971, I became active in earthquake engineering. More specifically related to "lifeline" earthquake engineering. (Lifelines = water, energy, transportation and communications - necessary for the life of, and restoration of a community after a disaster, such as an earthquake) I became a member of the national organization called the ASCE Technical Council on Lifeline Earthquake Engineering (TCLEE).

I have continued to be active in TCLEE and have chaired several committees, including the Executive Committee. Currently I represent the TCLEE Management Group A of ASCE and I will be going to a meeting Thursday in Coeur d' Alene, Idaho, where our management group will be meeting.

This last week I participated in a field investigation of damage to lifeline facilities in the Cape Mendicino (Eureka), California earthquakes of April 25 and 26, 1992. I have done lifeline earthquake investigations of San Fernando, Whittier Narrows, Pasadena, Upland and Sierra Madre earthquakes.

I also became involved in the Association of California Water Agencies (ACWA). I was appointed chair of the Domestic Water Committee in the mid 1980s and they met twice a year and I would put on programs on domestic water at their fall and spring conferences.

When the issue of water quality became so predominent with the passage by Congress of the Safe Drinking Water Act of 1986 Water quality regulations became very important. ACWA did not address those activities at the time, so they created a joint Water Quality Task Force of the Domestic Water and Agricultural Water Users committees to address water quality regulations. I was selected to be the chair of this combined committee in 1988. I am still the chair and we are the most active committee statewide on water quality that exists.

We input to EPA both orally and in writing to the State Department, of Health Sevices, Office of Drinking Water. I have testified before the State Water Resources Control Board. I participated in the ballot agruments against State Proposition 141 in which they proposed to apply Proposition 65 requirements to public agencies. Believe it or not the issue was defeated.

We meet probably six or seven times a year. I have a number of work groups who work for me who handle individual regulations and we approach all aspects of the Safe Drinking Water Act. We will be having our next meeting May 21, 1992, at Indian Wells. CA.

Other activities I am involved in outside the Department is Board of Trustees of the John Marshall High School Alumni Association. I am the President-Elect of the Cal-Tech Alumni Association. I am also a member of the Griffith Park Resources Board which is a citizens advisory board for the policies and activities related to Griffith Park. I was appointed to this position by the office of the City Council President, John Ferraro.

NELSON: You mentioned water quality. This has become "show business" of late. Bottle water producers and equipment manufacturers are aggressively marketing their products implying either that tap water is dangerous or that they can provide the "Fountain of Youth" to their subscribers. What is the condition of local tap water today?

LUND: Water quality is excellent. It meets all of the current federal public health standards and state standards. However, the regulatory process is tremendous. We are required to monitor our drinking water for all kinds of contaminents and notify the State whenever we exceed the maximun contaminent levels (MCL). If we exceed the MCL we are required to notify our customers. Los Angeles' water quality is excellent and meets all current Federal and State standards.

Any water that does not meet the current standards is not provided to the customer. Wherever we have, especially in the San Fernando Valley, in using the "we," I am talking about the Department of Water and Power, we the citizens of Los Angeles, and we the customers of the Department, are involved with a heavy cleanup program of volatile organic compounds (VOC), such as TCE and PCE used by previous industrial concerns, (not DWP) probably dating back as far as the 1930s. These VOC's have penetrated into the San Fernando Groundwater Basin.

We are in the process of cleaning up the basin. There are certain minimum standards set for TCE and PCE in the water. Currently we blend the water so we are below the standards.

No water is served to the public which exceeds the public health requirement that exists today.

But more stricter standards are in "the pipe" and they are going to become much more stringent. One of the big things now is radon, and in the future it will be arsenic in water. Radon is naturally occurring. It's a decompositon of radium in the soil perculating up through the soil into the basements of residences. The amount of radon in water, and the only time you get it, and it's not from drinking it, it's not from ingesting water, it's from breathing water, like when you would take a shower. The amount of radon that a person would be subjected to is less than about five percent of the total radon that might be in the home.

The amount of radon in the air in the home that comes through the basement is ninety-five percent of the radon that a person could be exposed to in the home. Some states have high radon content in their soil but California is one of the lowest.

My Association of California Water Agencies (ACWA) Water Quality Committee, by the way, we have a budget of about $200,000, and this is for a volunteer active committee. Anyway, we made a radon survey and a consultant estimated the treatment costs and we found that it would cost $3.6 billion, the capitalized cost of constructing the facilities to treat radon. To treat less than five percent of the problem with the EPA standard being proposed. And it would cost $500-700 million per year for operation and maintenance of the treatment facilities. Nationwide, it would be $12 to $20 billion. You could take that money and retrofit every

home and solve the total radon problem, air and water, and not just less than five percent of the problem.

ACWA Water Quality Committee members and others created a national coalition called the "Alliance For Radon Reduction". We are getting others to join to see if we can get either legislative or administrative actions to have EPA look at radon in the total environment. I have been to Washington D. C. to meet with members and staff of Congress and agency people and they say, "Our hands are tied. We've got the Safe Drinking Water Act, mandated by Congress, and we've got to look at radon in water."

Congressman Henry Waxman, Los Angeles, is behind the Safe Drinking Water Act. We need to do something to influence him which may be difficult. We also need to influence his collegues that we need to look at a radon standard in the total environment in the home.

We have a letter from The Office of Technology Assessment which requests EPA to look at radon in the air and water, but EPA is still required by the Act to set a standard for water alone.

DWP water quality is good. We have no drinking water delivered to the customer that is not of good quality. It all meets all the Federal and State standards.

NELSON: Val, how would you sum up your forty-two years with the Department?

LUND: I would say for a DWP temporary job in July 1947,

in an area that I had no idea I would ever become involved in it has been very satisfying. I probably would not do anything different. If I were asked today starting out where I would like to work I would like to work in a water utility and I would like to do the things that I have done in my years at DWP. The only difference in my career is that I had all the different waterworks activities in one company. Whether it would have been better to work in different companies and meet different people, I don't know. But I got all the experience and so that's probably why now people call upon me to assist them in different activities and I have become involved with consulting organizations that look to my background and experience as something that might be of help to their activity.

NELSON: Thank you for giving us your time.