

# **CHERRINGTON CORPORATION**

## **Statement of Qualifications**



# CHERRINGTON HDD

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**C**herrington has set the standard for Horizontal Directional Drilling technology since 1972. We are committed to the belief that HDD technology is the best option to place pipelines and utilities underground to avoid natural barriers and environmentally sensitive areas.

As one of the world's leaders in HDD technology, our goal is to provide innovative solutions, through experience and expertise that result in the highest quality services and products possible in the industry. Satisfying our client's needs is the key to our success.

**C**herrington Corporation has built a reputation within the Horizontal Directional Drilling (HDD) industry of always completing the job, no matter how difficult or challenging the project. Our technical expertise and field experience have enabled us to overcome insurmountable odds and extreme adversity at times to insure that our customer's projects are successfully completed.

Martin Cherrington was the first to successfully execute a river crossing, thus launching an industry over 30 years ago. Since then Cherrington has had over 125 foreign and domestic patents issued. Cherrington Corporation and its predecessor, Titan Contractors, has continued to expand the limits of HDD technology setting records for distance and diameter through hard and soft rock lithologies, worldwide. Expanding its traditional capabilities of crossing rivers, the company has also developed innovative uses and applications that include drilling methods, procedures, processes and equipment that have helped advanced the HDD industry.

With its manufacturing alliance partner, Tidril Corporation, Cherrington has contributed to the design of drilling equipment and downhole tools that have set the standard in the HDD industry for efficiency and durability. These include new generation drilling rigs, downhole tools and other technology to increase efficiency and productivity.

Cherrington Corporation has found that successful projects are not just the result of sound operating techniques and innovative technology. Success is achieved by sharing common goals between a contractor and owner. This is done through forming strategic alliances to help mitigate the potential risk of project cost and schedule overruns. Joint planning, superior communications and a clear understanding of work processes for a given project provide a shared appreciation of each party's challenges and promote common goals and objectives. Such alliances are based on the belief that by combining resources a contractor and owner can both be more successful.

# HORIZONTAL DIRECTIONAL DRILLING

## Origins

**H**DD evolved from horizontal boring techniques used in the utility construction industry to install small diameter conduits and pipes over short distances underground. Martin Cherrington, owner of Titan Contractors (a utility boring contractor and forerunner to Cherrington Corporation), was the first to apply these techniques to install a pipeline successfully under a river. In 1972, he drilled and placed a 4-inch OD gas pipeline under the Pajaro River near Watsonville, California, for PG&E, a regional utility company.

News of the successful completion of the PG&E project quickly spread to the pipeline and telecommunications industries. HDD was recognized as a cost-effective method to circumvent major obstacles to conventional open cut trenching. It also had the added benefit of minimizing the impact to the environment by its very nature. This helped accelerate its acceptance as a viable alternative to standard industry solutions to spanning tributaries and other natural or man-made obstacles.

Over the next seven years while obtaining thirteen patents, Titan Contractors developed the commercial feasibility of HDD technology. Because of its success, Titan Contractors was sold, in 1979, to Reading & Bates one of the worlds largest oil and gas drilling contractors. Today, Martin Cherrington is not only recognized as the originator of Horizontal Directionally Drilling but is credited for spawning many of today's companies engaged in the river crossing, or HDD industry.

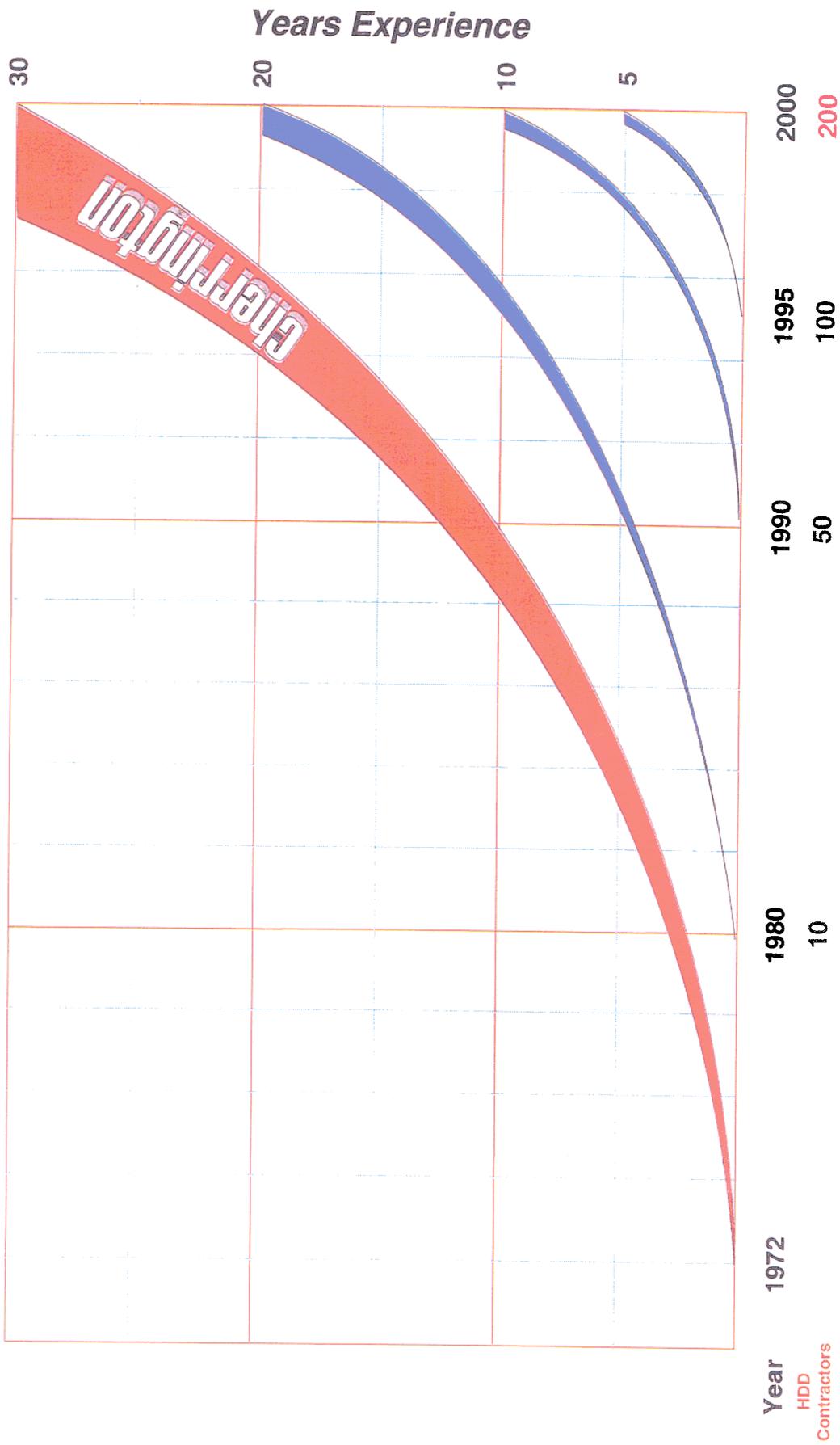
In 1984, after a five-year hiatus, Martin Cherrington formed a privately held company, Cherrington Corporation, to compete once again as an HDD contractor. Between 1979 and 1984, Cherrington and his colleagues, who had created the technique of river crossing, developed many innovative enhancements to HDD technology and equipment.

Cherrington Corporation played a major role assisting the U.S telecommunications industry, from 1984 to 1989, in the installation of the US fiber optic infrastructure. During that time, Cherrington developed and applied numerous patented techniques that facilitated the installation of the fiber optic network.

In addition to the accomplishments in the telecommunications industry, Cherrington perfected applications and specialized HDD equipment for the Oil & Gas, Power Distribution, Water & Waste Water and Environmental Remediation industries. The company has historically designed and manufactured its own line of HDD rigs, with capabilities of up to 1,000,000 pounds of pulling thrust and 90,000 ft-lbs of torque. Additionally, a wide variety of associated pipe installation equipment and specialized downhole drilling and reaming tools are manufactured.

To date, Cherrington and its employees have completed over 350 HDD projects totaling more than 350,000 feet, or 66 miles, while setting numerous world records for the installation of both large diameter pipe (up to 42-inch OD) and conduits over long distances (up to 5000 feet).

# HDD Learning Curve



## HDD Maxi-Rig Contractors Entering Industry

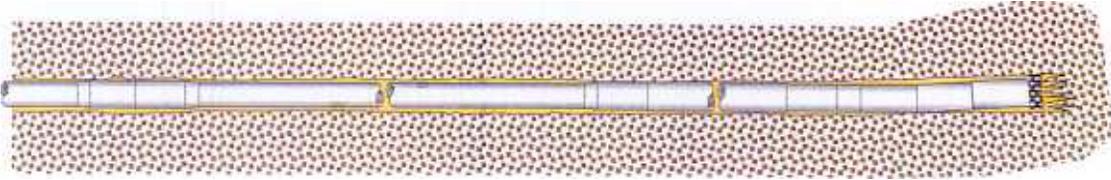
(Rig Capacities > 100,000 lbs.)

# CHERRINGTON HDD

## Typical HDD Drilling Phases

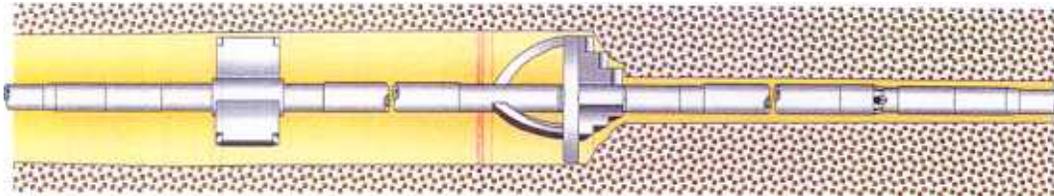
Phase

Pilot Hole

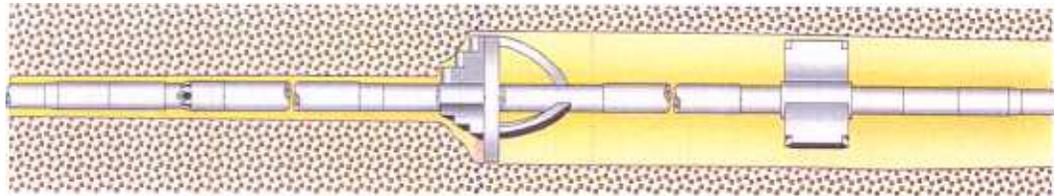


Phase II

Forward Ream  
(Optional)

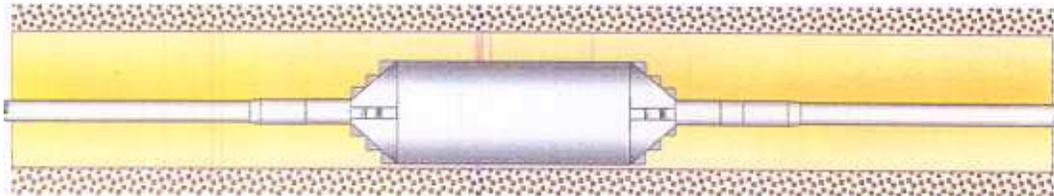


Pull Ream  
(Optional)



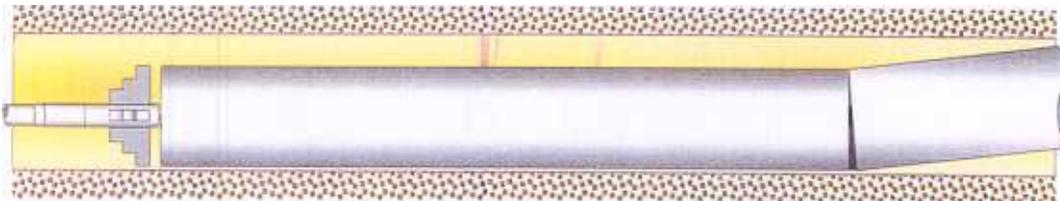
Phase III

Pre-Pullback



Phase IV

Pipe Pullback



**H**DD is used to place a wide range of pipelines and conduits under rivers or other obstacles during underground utility installations. Pipelines and conduits can range from 6 inches to 48 inches in diameter while crossing distances can reach up to 6000 feet long. HDD is applicable to a variety of industries that include:

- Oil & Gas
- Telecommunications
- Water & Waste Water
- Power
- Ocean outfall projects

### The HDD Process

The typical HDD process can be divided into four phases: Pilot Hole, Reaming, Pre-Pullback and Pipe-Pullback. The number and type of phases will depend on several factors:

- Type of installation
- Geological formation to be drilled
  - The product pipe or conduit size to be pulled through the hole
  - Whether reaming forward or pulling
  - Necessity of pre-pullback hole cleaning
  - Drill Pipe connections necessary for pullback

Each HDD project begins by drilling a small diameter pilot hole from the entry to exit side of a crossing. Formation samples are taken before the project commences to determine what type drill bit will be required. Hard rock formations require a tri-cone roller bit and a downhole mud motor for optimum penetration rates. Soft soil formations require a jet bit and a bent sub to change course, or borehole direction. If formation changes occur while drilling, the bit can be pulled out and changed. Behind the bit, a Directional Survey sensor, or Steering Tool, is located in a non-magnetic camera sub and drill collars that are necessary to make magnetic measurements downhole. The information from the Steering Tool is continuously transmitted to the surface. A computer system receives the data throughout the drilling process via a wireline connection inside the drill string to plot the location and orientation of the borehole.

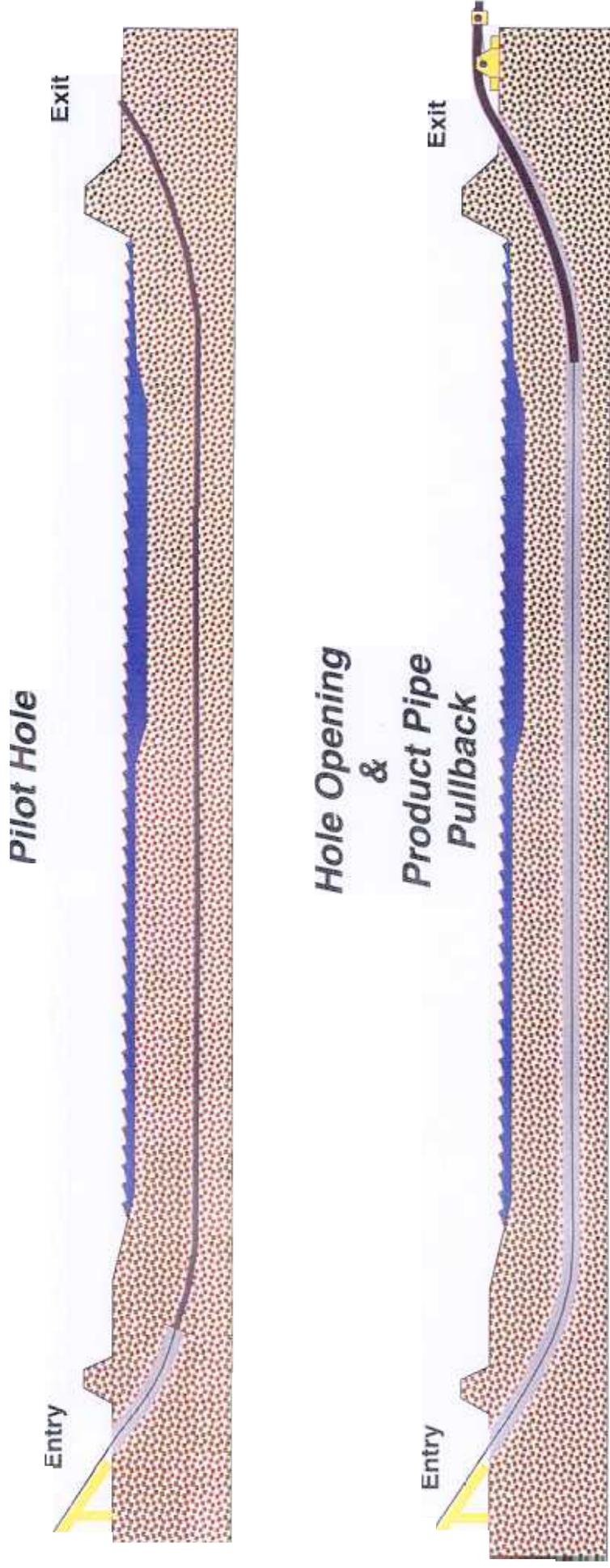
After a pilot hole is drilled, the hole diameter is increased sufficiently during the next phase to allow an adequate safety margin when pulling back the product pipe or conduit. The pipe size to be pulled determines the size of the hole opener to be used. Hole Openers may be Fly Cutters, for soft to medium hard formations, or Reamers for hard rock formations. The Hole Opening phase can be either Forward Reamed or Pull Reamed depending on lithology and other operational factors.

If conditions warrant, a Barrel Reamer is sometimes run after the Reaming Phase for final gauging of the hole prior to pipe pull back. This is known as the Pre-Pullback Phase. The Barrel Reamer diameter is matched to the diameter of the product pipe or conduit. It not only gauges the hole but also has cutters at both ends to re-ream in either direction should the borehole become incompetent.

Once the borehole has been opened to the correct size and conditioned, the product pipe or conduit is pulled into place. During this Phase the pipe is laid out on the exit side of the crossing for assembly and pre-testing. The pipe is either welded or fused, depending on the type of pipe material, into one uniform length prior to insertion into the borehole. This enables the pipe to be pulled into place in one continuous operation. For small diameter pipe, a pulling head and swivel are attached while pulling into place by the rig from the entry side. In the case of large diameter pipe, a special articulated Pipe Thrusting Head and Swivel Assembly are attached to the end of the product pipe to help negotiate the curvature of the borehole. A Pipe Thruster device on the exit side works in tandem with the rig to distribute the force necessary to pull large diameter pipe through the borehole. Following the pipe pullback, service connections are made to the placed pipe on each end of the crossing.

Pipelines and conduits installed using the HDD method are permanent, not subject to bank erosion, never become a navigational hazard and are environmentally sound.

# Typical HDD Crossing Profile



**C**herrington Corporation can handle the most challenging HDD project for a wide variety of industries and geological environments. With over 30 years of experience in diverse geographical, geological and environmental settings, Cherrington has successfully completed every HDD project attempted. This experience base gives us a superior competitive advantage to successfully complete your next crossing.

Each industry has unique requirements for placing pipelines or conduits across natural or man made obstacles along right-of-ways. Few companies have the depth of experience to meet demands associated with high profile projects. Cherrington has worked intimately with Pipeline Contractors, Telecommunications/Power Distribution Companies, Water/Waste-Water Utilities as well as Environmental Engineering companies and is qualified to meet any challenge that may arise.

### ***Applicable Industries***

- Oil & Gas Pipelines
- Telecommunications
- Electric Power Distribution
- Water/ Waste-Water
- Environmental Remediation

The difference between a competent HDD Service contractor and a mediocre one is the fundamental understanding of the downhole environment while drilling. Different types of lithologies require different drilling scenarios and equipment to achieve success. Proper understanding of downhole dynamics is critical. Utilizing drilling rigs with sufficient push/pull power and purpose built downhole tools will insure that a project is completed successfully. In unconsolidated soils, properly balanced mud systems are essential to maintain hole integrity during drilling as well as reaming. Designing Downhole Tools to work in a variety of rock and soil formations minimizes unnecessary trips to change out the bottom hole drilling or reaming assembly due to changes in formation type. Cherrington's innovative technological contributions to the HDD industry have resulted in over one hundred patents and worldwide recognition as an industry leader.

### ***Geological Environments***

- Rock
- Unconsolidated Formations
- Alluviums

Cherrington was the first to successfully execute a river crossing. It has also continued to set records for diameter and distance in the HDD industry. Expanding the limits of HDD technology, the company has also developed techniques for placing pipelines and cables from shore using outfalls and beach approaches. These techniques have also led to using HDD as a viable method for implementing "insitu remediation" of plumes of underground contamination.

### ***Contracting Services***

- River Crossings & Obstacle Avoidance
- Outfall Lines & Beach Approaches
- Environmental Remediation

Services normally conducted as part of Contracting are also available on a consulting basis. When alternate opinions are needed or additional resources are required, Cherrington's Staff can provide preliminary information for project planning.

### ***Construction Design/Consulting Services***

- Feasibility Studies
- Site Investigation
- Preliminary Execution Planning
- Budgetary Estimates
- Plan/Profile Drawings
- Presentations (Upon Request)

**H**orizontal Directional Drilling is by its very nature an environmentally friendly alternative to traditional trenching methods across rivers or other inaccessible areas for pipeline and cable right-of-ways. Unlike conventional trenching methods, nothing is disturbed along the right-of-way where the pipeline or conduit is installed underground. HDD equipment can be setup on a very small footprint on both sides of the crossing. This results in a minimum of disturbance to the local environment.

Cherrington Corporation assesses every project thoroughly to determine the potential impact on the topography, wildlife, vegetation and cultural surroundings. Mitigation plans are developed in advanced to use during the course of the operations. Routes to and from the project are carefully planned and selected to minimize disturbing local residents or the natural environment. Local, state and federal regulations are also strictly observed.

When setting up drilling and support equipment on location, several factors are taken into consideration. These include the geology, soil conditions and the need for erosion control. Drilling fluids and drill cuttings are stored onsite in steel tanks to insure safe containment and proper handling. Cuttings are removed frequently from the work site to authorized disposal areas nearby. Heavy drilling machinery is placed on thick absorbent pads and impervious membranes to prevent contamination of the soil when fueling, lubrication and operating equipment. Fuels and lubricating oils are also rigorously monitored during handling, storage and transportation.

Cherrington personnel are trained to safely handle and use fluids and materials required on each project site. Specific written procedures and policies are maintained on site designating supervisory and management personnel responsible for implementation and execution of environmental and safety monitoring reports and mitigation plans on each project.

Cherrington not only sets the technological standard for the HDD industry but is committed to the belief that HDD technology is the best option to place pipelines and utilities underground to avoid natural barriers and environmentally sensitive areas.

# CHERRINGTON HDD

## Manufacturing Alliance

**T**idril Corporation owned by Martin Cherrington, manufactures HDD equipment for Cherrington Corporation and the HDD Industry. This includes drilling rigs, drilling support equipment and specialty down-hole tooling.

A complete line of HDD drilling rigs have been built by Tidril with capacities of up to 1,000,000 pounds of pulling force and 90,000 ft-lbs of torque (see table below). Martin Cherrington's 30 years of HDD field experience has resulted in several significant HDD technological advancements. For example, "The Pipe Thruster" is

### Tidril Corporation Rig Manufacturing History

<i>Rigs</i>	<i>Customer</i>	<i>Year</i>	<i>Pull</i>	<i>Torque</i>
1	Titan Contractors	1973	50,000	20,000
2	Titan Contractors	1977	75,000	35,000
3	Titan Contractors	1978	300,000	45,000
4	Reading and Bates	1980	100,000	30,000
5	Reading and Bates	1982	1,000,000	90,000
6	Reading and Bates	1981	500,000	40,000
7	Reading and Bates	1981	500,000	40,000
8	Cherrington	1984	70,000	25,000
9	Cherrington (sold)	1985	75,000	30,000
10	Cherrington	1986	100,000	30,000
11	Cherrington	1987	300,000	40,000
12	Cherrington (sold)	1988	300,000	40,000
13	Bechtel	1992	750,000	90,000
14	NKK	1995	300,000	60,000
15	Transneft (X5)	1998	300,000	60,000
16	Intertorg	2001	350,000	40,000

a unique Cherrington design that compliments a rig's pulling capacity during pipe installation. Large diameter product pipe, several thousand feet in length, can be easily installed using the rig and Pipe Thruster in tandem to distribute a push/pull force up to a million pounds. Tidril manufactures a complete range of equipment to handle the simplest to the most difficult HDD project.

# CHERRINGTON HDD

## Management Resumes

### **Martin Cherrington** - *Principal, President and Owner*

Martin Cherrington founded Cherrington Corporation in 1984. Mr. Cherrington is recognized as the originator of horizontal directionally drilled river crossings and has made a significant contribution as a pioneer in HDD technology. His first company, Titan Contractors, successfully completed the first river crossing in the world in 1972. Since then, he has been granted over 18 patents related to horizontal directional drilling technology. He has authored articles in industry trade journals such as Oil & Gas Journal, Trenchless Technology, and given technical papers at several HDD Technology conferences.

Mr. Cherrington has set numerous world records for diameter and distance. His unique understanding of downhill drilling dynamics have produced innovative solutions that have resulted in successful completion of every job attempted. Mr. Cherrington's companies have completed over 350 crossings in the most complex geological environments under the most difficult operating conditions.

### **Larry Bertolucci** – *Vice President /Engineering and Estimating*

Mr. Bertolucci is a Principal of the company and has been associated with Cherrington Corporation since its inception in 1984. He has extensive field operations and supervision experience with Titan Contractors and Titan Western Corporation dating from 1973. Mr. Bertolucci is a certified Mud Engineer and is responsible for drilling fluids management for Cherrington Corporation. His responsibilities include preparing bid proposals, developing project scheduling, estimating project costs, determining project design criteria, as well as providing geo-technical analysis of core samples for each project.

### **Dan Callnon** – *VP Business Development & General Manager Tidril Corporation*

Mr. Callnon joined Cherrington Corporation in 1988. His HDD career began in 1973 with Titan Contractors where he held several key positions in field operations management. Mr. Callnon has worked extensively in the construction industry performing as a project manager and operations supervisor. His responsibilities include developing HDD market opportunities both domestically and internationally. Mr. Callnon has also managed HDD projects in the US and internationally. He is a Director in DCCA.

### **Mark Parsons** – *Operations Manager*

Prior to becoming Operations Manager, Mr. Parsons served as Directional Survey Engineer, Drilling Superintendent and Project Manager for Cherrington Corporation since joining the company in 1987. During his career, he has managed over 95 HDD projects in the US and internationally that include crossings up to 5500 feet long and pipe diameters up to 30 inches.

**Russ Randoll** – *Senior Drilling Technician/General Superintendent*

Mr. Randoll has field operations experience managing over 100 successful HDD projects worldwide for the pipeline, power distribution and telecommunications industries. His experience includes placing pipelines and conduits up to 4,700 feet long and pipe diameters up to 42 inches.

He has served as Project Manager/General Superintendent with Cherrington Corporation since 1991

**Harold V. Anderson** – *Civil Engineering Consultant*

Mr. Anderson is a Civil Engineer, Registered in the State of California, No. 16063. He is a fellow in the American Society of Civil Engineers, and a member of Tau Beta Pi, the American Concrete Institute, and PIANC. He holds both apparatus and method patents for laying underwater pipelines. The following are some highlights of Mr. Anderson's extensive experience:

- Construction Engineering for installation of Ocean Outfalls including San Diego, SWOOP, Santa Cruz, Sand Island, Richmond and Chevron Refinery at Richmond, California
- Design Engineer of all Containment Cells and Pipe Thruster - PGT/PG&E Pipeline Expansion, for Cherrington Corporation
- Construction Engineering for installation of numerous Submarine Pipelines including Petroleum Pipelines through surf zone and under ship channels, rivers and streams, and Directionally Drilled installations for pipelines and fiber optics.

# CHERRINGTON HDD

## Client References

<u>Client and Address</u>	<u>Contact Person</u>	<u>Phone Number</u>
<b>NORTHWEST PIPELINE COMPANY</b> 295 Chipeta Way Salt Lake City, UT 845158-0900	Gordon Hamilton	(801) 583-8800
<b>MOJAVE PIPELINE OPERATING CO.</b> 5001 E Commerce Center, Suite 300 Bakersfield, CA 93309	David Hurst	(805) 861-7334
<b>SAN DIEGO GAS &amp; ELECTRIC CO.</b> P.O. Box 1831 San Diego, CA 92112-4150	Bob Dalby	(619) 696-4127
<b>PACIFIC GAS &amp; ELECTRIC CO.</b> 3185 "M" Street Merced, CA 95348	Mike Tiere Tim Wright	(209) 726-6336
<b>SPEC SERVICES</b> 17101 Bushard Street Fountain Valley, CA 92708	Gary Lavold	(714) 963-8077
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