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Completion Report for DP Canyon Grade-Control Structure and Gage Station E039.1

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June 2010

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EXECUTIVE SUMMARY

This report was prepared by Kellogg Brown and Root Services, Inc. (KBR), and Post, Buckley, Schuh, and Jernigan, Inc. (PBS&J), for the U.S. Department of Energy (DOE) Los Alamos Site Office, and Los Alamos National Laboratory (LANL or the Laboratory) to document and summarize the design, analysis, and construction of the Delta Prime (DP) Canyon grade-control structure and associated stream gage E039.1. This report addresses engineering and site exploration activities, deviations from the original design, permitting, and construction activities.

The Los Alamos and Pueblo watershed, including the canyons and their tributaries, encompasses several former and current technical areas of the Laboratory. In 2004, the Los Alamos and Pueblo Canyons Investigation Report presented investigations of the nature, extent, transport, and potential risk from chemicals of potential concern in the watershed. Following a notice of disapproval from the New Mexico Environment Department (NMED) in 2005, DOE and the University of California prepared a supplemental investigation report for Los Alamos and Pueblo Canyons. In 2007, NMED issued an approval with direction for this report, with requests that the Laboratory conduct actions to mitigate the transport of polychlorinated biphenyls (PCBs) in stormwater. The February 2008 Interim Measure Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons presented interim actions to mitigate PCB transport. NMED issued an approval with modifications to the interim measure work plan, resulting in a supplemental interim measure work plan. The DP Canyon grade-control structure was presented in the supplemental plan as an additional mitigation measure to reduce contaminant transport within the Los Alamos and Pueblo watershed.

The DP Canyon project consisted of (1) the construction of a grade-control structure that raises the level of the stream bed to induce channel aggradation (sediment deposition) upstream of the structure and (2) the relocation of the E039 stream gage and construction of a supercritical-flow flume to enhance water flow measurements at the new location. The goal of the grade-control structure is to partially fill the upstream channel, with the result of more frequent out-of-bank flooding, thereby increasing the potential for sediment deposition on adjacent floodplains, burying contaminated sediment deposits. The DP Canyon grade-control structure is located downcanyon from the former Solid Waste Management Unit 21-011(k) Outfall at Technical Area 21 and near the site of the former E039 gaging station at the east end of reach DP-2. The relocated and upgraded gage, E039.1, is located 62 ft downstream of the structure. In this location, the flume and gage can measure the efficiency of the grade-control structure.

Construction of the grade-control structure began October 26, 2009, and was completed January 26, 2010. A letter submitted to NMED on February 5, 2010, gave notice of the grade-control structure completion and requested an extension to the completion report submittal date. In a letter dated February 16, 2010, NMED approved the requested extension for the completion report to June 3, 2010. Stream gage E039.1 construction was completed February 27, 2010. Seeding of the entire area was delayed until May when the noise ordinance for the canyon was lifted. The site was seeded May 4, 2010.

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Acronyms and Abbreviations

2-D	two-dimensional
3-D	three-dimensional
CMP	corrugated metal pipe
CQC	contractor quality control
DOE	Department of Energy (U.S)
DP	Delta Prime (canyon)
EPA	Environmental Protection Agency (U.S.)
FFA	flood frequency analysis
KBR	Kellogg Brown and Root Services, Inc.
HDC	hydraulic design chart
HEC-FFA	Hydrologic Engineering Center Flood Frequency Analysis (U.S. Army Corps of Engineers statistical computer program)
HEC-RAS	Hydrologic Engineering Center River Analysis System (U.S. Army Corps of Engineers surface model)
IMWP	interim measure work plan
LANL	Los Alamos National Laboratory
LIDAR	light detection and ranging
NMED	New Mexico Environment Department
PBS&J	Post, Buckley, Schuh, and Jernigan, Inc.
PCB	polychlorinated biphenyls

PM	project manager
PVC	polyvinyl chloride
SDIC	Security, Disaster, Infrastructure Construction (USACE multiple-award task-order contract)
SIMWP	supplemental interim measure work plan
TA	technical area
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey

1.0 PROJECT OBJECTIVES

The Los Alamos and Pueblo watershed, including the canyons and their tributaries, encompasses several former and current technical areas of Los Alamos National Laboratory (LANL or the Laboratory). The Los Alamos and Pueblo Canyons Investigation Report (LANL 2004, 087390) presented investigations of the nature, extent, transport, and potential risk from chemicals of potential concern in the watershed. Following a notice of disapproval from the New Mexico Environment Department (NMED) (2005, 088463), the Laboratory prepared a supplemental investigation report for Los Alamos and Pueblo Canyons (LANL 2005, 091818). NMED issued an approval with direction for this report (NMED 2007, 098284), with requests that actions be conducted to mitigate the transport of polychlorinated biphenyls (PCBs) in stormwater. The February 2008 Interim Measure Work Plan (IMWP) to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons (LANL 2008, 101714) presented interim actions to mitigate PCB transport. NMED issued an approval with modifications to the IMWP (NMED 2008, 103007), resulting in a supplemental IMWP (SIMWP) (LANL 2008, 105716; NMED 2009, 105014). The DP Canyon grade-control structure is an additional mitigation measure identified in the SIMWP to reduce contaminant transport within the Los Alamos and Pueblo watershed. Figure 1.0-1 shows sediment transport mitigation sites in Los Alamos and Pueblo Canyons, highlighting the DP Canyon grade-control structure and the stream gage E039.1.

The project consisted of the construction of a grade-control structure and relocation and upgrade of the E039 stream gage located within the Laboratory's Technical Area 71 (TA-71). The structure and associated stream gage are within Delta Prime (DP) Canyon and are referred to as the DP Canyon grade-control structure and stream gage E039.1, respectively. The DP Canyon grade-control structure is located downcanyon from the former 21-011(k) Outfall at TA 21 and near the site of the prior E039 gaging station at the east end of reach DP-2. The relocated stream gage, E039.1, is located approximately 62 ft downgradient of the structure as measured from the downstream end of the structure stilling basin to the upstream flume invert (see Figures 1.0-1, 1.0-2, and Appendix A).

The structure is part of remedial actions taken to reduce the migration of contaminated sediment into the lower reaches of DP and Los Alamos Canyons, where they could migrate off-site. Beneficial results of the grade control include the partial burial of upstream banks, reducing the potential for bank erosion, and the enhancement of floodplain deposition upstream of the structure.

The DP Canyon grade-control structure was designed to induce upstream aggradation (sediment deposition) that will fill the channel and partially bury the existing sediments in the floodplain. Aggradation within the channel upstream of the structure will reduce erosion of contaminated stream banks and overbank areas during significant storm events. Flood flows will more frequently spill into the overbank areas and, through deposition, bury existing contaminated floodplain deposits.

In order to simplify the design, reduce costs, and still provide a stable, safe structure, the structure was designed and constructed to ensure that it did not fall under New Mexico Safe Dams regulations. Under these rules and regulations, a structure is classified as a dam when the structure is more than 10 ft in height (measured from original channel elevation to the top of the low spillway) or is capable of impounding more than 10 acre-ft of water. The DP Canyon grade-control structure does not exceed either of these limitations. The design and final as-built height of the structure is 4 ft at the low-flow weir and 7 ft at the overflow weir as measured from the stream-channel elevation. Maximum impoundment at the low-flow weir is 0.05 acre-ft and at the overflow weir is 0.33 acre-ft.

The objective of relocating stream gage E039 downstream of the structure is to monitor the efficiency of the structure. To enhance the accuracy of water flow data, a concrete supercritical flume was constructed at the relocated stream-gage location.

2.0 DESIGN

2.1 General

2.1.1 Grade-Control Structure

The DP Canyon grade-control structure is composed of rock-filled gabion baskets with a 21-ft-wide low-flow weir centered perpendicular to the stream centerline. The low-flow weir was designed to carry storm runoff from a 5-yr storm event. A 54-ft-long overflow weir was constructed at 3 ft above the low-flow weir to accommodate a 100-yr storm event. The 100-yr flow was used to determine the upper-weir and confinement-wall dimensions and to calculate the energy dissipation stilling-basin dimensions (Figures 2.1-1 and 2.1-2, and Appendix A sheet C-400).

Since the gabion structure would be unsupported, it was designed to provide sufficient mass to prevent slippage and overturning. The design of the structure also provides for the raising of water surface elevations behind the structure during more frequent flood events (5-yr), such that the sediment deposition occurs immediately upstream of the structure and yet minimizes the backwater effects of the less frequent flood events (50- to 100-yr).

The structure design also includes buttress gabions upstream of the weir. The upstream buttress gabions protect the main gabion structure from flow that may contain boulders, trees, and other debris. The top of the grade-control structure was designed to direct flow onto the gabion benches below the top elevation. Downstream buttress gabions also provide energy dissipation of flows. With flows directed to the stilling-basin floor, energy will also be dissipated through the benches.

The upstream face of the structure was wrapped in a geotextile material to minimize the transport of fine sediments during the early stages of operation as well as to reduce the flow of water through the structure. The type of geotextile material was based on gradation analysis of the stream sediment. The material was buried by backfill, using streambed material to stabilize the geotextile and to add impermeability. In addition, a 3-in. concrete cap was applied to the low-flow and overflow weir crests to protect against potential damage from scouring and debris (Figure 2.1-3).

A perforated and slotted riser pipe was constructed approximately 25 ft upstream of the structure to assist in releasing water stored upstream (Figure 2.1-4). One side consists of removable wood boards placed in slots. The remaining riser pipe is a perforated corrugated metal pipe (CMP) to allow water to enter the pipe. This pipe is connected to an outfall pipe that goes through the gabion structure to the stilling basin. The top wood board is placed at the elevation of the low-flow weir or higher to ensure that maximum water surface elevations are achieved to induce sediment settling. After a storm event, the perforations on the pipe will allow dewatering behind the weir. However, if the rate of dewatering is not sufficient to meet standards or the perforations get plugged by debris, wood boards can be removed as needed to accelerate the dewatering process.

2.1.2 Stream Gage

The new stream gage, E039.1, was originally designed to be located within the grade-control structure. However, during construction the location was changed to provide more accurate measurements and to better monitor the efficiency of the grade-control structure. The stream gage's concrete supercritical-flow flume design measures flow up to 350 cubic ft per second (cfs) (Figure 2.1-5). The determination of the stream-gage location, approximately 62 ft downstream of the grade-control structure stilling basin, was based on topographic conditions, on-site investigations, and stream geometry. The U.S. Geological Survey (USGS) publication "Techniques of Water Resources Investigations of United States Geological Survey," Chapter A14, Use of Flumes in Measuring Discharge (Kilpatrick and Schneider 1983, 109514), was used to develop a flume design to accommodate measuring equipment and instrumentation and measure flows up to 350 cfs. The final design, the result of the collaboration of design, construction, and environmental professionals, was subjected to a thorough review by Laboratory and U.S. Department of Energy (DOE) personnel. Design details and as-built information are contained in Appendix A, sheets C-06 through SG-03.

2.2 Site Selection/Exploration

2.2.1 Grade-Control Structure

The grade-control structure location was chosen to meet the overall project objectives and also provide an efficient and value-engineered structure. During the initial design process, adjustments were made to the structure to reduce the overall length by taking advantage of existing topography.

The general area in which the structure was to be constructed was determined primarily by U.S. Army Corps of Engineers (USACE), DOE, and Laboratory input to meet the principal objectives for the project. During the design process, more detailed topographic information was obtained and a geotechnical exploration was performed. The geotechnical exploration and subsequent report provided information on subsurface soil and bedrock conditions; groundwater conditions; structure support; lateral earth pressures; and earthwork recommendations (see Appendix B for the geotechnical engineering report).

The final site selection was based on a variety of additional factors including hydrologic/hydraulic effectiveness, existing topography, vegetation, on-site investigations, an existing historic trail, and value engineering. Two factors were considered as the primary focus.

- **Hydraulic Effectiveness**. During the modeling and design process, the positions of the structure longitudinally along the canyon and laterally within the canyon were evaluated. Factors such as turbulence of flow, erosion mitigation, sediment containment, and structural stability were considered. Upstream and downstream channel conditions played a significant role in the design based on the model analysis of the effectiveness of the proposed upstream channel aggradation.
- **Existing Topography**. Significant material excavation and fill were necessary to construct the grade-control structure. Personnel and equipment access during construction and operation were also considered. Once a preliminary structure design was complete, the gabion configuration was fitted into the existing topography of several of the preliminary locations that were identified by field surveys. Each potential site was then evaluated based on the amount of material to be excavated and filled, ease of access, and position in reference to significant contour changes in the canyon.

Once the final location was determined, an additional field visit was performed to ensure no other existing conditions were overlooked.

2.2.2 Stream Gage

Greater accuracy in flow measurements and sediment data were factors that contributed to the choice of a supercritical-flow flume design for the stream gage. The new stream gage measures flow up to 350 cfs. The flume has specific dimensions, is trapezoidal in shape, and requires a 5% channel slope and a straight approach and exit for proper operation. Distance from the structure was also an important consideration. Location of the gage station was driven by

- channel geometry and topographic conditions, so that the approach to and exit from the flume would be fairly straight and that minimal channel disturbance would be required to construct the flume, and
- a distance from the structure that would allow water exiting the structure to calm before entering the flume but would not be too far to prevent accurate sediment disposition measurements.

Appendix A provides as-built drawings of the grade-control structure and stream gage.

2.3 Hydrologic/Hydraulic Modeling

2.3.1 General

The DP Canyon watershed is within the semiarid higher-elevation mountains of New Mexico and contains an ephemeral stream system. The watershed includes areas of variable vegetation density, rock outcrops, and urbanization. Flood-flow frequency estimates for the structure locations were based on statistical analysis based on historical stream-gage information within the project area and the regional USGS regression formulas (USGS 2000, 109515) and the USACE statistical computer program Hydraulic Engineering Center Flood Frequency Analysis (HEC-FFA) (USACE 1992, 109512).

A hydrologic analysis was performed to provide design parameters for the proposed grade-control structure. The initial analysis, performed in August 2009, was based on stream-gage data, topographic information, a site visit, and the geomorphic and climatologic conditions of the project area. This initial analysis was used to develop the conceptual and preliminary construction plans. Additional light detection and ranging (LIDAR) survey data was obtained during the final phases of design. This provided a more detailed and accurate surface model than was previously available. The new LIDAR data and final design dimensions, which included changes to weir elevations and approach conditions, were used to run a second analysis with the HEC River Analysis System (HEC-RAS) model (USACE 2008, 109518) in December 2009. The results of the new model verified that the final design and as-built structure met the original project objectives. Results of the HEC-RAS analysis are included in Appendix C.

2.3.2 Flood Frequency Analysis Results

Table 2.3-1 presents the FFA results for the DP Canyon project site collected at DP Canyon gage station E038. The gage data at the site is statistically very short, having only 6 yr of records. In addition, the USGS regression formulas used, USGS Rural (USGS 2000, 109515), are based on regional analysis of gage data, which also is sparse and generally of short-record periods.

Stream gage E038 is located upstream of the DP Canyon grade-control structure. Therefore, the FFA results were modified to reflect the larger drainage basin at the project location (Table 2.3-1, column 3, FFA Extended to Project Site). The modification involved multiplying the results by the ratio of the drainage area at the project site to the drainage area at the gage location to the power of the drainage area factor as recommended by the USGS for this region (Waltemeyer 2008, 109516).

In review of the results, the FFA extended discharge-frequencies are higher for the more frequent events (2- to 10-yr floods) and becoming smaller for the more rare events (50- to 500-yr floods). This may be explained by the fact that this watershed has a large area that has become urbanized. The USGS regression equation generally accounts for rural or undeveloped areas and would miss the higher runoff from more frequent rainfall events that would not produce runoff in undeveloped semiarid conditions. The FFA results are based on just a few years of information that do not contain a rare-event flood and miss the higher end of the frequency range (higher flows). Since the geomorphic design for DP Canyon is based upon the more frequent lower flow, the FFA Extended to Project Site was adopted. The higher flows (50- to 100-yr) were used to ensure that the structure can safely pass these flows. To accommodate the uncertainty at the high flows, a safety factor was incorporated by raising the side walls of the structure above the design elevation required to contain the 100-yr flood.

2.3.3 Development of the HEC-RAS Hydraulic Models

To determine the hydraulic effects of the proposed structures, HEC-RAS models were developed. The HEC-RAS Version 4.0 models were initially constructed using shape (.shp) files provided by the Laboratory. The two-dimensional (2-D) data were then converted to 3-D data and geographic information system techniques were used for cross-section development. Existing conditions models were constructed and calibrated to the best extent, and water surface elevations for the 2-, 5-, 10-, 50-, and 100-yr peak-flood discharges were simulated and plotted. All subsequent models used these peak-flood discharges. This initial model was used to develop a base design and plan for the structure. Additional survey data were collected for the site. Based on the new data, new cross sections were prepared and the final, revised, and refined current model was developed.

A proposed conditions model (with grade control), without accumulated sedimentation behind the structure, was constructed, simulated, and plotted. The HEC-RAS in-line weir option was used to model the grade-control structure. Proposed conditions models, with sedimentation, were created to simulate the change in the streambed elevations due to anticipated long-term deposition of sediment upstream of the grade-control structures (described in section 2.4). These three conditions—existing, grade-control structure without sediment deposits, and grade-control structure with sediment deposits—were compared and analyzed. Cross-section layouts, profiles, cross sections, and tabular results for each model condition are included in Appendix C.

2.3.4 Grade-Control Structure Stilling-Basin Design

The stilling-basin length and end-sill height were determined using the USACE Hydraulic Design Chart (HDC) Number 623 (USACE 1959, 109511) based upon the 100-yr flood. HDC 623 develops empirical relationships between the design-critical depth of the approach flow to the height between the weir crest and the top of the end sill in order to size the length of the stilling basin as well as the height of the end sill.

For the empirical relationship of HDC 623 to be successful, the tailwater depth beyond the end sill is recommended to be between 1.25 to 1.67 times that of the approach flow-critical depth. For DP Canyon, the design discharge tailwater would need to be approximately 2½ to 3 ft above the top of the end sill. The HEC-RAS results showed the tailwater conditions were met.

2.3.5 Grade-Control Structure Low-Flow Weir Design

A low-flow rectangular weir was sized to induce the design volumes and location of deposition in the upstream area. The width and depth of the weir was estimated using regime equations (Copeland 1994, 109508) and assuming that the 5-yr discharge is a “channel forming” discharge; a common practice for arid to semiarid regions. The regime width and depth dimensions for the 5-yr flood were used as initial guides and adjusted to meet multiple objectives such as accommodating standard gabion sizes and physical site restrictions and minimizing the structure footprint. The weir was laterally placed where the natural thalweg of the stream is located. The height of the weir above the natural ground was determined by examining the design deposition slope (described in section 2.4) and adjusting it vertically to maximize deposition on the overbank sediments, safely pass the 100-yr flood above the weir, and still be a stable structure. The initial height of the low-flow weir is 1 ft above the existing ground. This height can be varied as described in section 2.5.

2.4 Sediment Deposition Profile Analysis

The profile of the anticipated sedimentation behind the grade-control structure was based upon examination of equilibrium slope analyses (Pemberton and Lara 1984, 109509) and engineering judgment to select an appropriate slope. The equilibrium slope is the theoretical slope that the stream would eventually reach. This slope is projected upstream, starting at the low-flow weir notch elevation, to determine the depths that would cover the contaminated sediments in the floodplain and the potential wetland extents. This deposition profile was used to adjust the cross-section geometry in the HEC-RAS models to determine the water surface elevations for the varied-frequency floods. The deposition profile predicts the water surface profiles for ultimate conditions.

2.5 Adaptive Management Features

2.5.1 Adjustable Weir Crest Height

Predictions of the sediment deposition in the upstream overbank areas can vary because of variations in the stream flow, changes in the sediment characteristics, varying equilibrium slopes, and other factors. To enhance operational flexibility, an additional vertical column of gabions was added to the structure, increasing the thickness of the upper weir foundation. The thicker foundation makes it possible to increase the low-flow weir crest by progressively adding gabions or gabion mattresses up to the crest of the 100-yr overflow. This gives opportunities to accelerate the deposition and to increase or decrease the sediment deposition elevations in the areas upstream of the structure. The initial design crest of the low-flow weir is 1 ft above the existing ground but can go as high as 7 ft. Any additional gabions also increase the structural integrity of the structure.

2.5.2 Adjustable Riser Pipe

When a flow event occurs, the structure causes an impoundment of the water and allows settling of the sediment. After the event has receded and the majority of the suspended sediment has settled, the standing water must be released downstream. A perforated and slotted riser pipe, placed approximately 25 ft upstream of the structure, assists in these functions. The upstream face consists of removable wood boards placed in slots, while the remainder of the riser pipe is perforated CMP (Figure 2.1-4). This pipe is connected to an outfall pipe that goes through the gabion structure out to the stilling basin. The height of the riser pipe is the same as the top of the overflow weir to allow for adjustments if the low-flow weir elevation is ever increased. Varying the elevation of the top board enables maximum retention of water behind the structure, inducing sediment settlement, or allows for accelerated dewatering.

2.6 Engineering

2.6.1 Grade-Control Structure

Since the gabion grade-control structure is unsupported and acts as a retaining structure, the gabion design required sufficient mass to prevent sliding and overturning. The design of the structure required raising the water surface elevations for the more frequent flood events (5-yr) such that significant sediment deposition will now occur immediately upstream of the structure, minimizing potential backwater effects of the rare flood events (50- to 100-yr) and ensuring the 100-yr flood does not overtop the structure.

The 5-yr flow was used to design a low-flow notch. The 100-yr flow was used to determine the dimensions of the rest of the structure (the overflow weir and confinement walls) and to calculate the energy dissipation (stilling) basin dimensions and end-sill heights. A 50-yr design was considered, but since the increase in design heights to contain the 100-yr event was small (0.5 ft or less); the design was based upon the 100-yr peak-flood event. This resulted in a minimal increase in cost as well as provided additional structural safety. Structural integrity of the grade-control structures, with and without saturated sediment against the upstream face, was evaluated by a licensed structural engineer.

The structure design included additional gabions upstream of the low-flow weir. The purpose of these gabions is to raise the flow of water approaching the weir for better efficiency; to prevent damage of the main gabion structure and weirs from flow that may contain large rocks, trees, and other debris; and to provide additional structural mass to prevent sliding and overturning. The lower and upper weirs direct flow into buttress gabions downstream. These gabions dissipate flow energy and also provide additional structural mass to prevent sliding and overturning.

The structure design is composed of gabions consisting of 6- to 9-in. -diameter rock enclosed in wire baskets. Whenever possible, standard 3-ft x 3-ft x 6-ft gabions were used. Structure dimensions and embedment elevations were conservatively adjusted to eliminate the need for nonstandard size gabions. See Appendix A for as-built drawings.

2.6.2 Stream Gage

The supercritical-flow flume is a concrete structure approximately 19 ft wide at the entrance, 15 ft wide at the exit, 15 ft in length, and 4 ft in depth. Several factors were considered in determining the flume location, including minimal disturbance to the downstream channel, overall design and construction costs, providing a straight channel for entrance and exit, and minimal influence on the accuracy of instrument readings. The flume was placed 62 ft downstream of the structure.

Class A rip-rap armoring was added upstream, downstream, and along the edges of the flume to prevent water from undermining the flume, to minimize potential accumulation of additional sediment between the gabion structure and flume, and to protect the stream channel from potential erosion. To maintain flow through the flume and provide accurate measurements, the Class A rip rap on the downstream is a minimum of 4 in. below the bottom of the flume. This elevation difference allows unimpeded flow from the flume.

Three polyvinyl chloride (PVC) pipes are embedded into the south wall of the flume at varying heights. The PVC pipes daylight into a CMP stilling well. As the water levels in the flume reach the pipe openings, the water is conveyed to the stilling well. Equipment used in measuring water flow and in sample collection is housed in and on top of the CMP. The height of the CMP was designed to keep the equipment above the water surface in the event of a 100-yr flow event. As-built drawings are provided in Appendix A. Equipment for collecting sampling and flow data was also installed at the stream gage E039.1.

2.7 Permitting

The Laboratory's Construction and Engineering group performed an internal review of the design model and the construction documents. To comply with Section 404/401 of the Clean Water Act, applications for Nationwide Permits 43 and 5 were filed with the NMED Surface Water Quality Bureau and the Albuquerque District of the USACE. Section 404 regulates discharges of dredged or filled material in waters of the United States. NMED certified the proposed discharges would not adversely affect water quality standards under Section 401. Local municipal permitting was not required for the proposed improvements.

An erosion control plan was prepared and followed to ensure the use of best management practices and ensure maximum protection of the environment during and after construction. Erosion and sediment control measures were in accordance with NMED Watershed Protection and U.S. Environmental Protection Agency Guidelines (EPA 2007, 109510) for stormwater pollution prevention. The protocols of the erosion control plan conform to Laboratory requirements. This plan was prepared under the direction of a certified professional in erosion and sediment control. The erosion control plan is provided in Appendix A, sheet C-304.

2.8 Design Improvements/Deviations

The design process was relatively fluid and adaptive to the existing site conditions and Laboratory requirements. The following were the key design changes in the project:

- A riser pipe was designed and installed upstream of the structure to facilitate sedimentation while providing a means for discharging retained water through the structure. The riser pipe is adjustable so that it remains functional as sedimentation accumulates behind the structure.
- The riser pipe elevation was increased from the height of the low-flow weir crest to match the height of the overflow weir crest, allowing for greater flexibility should the height of the structure increase.
- The structure was shifted to accommodate the existing topographic conditions and minimize potential impact to an existing historic trail.
- Gabion depths and configuration were adjusted in some areas where bedrock was encountered.
- A 3-in. concrete cap was added to the low-flow and overflow weirs to protect the gabions and reduce long-term maintenance.
- Class B rip rap was added downstream of the structure to ensure that flows exiting the stilling basin would not undermine the downstream side of the stilling-basin gabions.
- Existing bedrock found directly downstream of the structure was used as a substitute for a portion of the proposed rip rap.

Constructability reviews by the construction subcontractor where completed before the initiation of construction. Therefore, no significant modifications occurred during the construction process. As-built drawings of the improvements detail the minor deviations (Appendix A).

3.0 CONSTRUCTION

3.1 General

Under contract with the USACE, Omaha District, Security, Disaster, Infrastructure Construction (SDIC) multiple award task order contract, Kellogg Brown and Root Services, Inc. (KBR) performed general contractor services, delivering the project using the design-build method. Construction of the DP Canyon grade-control structure and stream gage E039.1 began on October 26, 2009. The grade-control structure was completed on January 26, 2010. The Class B rip-rap installation downstream of the structure and construction of the stream gage and associated Class A rip rap were completed on February 27, 2010. Seeding of the entire area was delayed until May when the noise ordinance for the canyon was lifted. The site was seeded May 4, 2010. Appendix D presents photo documentation of construction activities.

3.2 Safety and Health

With the guidance and approval of the Omaha District of the USACE, and the Laboratory, the design-build contractor implemented a specific project safety plan to ensure the project met safety and health goals. All work and reports were accomplished in accordance with the USACE Safety and Health Requirements Manual EM 385-1-1 and Laboratory requirements. An activity hazard analysis was conducted for each definable feature of work. Consideration was given to work tasks and steps; hazards, concerns, and potential accidents; controls, preventive measures, and bounding conditions; reference documents; and training and qualification requirements. As a result, there were no lost-time accidents or incidents during the entire project.

3.3 Quality Control

With the guidance and approval of the Omaha District of the USACE, the design-build contractor implemented a contractor quality control (CQC) plan to ensure the project met quality construction goals. The plan was compliant with ISO 9001:2000 international quality standards and met the quality control requirements of the contract. The project quality manager used the quality management system and CQC plan to ensure adherence to USACE SDIC requirements and standards.

The design-build contractor implemented the CQC as follows:

- Assigned ultimate responsibility for quality to the project manager (PM), who delegated responsibility to each level within the program organization, down to the individual craftsperson and worker. Each level was responsible for application and enforcement of policy within its respective area of authority.
- Provided a quality control supervisor who assisted the PM by administering the program and providing an independent analysis of the quality control program's results.
- Explained to each employee and subcontractor, through an orientation, the program, the individual's role in it, and his or her expected contribution. A primary goal of the quality improvement program was to promote a sense of pride in workmanship. Top management led this program and took a strong, active part in its implementation.
- Delegated to the quality control supervisor the necessary authority, such as stop-work authority, to make quality a viable program. This delegated authority for the quality function ensured that deficiencies were corrected.

4.0 REFERENCES

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

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LANL (Los Alamos National Laboratory), October 2008. "Supplemental Interim Measures Work Plan to Mitigate Contaminated Sediment Transport in Los Alamos and Pueblo Canyons," Los Alamos National Laboratory document LA-UR-08-6588, Los Alamos, New Mexico. (LANL 2008, 105716)

NMED (New Mexico Environment Department), March 14, 2005. "Notice of Disapproval, Los Alamos and Pueblo Canyons Investigation Report," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and G.P. Nanos (LANL Director) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2005, 088463)

NMED (New Mexico Environment Department), August 30, 2007. "Approval with Direction, Los Alamos and Pueblo Canyons Supplemental Investigation Report," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2007, 098284)

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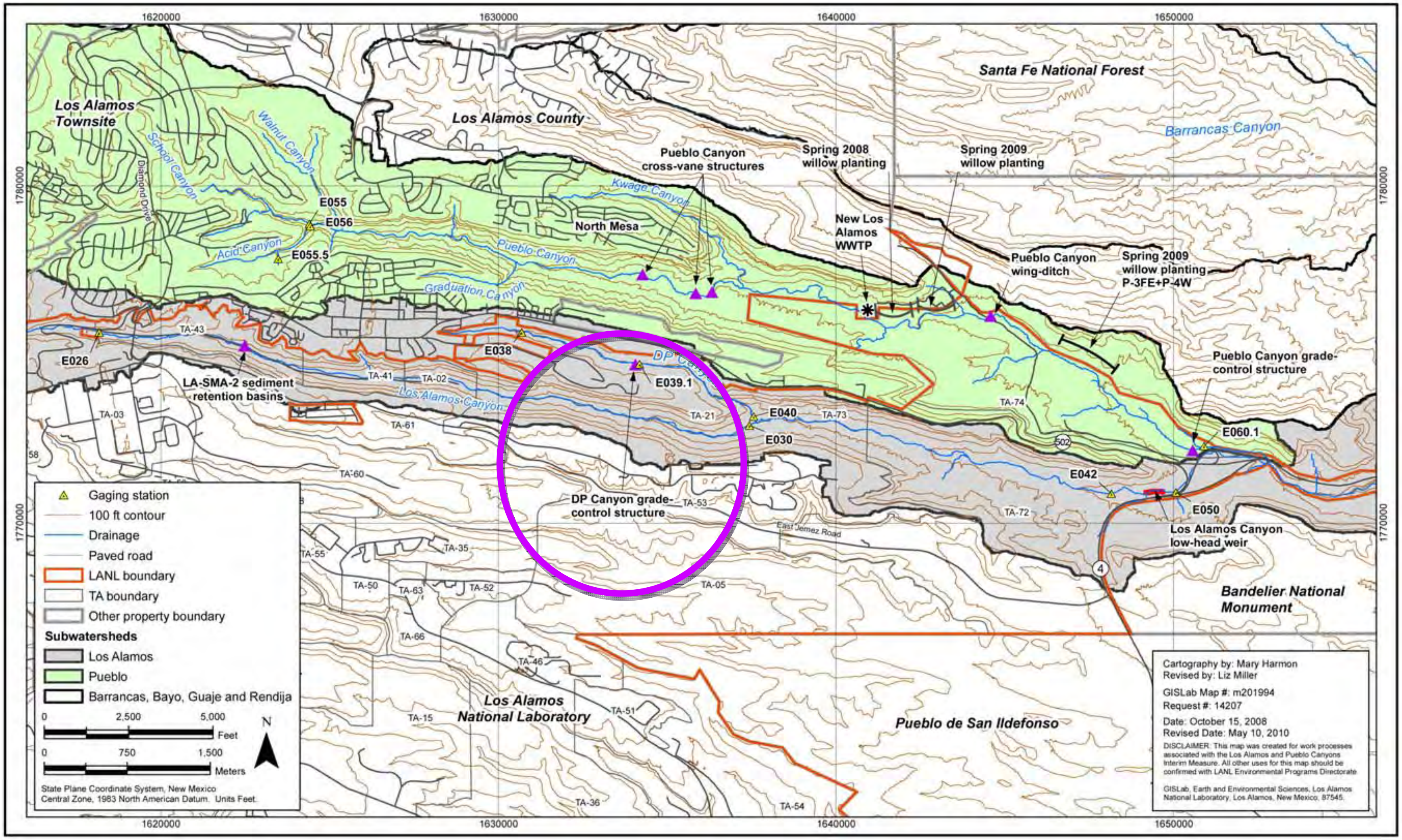


Figure 1.0-1 Sediment transport mitigation sites in Los Alamos and Pueblo Canyons, highlighting the site locations for the DP Canyon grade-control structure and stream gage E039.1

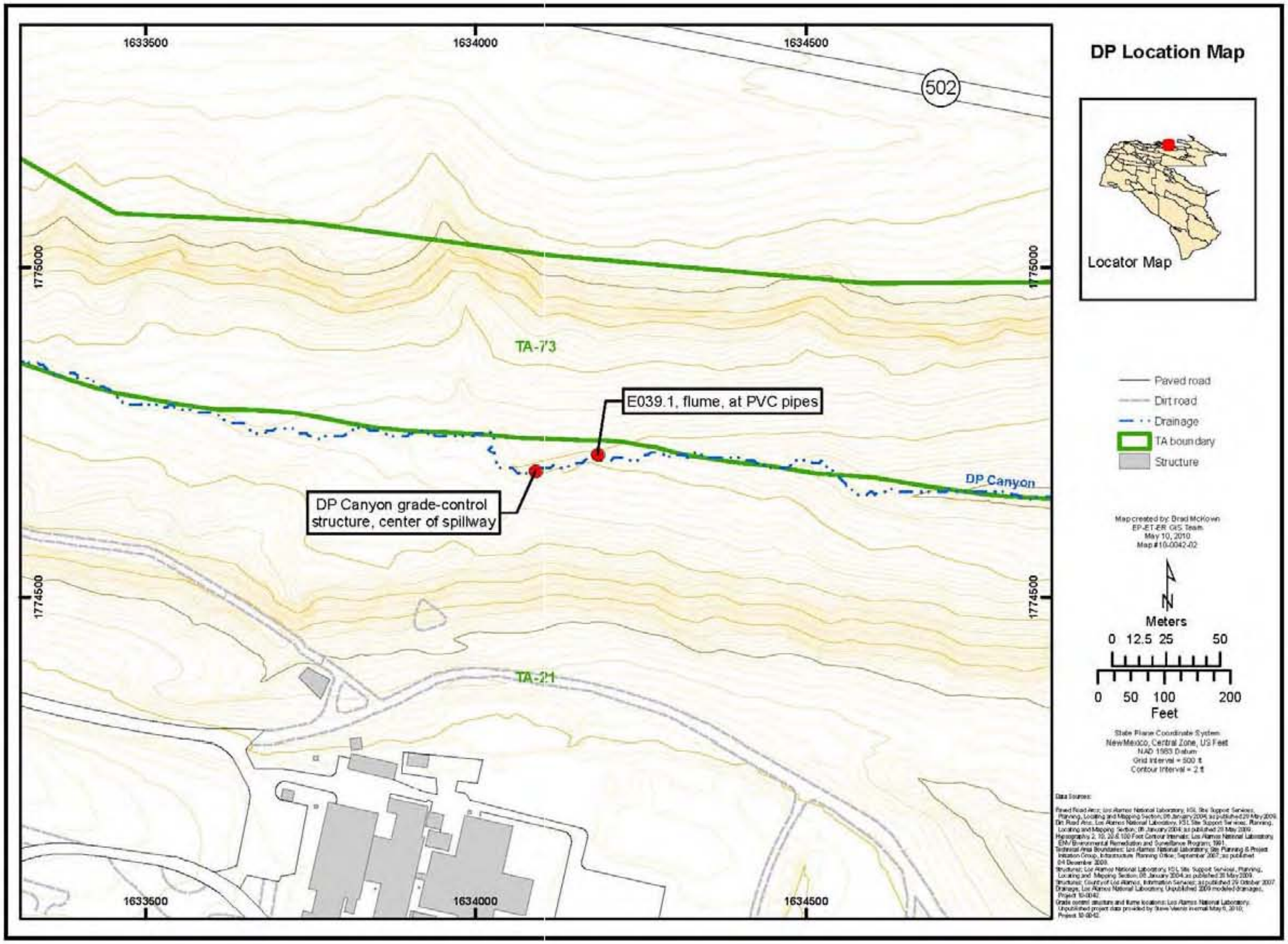


Figure 1.0-2 DP Canyon grade-control structure and stream gage E039.1 site locations

Figure 2.1-1 DP grade-control structure (looking north)

Figure 2.1-2 DP grade-control structure (looking east), low-flow and overflow weirs shown (riser pipe in foreground)

Figure 2.1-3 Concrete cap placement

Figure 2.1-4 Adjustable riser pipe extended in height to match overflow weir crest height, low-flow and overflow weirs in background

Figure 2.1-5 E039.1 supercritical-flow flume/stream gage

Table 2.3-1
DP Canyon Flood Frequencies

Percent Chance Exceedance	FFA at Gage E038 (cfs)[a]	FFA Extended to Project Site (cfs)[a,b]	USGS Rural (cfs)[c]
0.2 (500 yr)	372	523	998
1 (100 yr)	333	465	601
2 (50 yr)	316	438	468
10 (10 yr)	274	374	226
20 (5 yr)	253	343	149
50 (2 yr)	218	289	68

Note: Equations used for determining basin discharges were based on the following references:

[a] USACE (U.S. Army Corps of Engineers), May 1992. "HEC-FFA Flood Frequency Analysis, User's Manual," Computer Program Documentation No. CPD-13, Washington, D.C. (USACE 1992, 109512).

[b] Waltemeyer, S.D., 2008. "Analysis of the Magnitude and Frequency of Peak Discharge and Maximum Observed Peak Discharge in New Mexico and Surrounding Areas," report prepared for the U.S. Department of the Interior and the U.S. Geological Survey in cooperation with the New Mexico Department of Transportation, Scientific Investigations Report 2008-5119, Washington, D.C. (Waltemeyer 2008, 109516).

[c] USGS (U.S. Geological Survey), October 2000. "The National Flood-Frequency Program—Methods for Estimating Flood Magnitude and Frequency in Rural Areas in New Mexico, 2000," USGS Fact Sheet 055-00. (USGS 2000, 109515)

Appendix A

As-Built Drawings

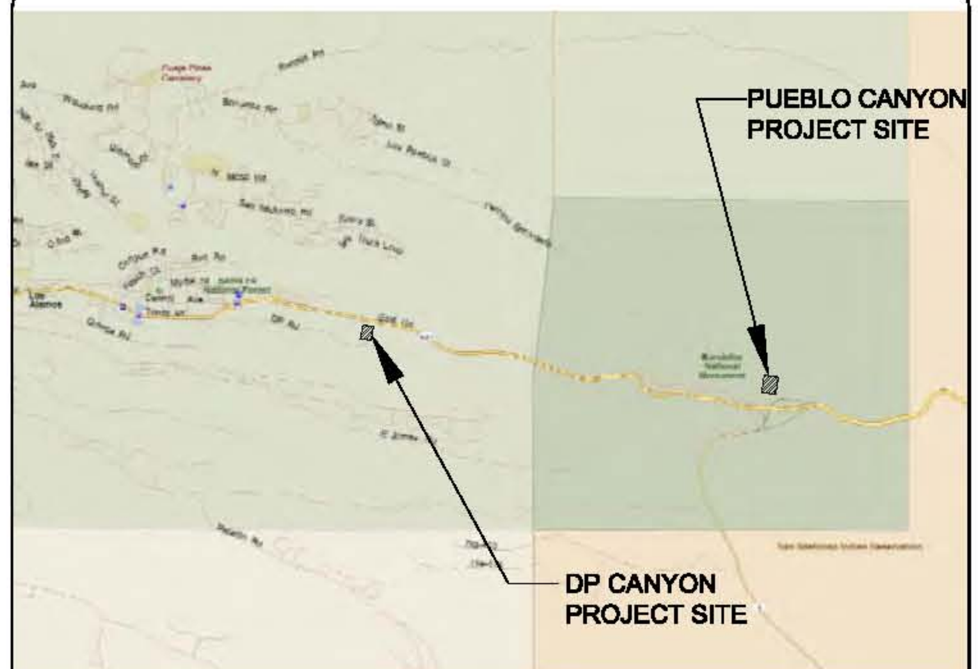
CONSTRUCTION PLANS FOR:

LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURE

FOR DP CANYON
LOS ALAMOS, NEW MEXICO

INDEX OF DRAWINGS

LOCATION MAP



VICINITY MAP

DRAWINGS REVISED TO INCORPORATE CONTRACTOR AS-BUILT INFORMATION. REVISIONS ARE INDICATED AS REVISION 1 WHERE APPLICABLE. ⚠1

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DATE:	SHEETS	BY:
05/05/2010	C-000,C-400,C-501	JVC

REVISIONS

LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURE

JOB NO. 100005632

DATE: 10/13/2009 | SHT. 1 OF 12

GENERAL CONSTRUCTION NOTES

1. ALL ELEVATIONS REFER TO THE NORTH AMERICAN DATUM (1983).

2. LOCATIONS, ELEVATIONS, AND DIMENSIONS OF EXISTING UTILITIES, STRUCTURES, AND OTHER FEATURES ARE SHOWN ACCORDING TO THE BEST INFORMATION AVAILABLE AT THE TIME OF PREPARATION OF THESE PLANS. THE CONTRACTOR SHALL VERIFY THE LOCATIONS, ELEVATIONS, AND DIMENSIONS OF ALL EXISTING UTILITIES, STRUCTURES AND OTHER FEATURES AFFECTING THIS WORK PRIOR TO CONSTRUCTION.

3. THE CONTRACTOR SHALL CHECK PLANS FOR CONFLICTS AND DISCREPANCIES PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY THE OWNER'S ENGINEER OF ANY CONFLICT BEFORE PERFORMING ANY WORK IN THE AFFECTED AREA.

4. THE CONTRACTOR SHALL EXERCISE EXTREME CAUTION IN AREAS OF BURIED UTILITIES AND SHALL PROVIDE AT LEAST 48 HOURS NOTICE TO THE VARIOUS UTILITY COMPANIES IN ORDER TO PERMIT MARKING THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES IN ADVANCE OF CONSTRUCTION.

5. ANY WELLS DISCOVERED DURING EXCAVATION, EARTHMOVING OR CONSTRUCTION MUST BE REPORTED TO THE APPROPRIATE GOVERNMENTAL AGENCY OFFICE WITHIN 24 HOURS OF DISCOVERY.

6. IT IS THE CONTRACTOR'S RESPONSIBILITY TO BECOME FAMILIAR WITH THE PERMIT AND INSPECTION REQUIREMENTS OF THE VARIOUS GOVERNMENTAL AGENCIES. THE CONTRACTOR SHALL SCHEDULE INSPECTIONS ACCORDING TO AGENCY INSTRUCTION.

7. ALL SPECIFICATIONS AND DOCUMENTS REFERRED TO SHALL BE OF LATEST REVISIONS AND/OR LATEST EDITION.

8. ALL WORK PERFORMED SHALL COMPLY WITH THE REGULATIONS AND ORDINANCES OF THE GOVERNMENTAL AGENCIES HAVING JURISDICTION OVER THE WORK.

9. CONTRACTOR SHALL SUBMIT FOR APPROVAL TO THE OWNER'S ENGINEER SHOP DRAWINGS ON ALL PRECAST AND MANUFACTURED ITEMS PRIOR TO ORDERING MATERIALS. FAILURE TO OBTAIN APPROVAL BEFORE INSTALLATION MAY RESULT IN REMOVAL AND REPLACEMENT AT CONTRACTOR'S EXPENSE.

10. AT LEAST 3 WORKING DAYS PRIOR TO CONSTRUCTION THE CONTRACTOR SHALL NOTIFY THE OWNER AND APPROPRIATE AGENCIES. NOTIFICATION SHALL INCLUDE THE CONTRACTOR'S NAME, STARTING DATE, PROJECTED SCHEDULE, AND OTHER INFORMATION AS REQUIRED. ANY WORK PERFORMED PRIOR TO NOTIFYING THE OWNER OR WITHOUT AGENCY INSPECTOR PRESENT MAY BE SUBJECT TO REMOVAL AND REPLACEMENT AT THE CONTRACTOR'S EXPENSE.

11. ALL DISTURBED AREAS WITHIN PUBLIC RIGHT-OF-WAY ARE TO BE RESTORED TO ORIGINAL CONDITION OR BETTER.

12. THE CONTRACTOR IS RESPONSIBLE FOR THE REPAIR AND/OR REPLACEMENT OF ALL PROPERTY, ABOVE AND BELOW GROUND, AFFECTED BY THIS WORK. ALL PROPERTY SHALL BE RESTORED TO A CONDITION EQUAL TO OR BETTER THAN EXISTING CONDITIONS BEFORE CONSTRUCTION COMMENCED UNLESS SPECIFICALLY EXEMPTED BY THE PLANS. ADDITIONAL COSTS ARE INCIDENTAL TO OTHER CONSTRUCTION.

13. ALL DISTURBED AREAS ASSOCIATED WITH CONSTRUCTION, WHICH ARE NOT TO BE SODDED, ARE TO BE SEEDED AND MULCHED TO THE NEW MEXICO DEPARTMENT OF TRANSPORTATION STANDARDS AND MAINTAINED UNTIL A SATISFACTORY STAND OF GRASS ACCEPTABLE TO THE OWNER HAS BEEN OBTAINED. ANY WASHOUTS, REGRADING, RESEEDING, GRASSING, AND OTHER EROSION WORK REQUIRED, WILL BE PERFORMED BY THE CONTRACTOR/SUBCONTRACTOR UNTIL THE SYSTEM IS ACCEPTED FOR MAINTENANCE BY THE OWNER.

15. AS-BUILT DRAWINGS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RECORDING INFORMATION ON A SET OF THE APPROVED PLANS CONCURRENTLY WITH CONSTRUCTION PROGRESS. WITHIN TWO (2) WEEKS FOLLOWING FINAL INSPECTION THE CONTRACTOR SHALL SUBMIT ONE (1) SET OF AS-BUILT DRAWINGS TO THE ENGINEER. THE FINAL RECORD DRAWINGS SHALL COMPLY WITH THE FOLLOWING REQUIREMENTS:

   A. DRAWINGS TO BE LEGIBLY MARKED TO RECORD ACTUAL CONSTRUCTION.
   B. DRAWINGS SHALL SHOW ACTUAL LOCATION OF ALL UNDERGROUND WORK.
   C. DRAWINGS SHALL CLEARLY SHOW ALL FIELD CHANGES OF DIMENSION AND DETAIL INCLUDING CHANGES MADE BY FIELD ORDER OR BY CHANGE ORDER.
   D. DRAWINGS SHALL CLEARLY SHOW ALL DETAILS NOT ON ORIGINAL CONTRACT DRAWINGS BUT CONSTRUCTED IN THE FIELD. ALL EQUIPMENT AND PIPING RELOCATION SHALL BE CLEARLY SHOWN.
   E. LOCATIONS OF ALL FEATURES SHALL BE SHOWN.
   F. DRAWINGS TO BE SIGNED AND SEALED BY A LICENSED SURVEYOR.

16. ALL CONCRETE STRUCTURES SHALL BE MADE OF 3000 PSI CONCRETE PER DOT STANDARD SPECIFICATIONS UNLESS OTHERWISE NOTED ON THE PLANS.

SITE CLEARING PREPARATION NOTES

1. THE CONTRACTOR IS TO PREPARE THE SITE PRIOR TO BEGINNING INFRASTRUCTURE CONSTRUCTION IN ACCORDANCE WITH SOILS TESTING REPORT.

2. CONTRACTOR SHALL CLEAR AND GRUB ONLY THOSE PORTIONS OF THE SITE NECESSARY FOR CONSTRUCTION. DISTURBED AREAS WILL BE SEEDED, MULCHED, OR PLANTED WITH OTHER APPROVED LANDSCAPE MATERIAL IMMEDIATELY FOLLOWING CONSTRUCTION.

3. THE TOP 4" TO 6" OF GROUND REMOVED DURING CLEARING AND GRUBBING SHALL BE STOCKPILED AT A SITE DESIGNATED BY THE OWNER TO BE USED FOR LANDSCAPING PURPOSES, UNLESS OTHERWISE DIRECTED BY THE OWNER.

4. ALL CONSTRUCTION DEBRIS AND OTHER WASTE MATERIAL SHALL BE DISPOSED OF OFF-SITE IN ACCORDANCE WITH APPLICABLE REGULATIONS.

5. CONTRACTOR TO OBTAIN ALL NECESSARY PERMITS AND APPROVALS PRIOR TO BEGINNING WORK.

6. THE LOCATION OF ALL EXISTING UTILITIES SHOWN ON THE PLANS HAVE BEEN DETERMINED FROM THE BEST INFORMATION AVAILABLE AND ARE GIVEN FOR THE CONVENIENCE OF THE CONTRACTOR/SUBCONTRACTOR. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR ACCURACY PRIOR TO THE START OF ANY CONSTRUCTION ACTIVITY. IT SHALL BE THE CONTRACTOR'S/SUBCONTRACTOR'S RESPONSIBILITY TO NOTIFY THE VARIOUS UTILITIES AND TO MAKE THE NECESSARY ARRANGEMENTS FOR ANY RELOCATIONS OF THESE UTILITIES WITH THE OWNER OF THE UTILITY. THE CONTRACTOR/SUBCONTRACTOR SHALL EXERCISE CAUTION WHEN CROSSING ANY UNDERGROUND UTILITY, WHETHER SHOWN ON THE PLANS OR LOCATED BY THE UTILITY COMPANY. ALL UTILITIES WHICH INTERFACE WITH THE PROPOSED CONSTRUCTION SHALL BE RELOCATED BY THE RESPECTIVE UTILITY COMPANIES AND THE CONTRACTOR/SUBCONTRACTOR SHALL COOPERATE WITH THE UTILITY COMPANIES DURING RELOCATION OPERATIONS. ANY DELAY OR INCONVENIENCE CAUSED TO THE CONTRACTOR/SUBCONTRACTOR BY THE VARIOUS UTILITIES SHALL BE INCIDENTAL TO THE CONTRACT AND NO EXTRA COMPENSATION WILL BE ALLOWED.

7. ALTHOUGH NOT ANTICIPATED, THE LOCATION OF ANY EXISTING UNDERGROUND UTILITY LINES, WELLS OR OTHER BURIED PIPING OR STRUCTURES ASSOCIATED WITH PAST SITE USE WITHIN THE CONSTRUCTION AREA SHOULD BE ESTABLISHED PRIOR TO CONSTRUCTION. PROVISIONS SHOULD THEN BE MADE TO RELOCATE ANY INTERFERING UTILITY LINES WITHIN THE CONSTRUCTION AREA TO APPROPRIATE LOCATIONS. IN THIS REGARD, IT SHOULD BE NOTED THAT IF ABANDONED UNDERGROUND PIPES ARE NOT PROPERLY REMOVED OR PLUGGED, THEY MAY SERVE AS CONDUITS FOR SUBSURFACE EROSION, WHICH SUBSEQUENTLY MAY RESULT IN EXCESSIVE SETTLEMENTS.

8. SITE CLEARING, GRUBBING AND DEMOLITION SHALL INCLUDE THE REMOVAL OF TREES, GROUND BRUSH, ORGANIC SOILS, ROOT MATS, EXISTING STRUCTURES, PAVEMENT, UTILITIES OR OTHER DELETERIOUS MATERIALS ENCOUNTERED. CLEARING AND GRUBBING SHALL BE REVIEWED BY THE OWNER'S REPRESENTATIVE PRIOR TO BEGINNING CONSTRUCTION AT THE SITE. AS A MINIMUM, THE CLEARING OPERATIONS SHALL EXTEND AT LEAST 5 FEET BEYOND THE BUILDING PERIMETERS. ANY EXCAVATIONS OR CAVITIES FORMED BY THE REMOVAL OF ORGANIC MATERIAL, GROUND BRUSH OR STUMPS SHOULD BE FILLED WITH CLEAN, COMPACTED STRUCTURAL FILL.

GRADING AND EROSION CONTROL NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING EXCAVATIONS AGAINST COLLAPSE AND WILL PROVIDE BRACING SHEETING OR SHORING AS NECESSARY. TRENCHES SHALL BE KEPT DRY WHILE PIPE AND APPURTENANCES ARE BEING PLACED. DEWATERING SHALL BE USED AS REQUIRED.

2. CONTRACTOR IS TO PROVIDE EROSION CONTROL BARRIERS (HAY BALES OR SILTATION CURTAIN) TO PREVENT SILTATION OF ADJACENT PROPERTY, STREETS, STORM SEWERS, WATERWAYS, AND EXISTING WETLANDS PER THE CONSTRUCTION DRAWINGS. IN ADDITION, CONTRACTOR SHALL CONSTRUCT A TEMPORARY CONSTRUCTION EXIT (SEE DETAILS) IN AREAS WHERE CONSTRUCTION RELATED TRAFFIC IS TO ENTER AND EXIT THE SITE. IF, IN THE OPINION OF THE OWNER'S REPRESENTATIVE OR GOVERNMENTAL AGENCY THAT EXCESSIVE QUANTITIES OF EARTH ARE TRANSPORTED OFF-SITE EITHER BY NATURAL DRAINAGE OR BY VEHICULAR TRAFFIC, THE CONTRACTOR IS TO REMOVE SAID EARTH TO THE SATISFACTION OF THE OWNER'S REPRESENTATIVE AND/OR GOVERNING OFFICIALS. SEE SWPPP NARRATIVE FOR ADDITIONAL INFORMATION.

3. IF WIND EROSION BECOMES SIGNIFICANT DURING CONSTRUCTION, THE CONTRACTOR SHALL STABILIZE THE AFFECTED AREA USING SPRINKLING, IRRIGATION, OR OTHER ACCEPTABLE METHODS.

4. THERE IS TO BE NO DISCHARGE (I.E. PUMPING, SHEET FLOW, SWALE, DITCH, ETC.) INTO EXISTING DITCHES OR CANALS WITHOUT THE USE OF SETTLING PONDS. IF THE CONTRACTOR DESIRES TO DISCHARGE INTO THE EXISTING DITCHES OR CANALS A SETTLING POND PLAN PREPARED BY THE CONTRACTOR MUST BE SUBMITTED TO AND APPROVED BY THE OWNER'S REPRESENTATIVE AND APPROPRIATE GOVERNMENTAL AGENCY PRIOR TO CONSTRUCTION.

GRADING AND EROSION CONTROL NOTES (CONT'D)

5. ANY VEGETATION FROM CLEARING/GRUBBING SHALL BE DISPOSED OF OFF-SITE.

6. SITE CONDITIONS
   A. DP CANYON. SURFACE SOILS CONSIST OF SILTY SANDS (SM) TO A DEPTH OF ABOUT 3 TO 4 FEET, VOLCANIC TUFF BEDROCK WAS ENCOUNTERED BELOW THE SILTY SAND AND EXTENDED DOWN TO THE DEPTH OF BORING TERMINATION (APPROXIMATE 15 FEET). TUFF BEDROCK VARIED FROM NON-WELDED TO STRONGLY WELDED.

   B. PUEBLO CANYON. SURFACE AND SUBSURFACE SOILS CONSIST OF WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), POORLY GRADED SAND WITH GRAVEL (SP), SILTY SAND (SM), AND SANDY SILT (ML) TO THE FULL DEPTH OF EXPLORATION (SEE SOILS REPORT)

7. IT IS ANTICIPATED THAT SHALLOW EXCAVATIONS IN SOME AREAS FOR THE PROPOSED CONSTRUCTION CAN BE ACCOMPLISHED WITH CONVENTIONAL EARTHMOVING EQUIPMENT. HOWEVER, VERY HARD BEDROCK MATERIALS, AND AUGER REFUSAL MATERIALS WERE ENCOUNTERED AT DEPTHS RANGING BETWEEN 2 AND 3 FEET BELOW EXISTING GROUND SURFACE. BASED UPON THE BORING AND TEST PIT DATA, THIS CONDITION APPEARS TO BE ASSOCIATED WITH THE DP CANYON SITE. DIFFICULT EXCAVATION TECHNIQUES MAY BE REQUIRED IN THIS AREA DEPENDING ON THE FINAL EXCAVATION DEPTHS. CONTRACTOR SHOULD REVIEW THE DATA AND INFORMATION CONTAINED IN THE GEOTECHNICAL REPORT TO DETERMINE THE APPROPRIATE EQUIPMENT REQUIRED TO ADVANCE THE EXCAVATIONS TO CONSTRUCTION DEPTHS.

8. SUBGRADE PREPARATION: EXPOSED AREAS WHICH WILL RECEIVE FILL OF THE INITIAL COURSE OF THE GABION STRUCTURE, ONCE PROPERLY CLEARED, SHOULD BE SCARIFIED TO A MINIMUM DEPTH OF 10 INCHES, CONDITIONED TO NEAR OPTIMUM MOISTURE CONTENT, AND COMPACTED.

9. FILL MATERIALS AND PLACEMENT: GENERALLY, CLEAN ON-SITE SOILS OR APPROVED IMPORTED MATERIALS MAY BE USED AS FILL MATERIAL (IF APPLICABLE) FOR THE SITE. THE FILL MATERIALS SHOULD CONFORM TO THE FOLLOWING:

GRADATION	PERCENT FINER BY WEIGHT ASTM C136)
6"	100
3"	70-100
NO. 4 SIEVE	50-100
NO. 200 SIEVE	35(MAX)
• LIQUID LIMIT	30 (MAX)
• PLASTICITY INDEX	12 (MAX)

   FILL LIFTS SHOULD NOT EXCEED 10 INCHES LOOSE THICKNESS. IMPORTED SOILS SHOULD BE COMPACTED WITHIN A MOISTURE RANGE OF OPTIMUM 3 PERCENT ABOVE OPTIMUM IF THE MATERIALS HAVE A PI OF 5 OR MORE. ON-SITE SOILS AND IMPORT SOILS THAT HAVE A PI OF LESS THAN 5 SHOULD BE COMPACTED WITHIN A MOISTURE RANGE OF ±3 PERCENT OF OPTIMUM MOISTURE CONTENT.

10. DISTURBED AREAS, NOT DESIGNATED TO RECEIVE OTHER PERMANENT COVER, SHALL BE SEEDED IN ACCORDANCE WITH SECTION 632.2 OF THE NEW MEXICO DEPARTMENT OF TRANSPORTATION (NMDOT) STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES.

11. PROVIDE TEMPORARY TRAFFIC CONTROL DEVICES, AT PUEBLO CANYON, IN ACCORDANCE WITH NMDOT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES SECTION 702.

12. CONTRACTOR SHALL SUBMIT NPDES NOTICE OF INTENT (N.O.I.) A MINIMUM OF 7 DAYS PRIOR TO BEGINNING WORK.

13. CONTRACTOR SHALL SUBMIT NPDES NOTICE OF TERMINATION (N.O.T.) WITHIN 30 DAYS OF CONSTRUCTION COMPLETION.

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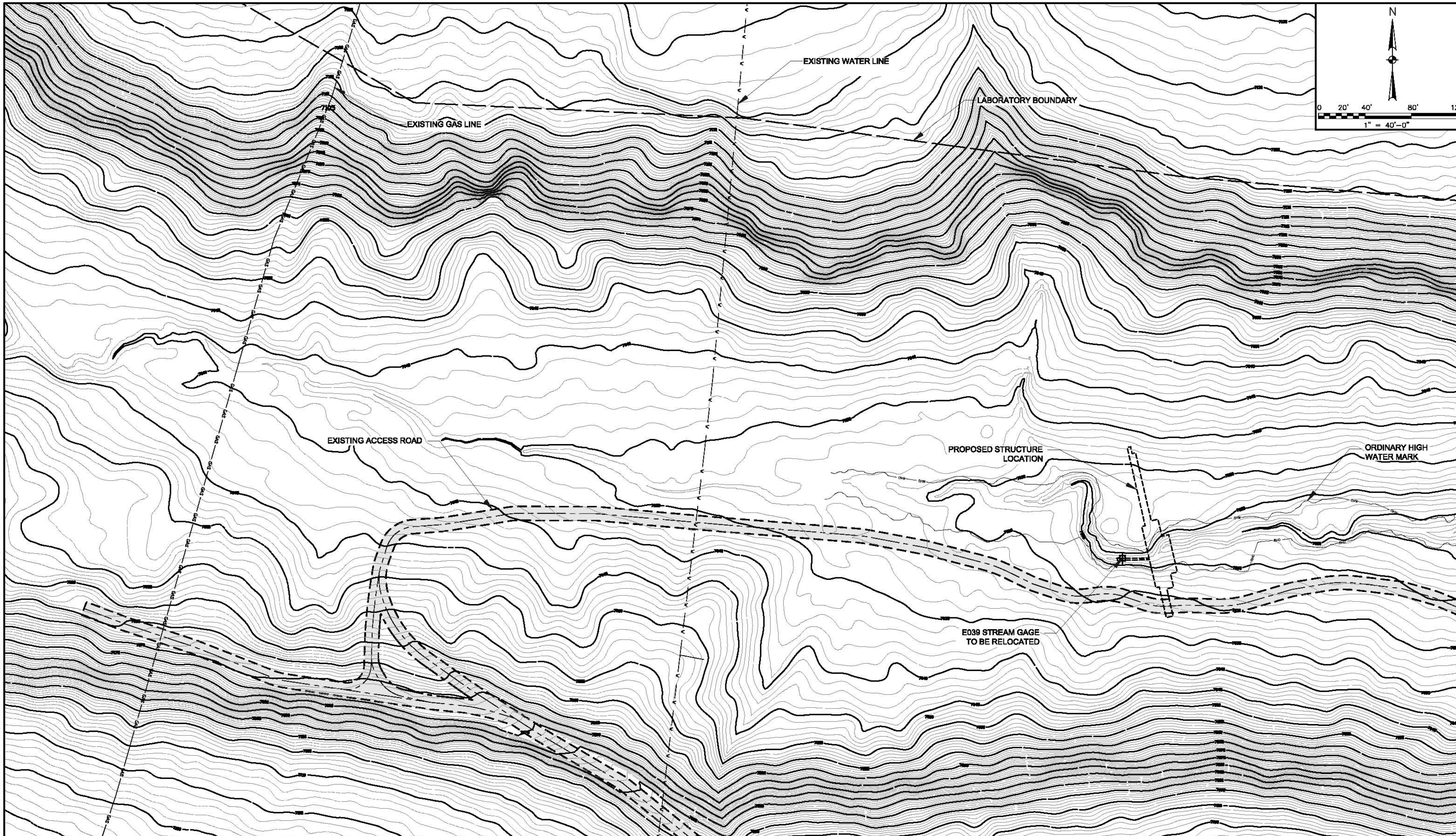
FBPR Certificate of Authorization No.: 24

KBR

CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY	LOS ALAMOS NATIONAL LABORATORY	GENERAL NOTES
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	

ORIGINAL DATE: 08/24/09
REVISIONS:
1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.

JOB NO. 100005632
DATE 10/13/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-001



101 Arthur Andersen Parkway, Suite 260 Sarasota, Florida 34232 Ph. (941) 378-0272 Post Buckley Schuh & Jernigan, Inc,. d/b/a PBS&J 5300 West Cypress Street, Suite 200, Tampa, Fl 33607 FBPR Certificate of Authorization No.: 24	KBR	CLIENT LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	PROJECT LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	TASK DP CANYON EXISTING CONDITIONS	ORIGINAL DATE: 08/24/09 REVISIONS: 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	JOB NO. 100005632 DATE 10/13/2009 DESIGNED DTW PE RMP CHECKED IMT QC MS SHEET C-301

User Name: 22190
Drawing Name: \\SARFS01\COMMON\100005632 Los Alamos\Record Drawings\DP & Pueblo Canyon\C-301 - DP CANYON EXISTING CONDITIONS.dwg May 05, 2010 - 8:49pm

N

0 25' 50' 100' 150'

1" = 50'-0"

DISTURBED AREAS	
STRUCTURE	0.293 ACRES
LAYDOWN AREA	0.039 ACRES
TOTAL	0.332 ACRES
FILL WIITHIN OHWM	
OHWM IMPACT	0.013 ACRES

PBSJ

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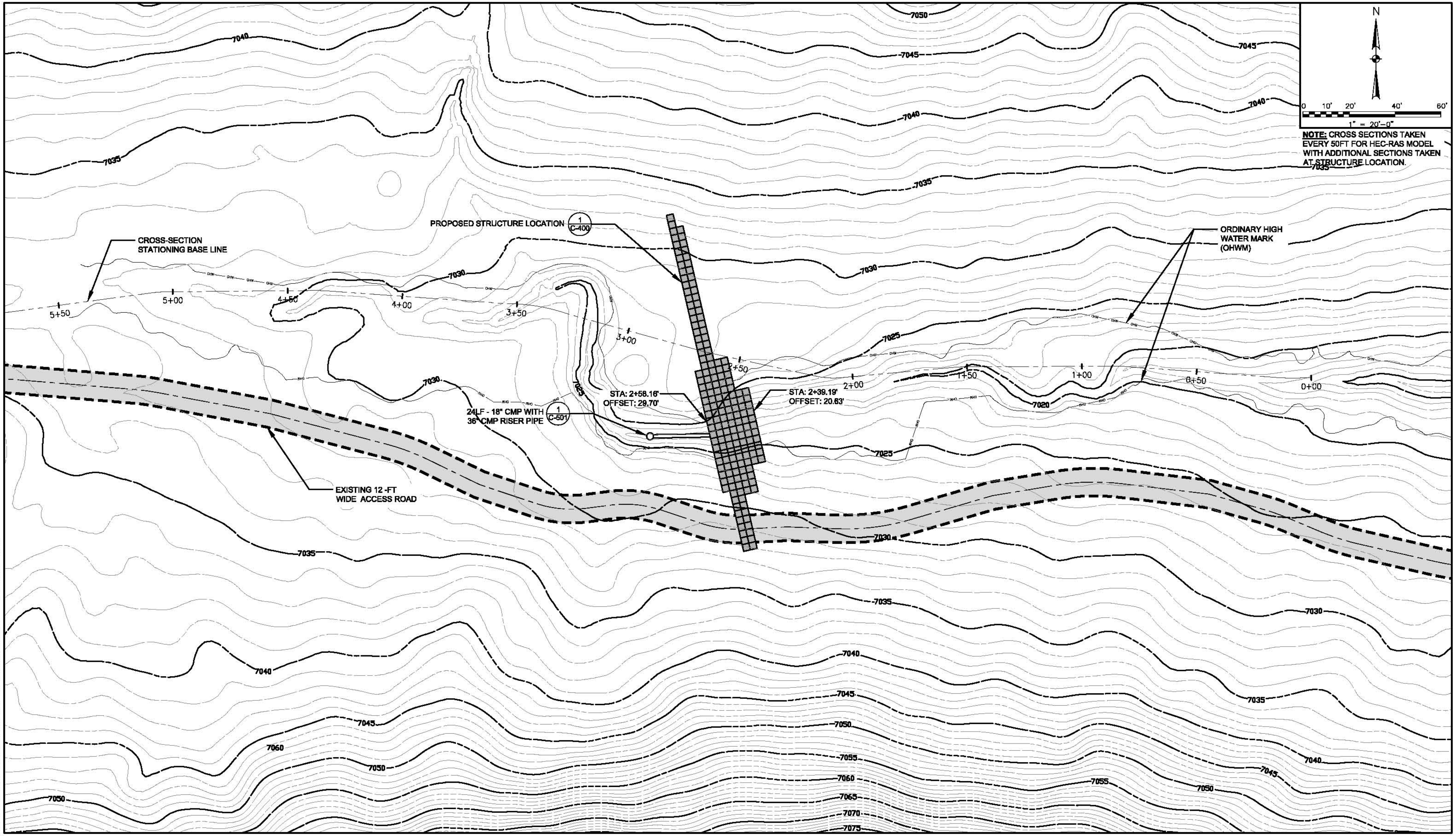
KBR

CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	DP CANYON OVERALL SITE PLAN WITH AERIAL

ORIGINAL DATE: 08/24/09
REVISIONS:
1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.

JOB NO. 100035632
DATE 10/13/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-302



PBSJ 101 Arthur Andersen Parkway, Suite 260 Sarasota, Florida 34232 Ph. (941) 378-0272 Post Buckley Schuh & Jernigan, Inc., d/b/a PBS&J 5300 West Cypress Street, Suite 200, Tampa, Fl 33607 FBPR Certificate of Authorization No.: 24	**KBR**	CLIENT LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	PROJECT LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	TASK DP CANYON ENLARGED SITE PLAN	ORIGINAL DATE: 08/24/09 REVISIONS: 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.

JOB NO. 100005632
DATE 10/13/2009
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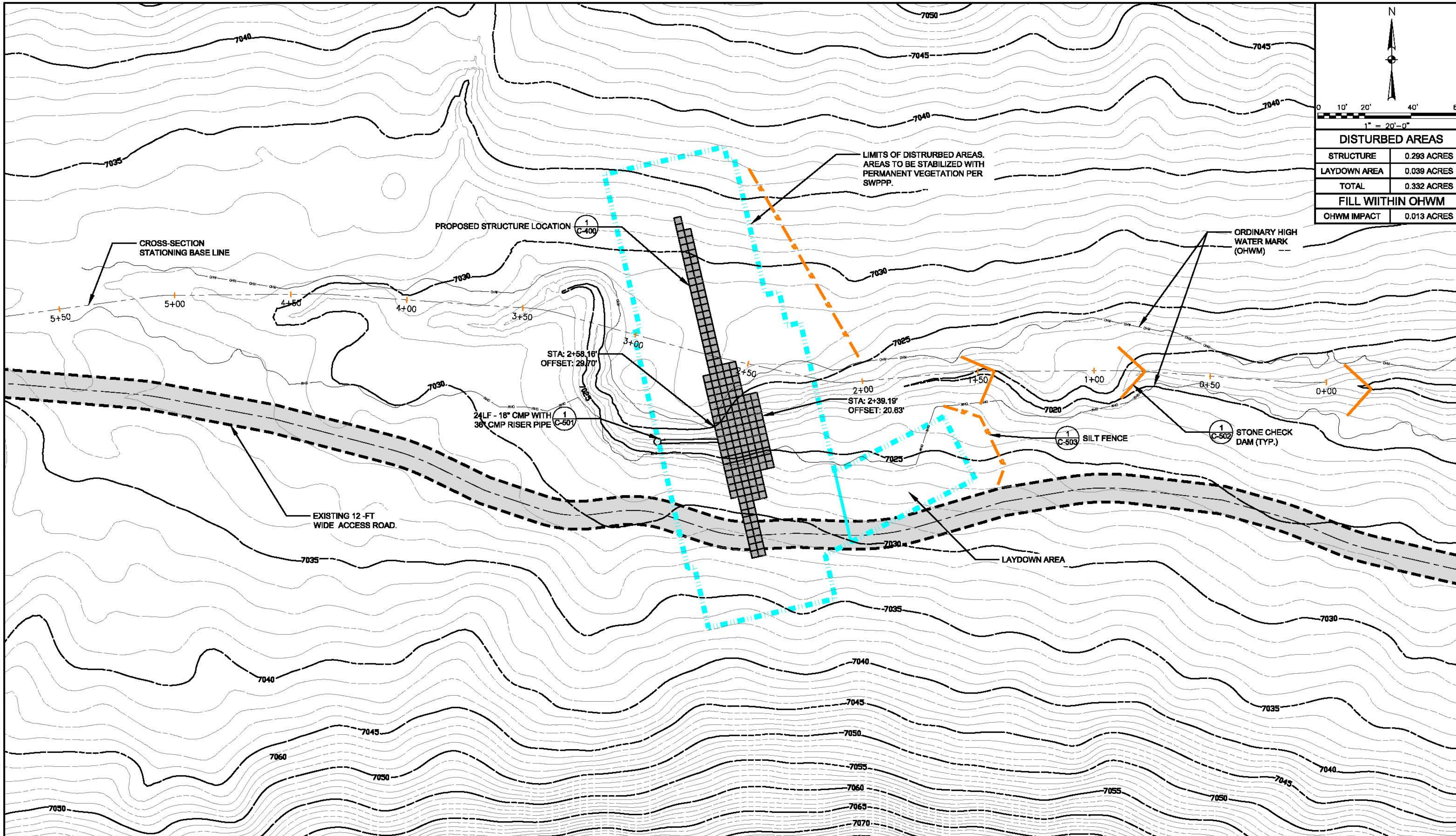
QC MS
SHEET C-303



DISTURBED AREAS

STRUCTURE	0.293 ACRES
LAYDOWN AREA	0.039 ACRES
TOTAL	0.332 ACRES

FILL WIITHIN OHWM

OHWM IMPACT	0.013 ACRES

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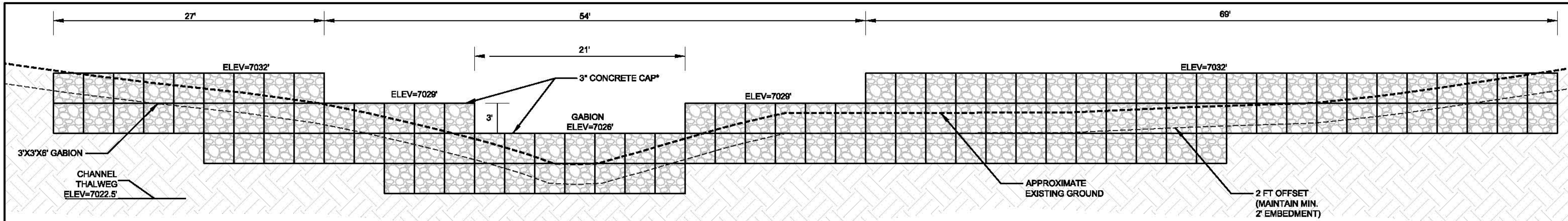
5300 West Cypress Street, Suite 200, Tampa, Fl 33607
FBPR Certificate of Authorization No.: 24

KBR

CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY	LOS ALAMOS NATIONAL LABORATORY	DP CANYON
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	EROSION CONTROL PLAN

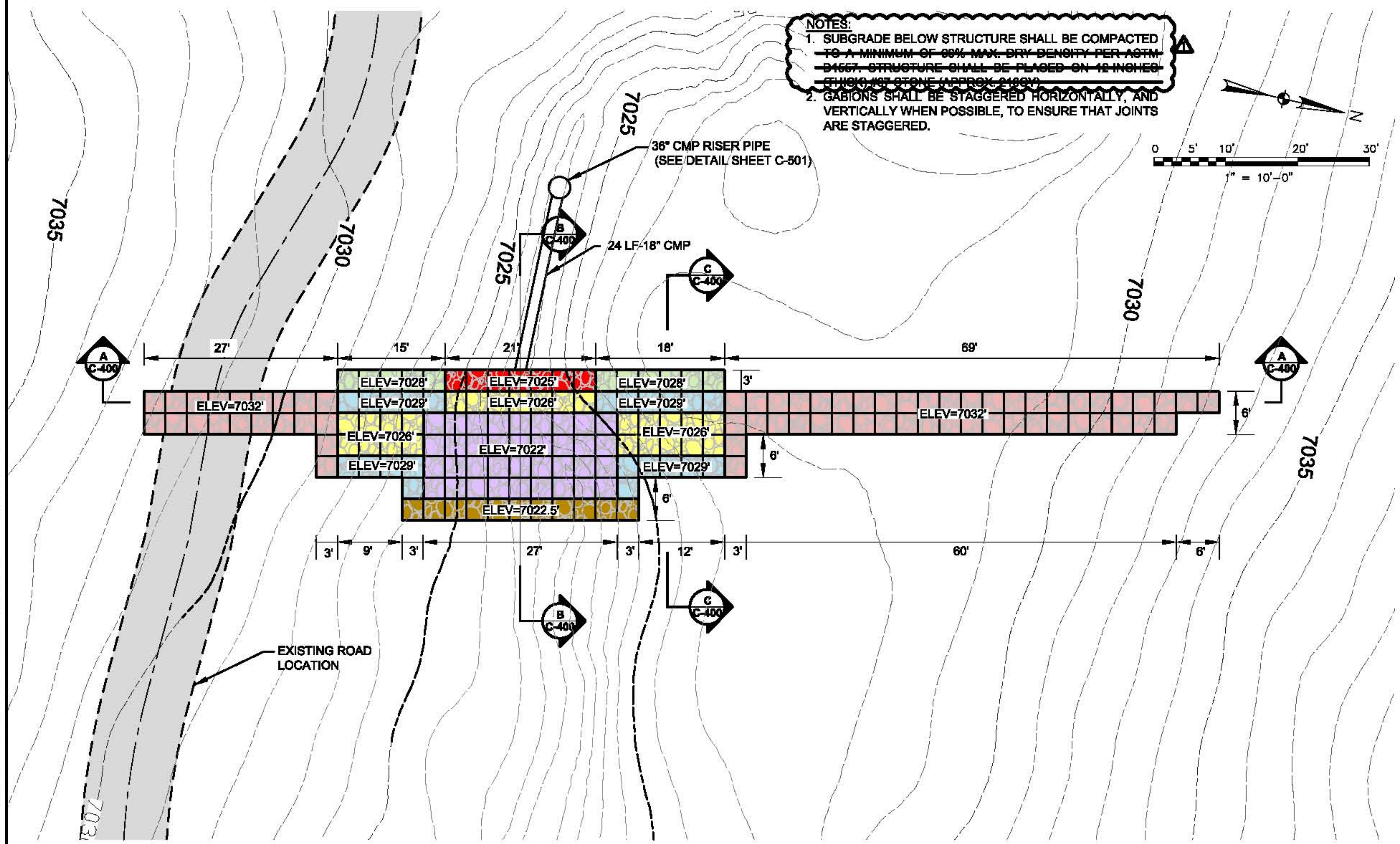
ORIGINAL DATE: 08/24/09
REVISIONS: 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.

JOB NO. 100005632
DATE 10/13/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-304

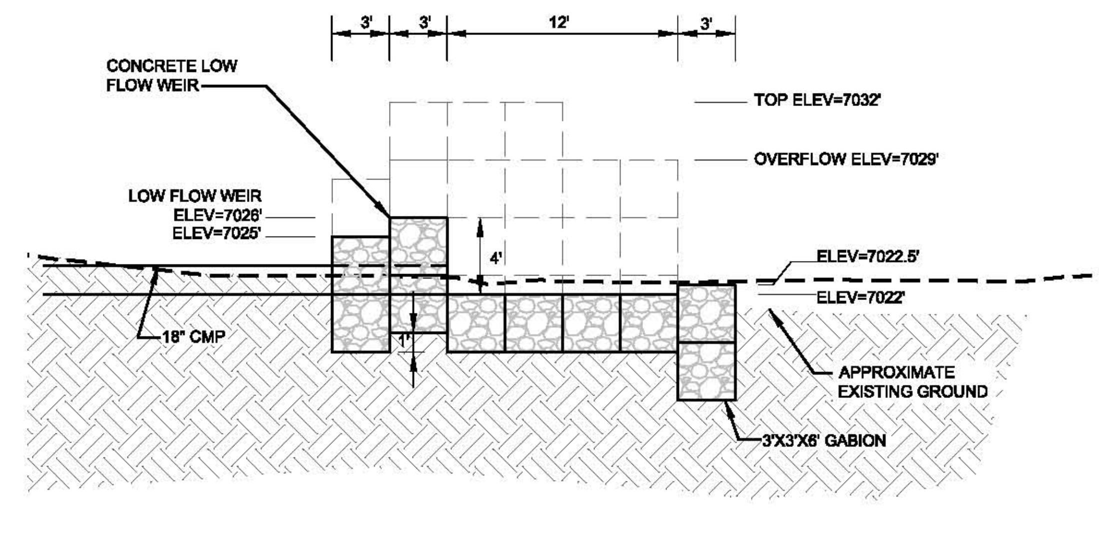


* CAP LOW FLOW AND OVERFLOW WEIR WITH MIN. 4,000 PSI CONCRETE, EMBEDDED 5" INTO TOP GABION. PROVIDE ¾" CHAMFER AT EDGES AND INTEGRAL COLORS - CLIFFSIDE BROWN #6804 (OR APPROVED EQUAL) PER MANUFACTURER'S INSTRUCTIONS.

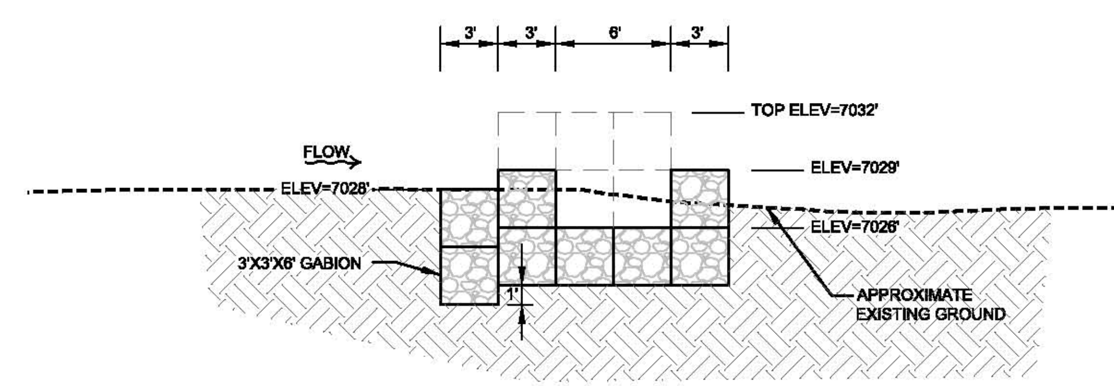
A C-400 | C-400 DP CANYON GABION CROSS SECTION A-A
SCALE: 1" = 5'



1 C-400 | C-400 DP CANYON GABION PLAN VIEW
SCALE: 1" = 10'



B C-400 | C-400 PROFILE SECTION B-B
SCALE: N.T.S.



C C-400 | C-400 PROFILE SECTION C-C
SCALE: N.T.S.

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CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	DP CANYON CROSS SECTIONS

ORIGINAL DATE: 08/24/09
REVISIONS:
1 INCORPORATED CONTRACTOR AS-BUILT INFO 05/05/2010
2.
3.
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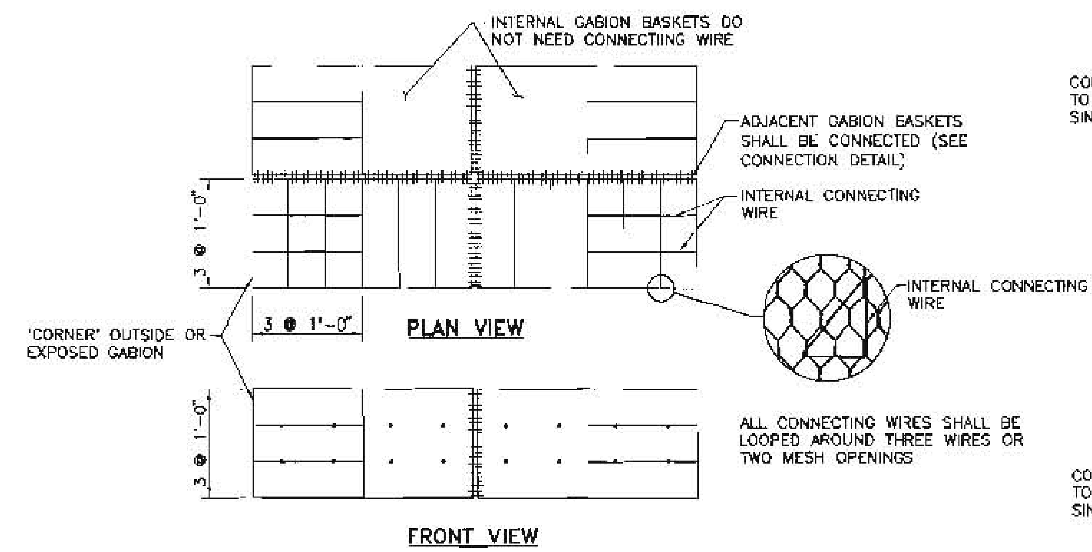
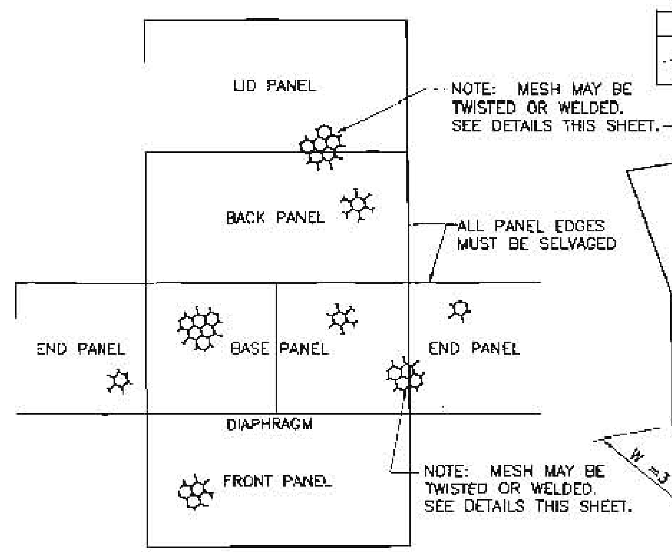
JOB NO. 100005632
DATE 10/13/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-400



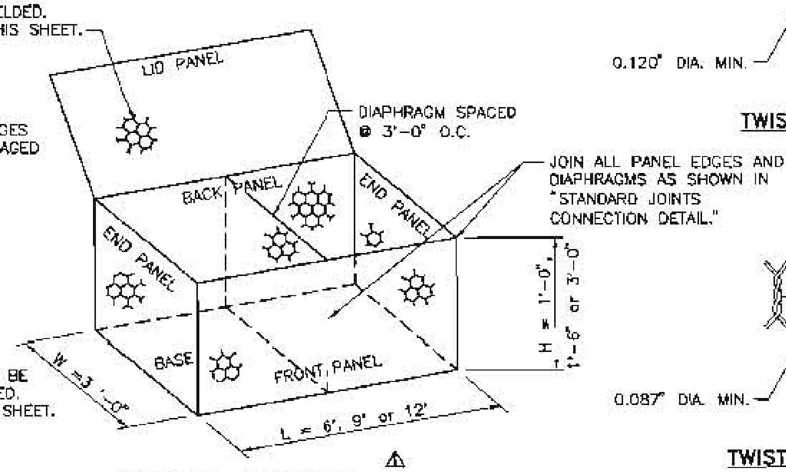
DETAILS OF 9 GAGE INTERNAL CONNECTING WIRES

STANDARD REVETMENT MATTRESS SIZES				
LENGTH	WIDTH (FEET)	HEIGHT (FEET)	NUMBER OF CELLS	VOLUME CUBIC YARDS
9'-0"	6'-0"	0'-6"	3	1.00
12'-0"	6'-0"	0'-6"	4	1.33
9'-0"	6'-0"	0'-9"	3	1.50
12'-0"	6'-0"	0'-9"	4	2.00

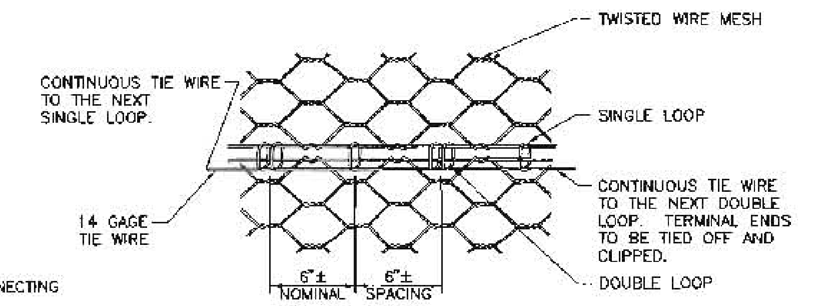
STANDARD GABION SIZES				
LENGTH	WIDTH (FEET)	HEIGHT (FEET)	NUMBER OF CELLS	VOLUME CUBIC YARDS
6'-0"	3'-0"	3'-0"	2	2.00
9'-0"	3'-0"	3'-0"	3	3.00
12'-0"	3'-0"	3'-0"	4	4.00
6'-0"	3'-0"	1'-6"	2	1.00
9'-0"	3'-0"	1'-6"	3	1.50
12'-0"	3'-0"	1'-6"	4	2.00
6'-0"	3'-0"	1'-0"	2	0.66
9'-0"	3'-0"	1'-0"	3	1.00
12'-0"	3'-0"	1'-0"	4	1.33



TYPICAL FLAT LAYOUT OF GABION BASKET

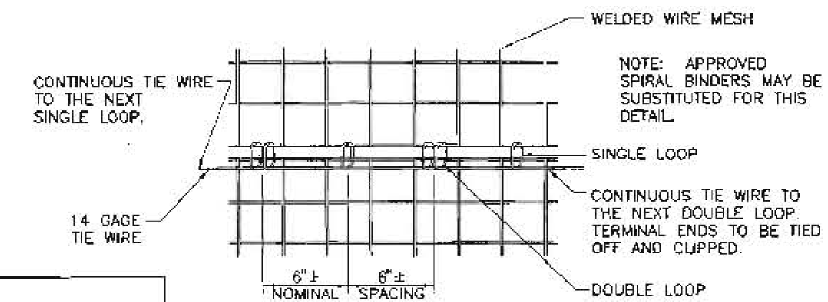


TYPICAL ASSEMBLED GABION BASKET



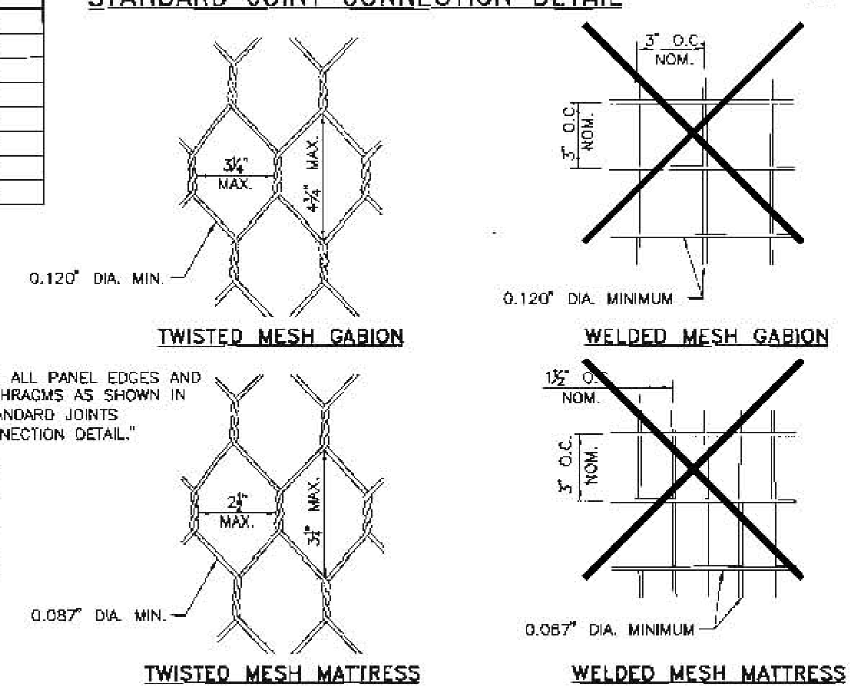
(FOR USE W/ TWISTED MESH)

STANDARD JOINT CONNECTION DETAIL



(FOR USE W/ WELDED WIRE MESH)

STANDARD JOINT CONNECTION DETAIL



TYPICAL ACCEPTABLE MESH STYLES

GENERAL NOTES

1. INTERNAL CONNECTING WIRES ARE TO BE INSTALLED ACROSS WIDTH OF INTERIOR GABIONS AND ACROSS WIDTH AND LENGTH OF END GABIONS.
2. INTERNAL CONNECTING WIRE, LACING WIRE AND GABION MESH SHALL BE GALVANIZED.
3. INTERNAL CONNECTING WIRES ARE REQUIRED ON ALL GABIONS 3'-0" HIGH AND ON ALL GABIONS 1'-6" HIGH WHEN USED TO BUILD VERTICAL STRUCTURES.
4. PREFORMED STIFFENERS (11 GAGE OR 9 GAGE) ARE AN ACCEPTABLE ALTERNATIVE TO INTERNAL CONNECTING WIRES. INSTALL THEM AS RECOMMENDED BY THE MANUFACTURER OR AS DIRECTED BY THE PROJECT MANAGER AT ⅓ POINTS.
5. PLACE ROCK IN THE END GABION CELL FIRST, AND CONTINUE BY FILLING INTERIOR GABION CELLS.
6. FOR GABION DIMENSIONS, REFER TO THE TABLE "STANDARD GABION SIZES."
7. A JOINT CONNECTION MUST BE MADE WHERE ANY PANEL EDGE MEETS ANOTHER PANEL. THIS INCLUDES ADJACENT GABION BASKETS, INDIVIDUAL PANELS WITHIN A BASKET, DIAPHRAGM EDGES ETC. ALL JOINT CONNECTIONS SHALL BE MADE USING STANDARD TIE WIRE.
8. ALTERNATE JOINT CONNECTION PROCEDURES MAY BE USED PROVIDED THAT THE COMPLETED JOINT WILL DEVELOP A TENSILE STRENGTH OF NOT LESS THAN 1400 POUNDS PER FOOT. IF ALTERNATE JOINT CONNECTION PROCEDURES ARE USED THE CONTRACTOR SHALL SUBMIT TO THE PROJECT MANAGER CERTIFIED TEST REPORTS DEMONSTRATING THE ALTERNATE JOINT CONNECTIONS WILL MEET THE MINIMUM TENSILE STRENGTH REQUIREMENTS.

SERIAL 602-05-2/2 SHEET 2 OF 2 MUST ACCOMPANY THIS SHEET.

NO.	DATE	REV. BY	DESCRIPTION
1	01/16/08	YML	CORRECTED L = 6', 9' or 12'

REVISIONS (OR CHANGE NOTICES)

NEW MEXICO
DEPARTMENT OF TRANSPORTATION
STANDARD DRAWING

GABION
BASKET DETAILS

APPROVED [signature] DESIGN ENGINEER 3-5-08 DATE

DESIGNED BY TM DRAWN BY SKL CHECKED BY YML

602-05-1/2 SHEET 1 of 2

1 GABION BASKET DETAIL (NMDOT)
C-103 C-303 C-500 SCALE: NTS

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FBPR Certificate of Authorization No.: 24

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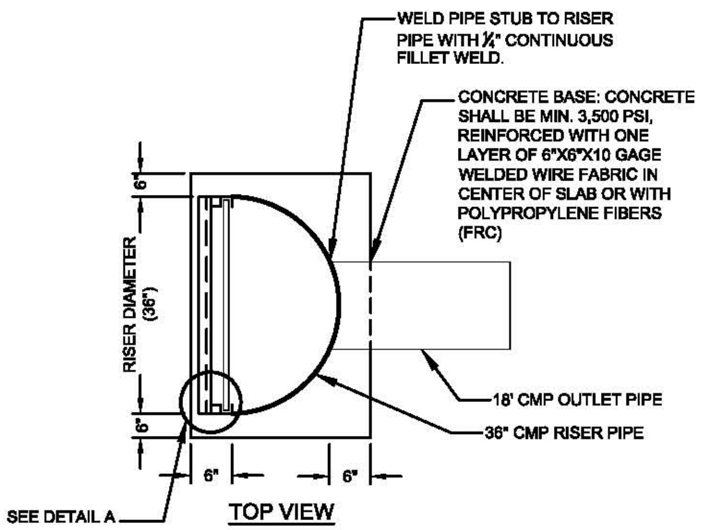
CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	GENERAL DETAILS

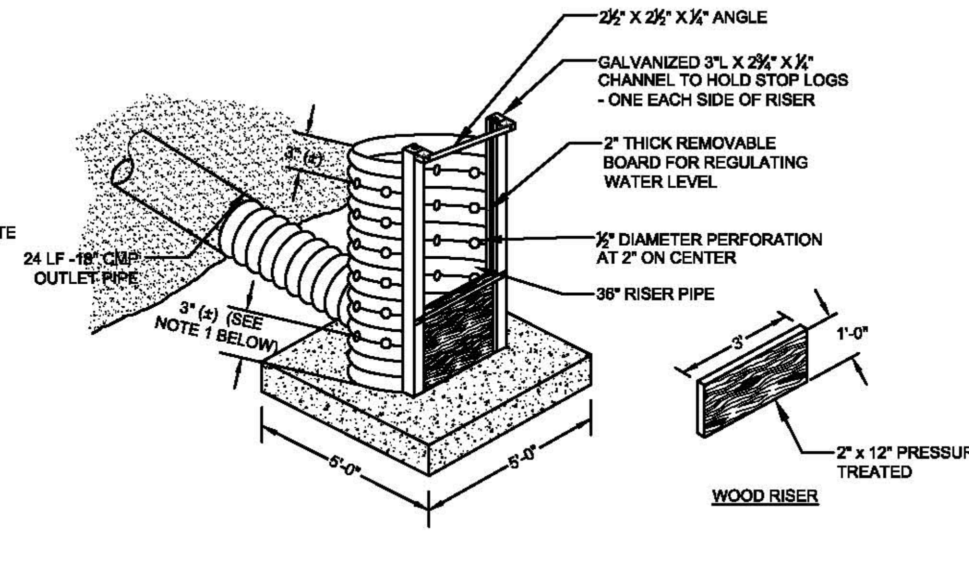
ORIGINAL DATE: 08/24/09
REVISIONS: 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.

JOB NO. 100005632
DATE 10/13/2009
DESIGNED DTW
PE RMP
CHECKED MT
QC MS
SHEET C-500

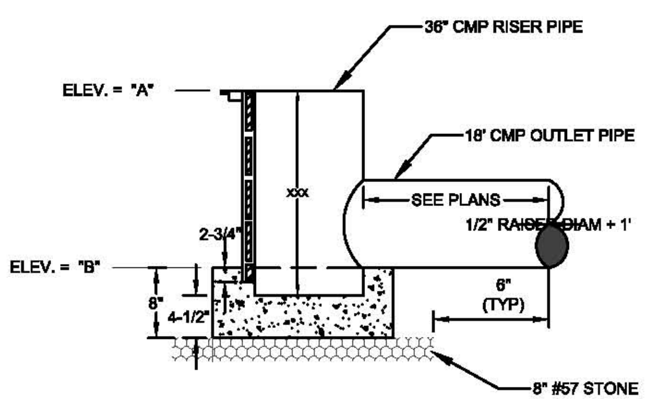
NOTE: ALL APPURTENANCES SHALL BE GALVANIZED, OR PAINTED WITH NOT LESS THAN TWO COATS OF ZINC OXIDE PAINT.



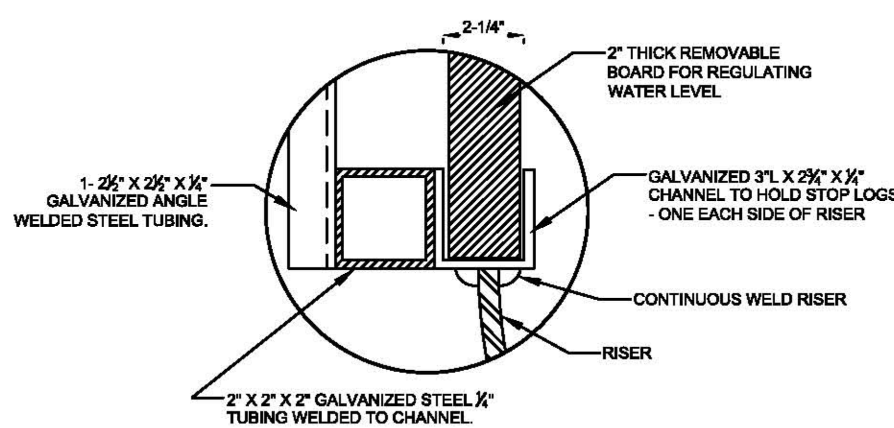
TOP VIEW



ISOMETRIC VIEW



CROSS SECTION OF RISER



DETAIL A

	DP CANYON	PUEBLO CANYON
ELEV "A"	~~7026.0'~~ 7029'	~~6344.0'~~ 6343'
ELEV "B"	7022.5'	6335.5'

NOTES:
1. AT PUEBLO CANYON PERFORATIONS SHALL NOT EXTEND BELOW ELEV. 6339'.
2. CMP SHALL BE FULLY COATED.

1 C-200 C-400 | C-501 RISER PIPE DETAILS
SCALE: NTS

User Name: 22180
Drawing Name: \\SARFS01\COMMON\100005632 Los Alamos\Record Drawings\DP & Pueblo Canyon\C-500 – C-501 – GENERAL DETAILS.dwg May 06, 2010 – 9:06am

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FBPR Certificate of Authorization No.: 24
KBR

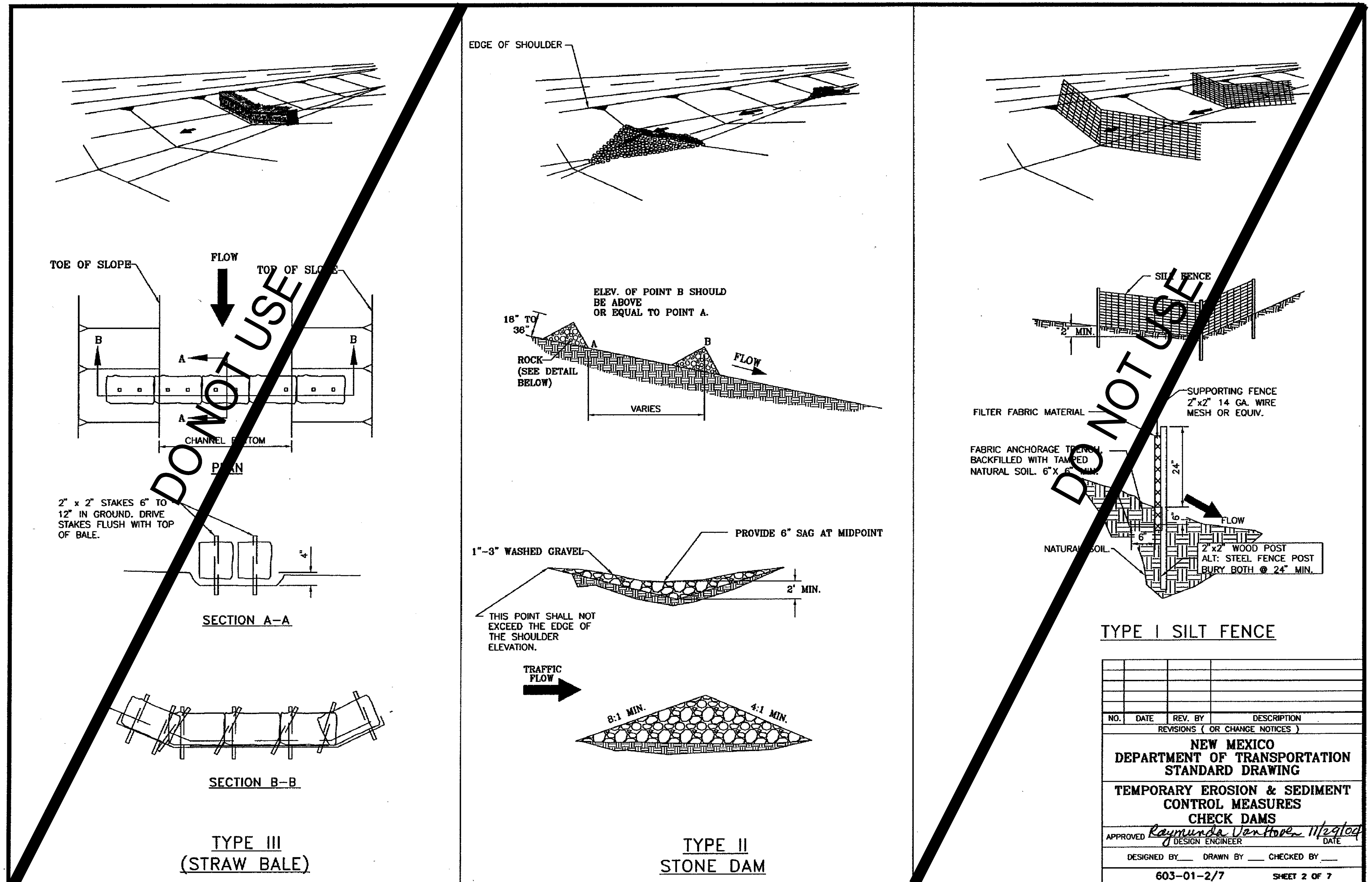
CLIENT: LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NM

PROJECT: LOS ALAMOS NATIONAL LABORATORY, GRADE CONTROL STRUCTURES

TASK: GENERAL DETAILS

ORIGINAL DATE: 08/24/09
REVISIONS:
1. INCORPORATED CONTRACTOR AS-BUILT INFO 05/05/2010

JOB NO. 100005632
DATE 10/13/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-501



1 CHECK DAM DETAILS (NMDOT)

C-104 C-502 C-304 SCALE: NTS

PBSJ
101 Arthur Andersen Parkway, Suite 260
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FBPR Certificate of Authorization No.: 24

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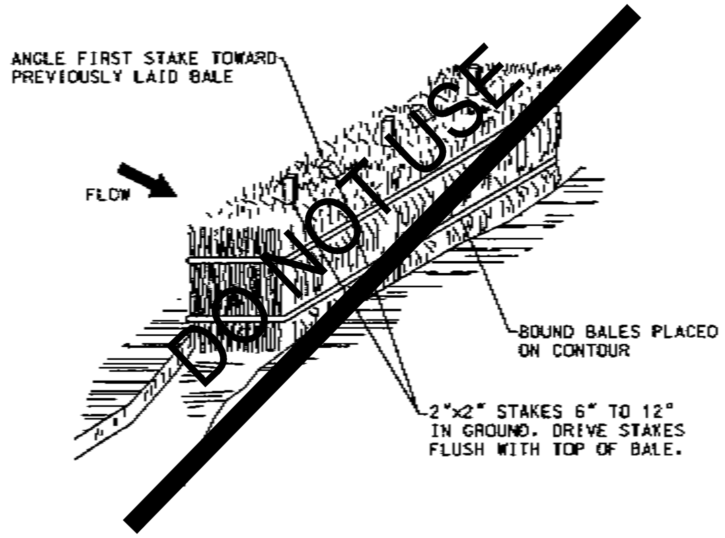
CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	S.W.P.P.P. DETAILS

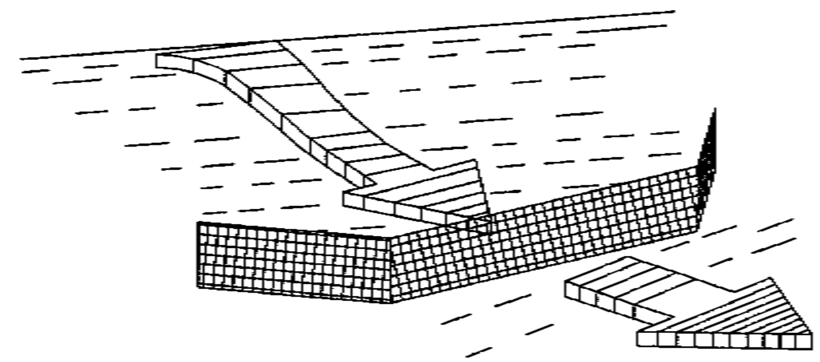
ORIGINAL DATE: 08/24/09
REVISIONS:
1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.

JOB NO. 100005632
DATE 10/13/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-502

User Name: 22190
May 06, 2010 - 9:14am



TYPE II
STRAW BALE OPTION



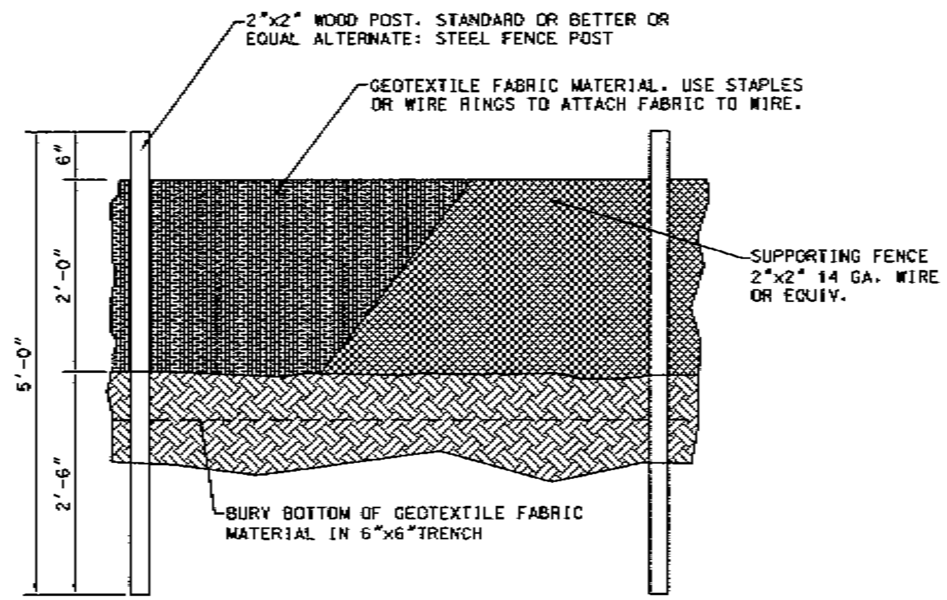
TYPE I
SILT FENCE

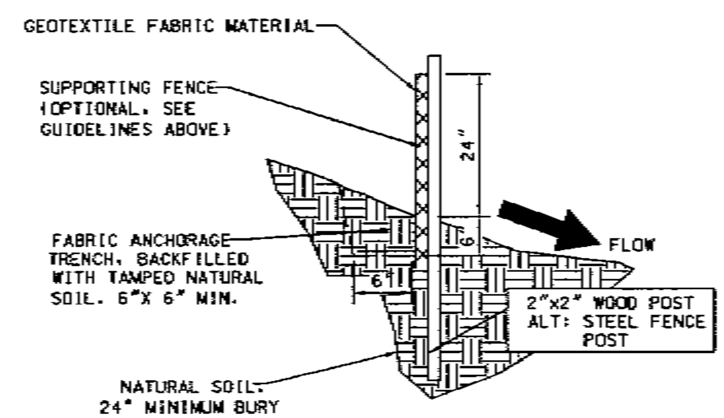
NOTES: SILT FENCE AND CHECK DAM

THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE POST SPACING FOR SILT FENCES TO MINIMIZE MAINTENANCE.

1. POST SPACING SHALL BE 4 FT. MAXIMUM WITHOUT SUPPORTING FENCE, 10 FT. MAXIMUM WITH SUPPORTING FENCE.
2. POSTS FOR 4 FT. MAXIMUM POST SPACING SHALL BE 2 INCH SQUARE NOMINAL SIZE OR HEAVIER WOOD POSTS, OR STANDARD "T" OR "U" SECTION STEEL POSTS WEIGHING NOT LESS THAN 2 LBS. PER. LINEAR FOOT.

   POSTS FOR 10 FT. MAXIMUM POST SPACING SHALL BE 4 INCH SQUARE NOMINAL SIZE OR HEAVIER WOOD POSTS, OR STEEL POSTS AS SPECIFIED ABOVE.
3. SUPPORTING FENCE SHALL BE WIRE MESH (14 GA. MIN., 1 INCH MAX. MESH OPENINGS), SNOW FENCE, PLASTIC FENCE OR APPROVED.
4. SUPPORTING FENCE SHALL BE FASTENED SECURELY TO POSTS WITH STAPLES OR WIRE TIES. GEOTEXTILE FABRIC SHALL BE FASTENED SECURELY TO SUPPORTING FENCE WITH WIRE TIES SPACED AT 2 FT. CENTERS ALONG THE TOP AND MID-SECTION. WHEN A SUPPORTING FENCE IS NOT USED, GEOTEXTILE FABRIC SHALL BE SECURELY FASTENED TO POSTS WITH STAPLES OR WIRE TIES.
5. ~~WHEN SILT FENCE IS USED FOR CHECK DAMS INSTALLED IN DITCHES, A SUPPORTING FENCE SHALL BE PROVIDED, WITH MAXIMUM POST SPACING OF 10 FT.~~
6. ~~STANDARD "T" OR "U" SECTION STEEL POSTS SHALL NOT BE USED WITHIN THE CONSTRUCTION CLEAR ZONE RECOVERY AREA.~~
7. ~~STRAW BALES ARE NOT INTENDED FOR USE ON NEW MEXICO DEPARTMENT OF TRANSPORTATION PROJECTS.~~





1 T.E.S.C.M. SILT FENCE (NMDOT)
C-104 C-304 | C-503 SCALE: NTS

NO.	DATE	REV. BY	DESCRIPTION

REVISIONS (OR CHANGE NOTICES)

NEW MEXICO
DEPARTMENT OF TRANSPORTATION
STANDARD DRAWING

TEMPORARY EROSION & SEDIMENT CONTROL MEASURES
SILT FENCE

APPROVED Raymunda Von Hoven 11/29/04
DESIGN ENGINEER DATE

DESIGNED BY___ DRAWN BY___ CHECKED BY___

603-01-3/7

PBS&J
101 Arthur Andersen Parkway, Suite 260
Sarasota, Florida 34232
Ph. (941) 378-0272
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FBPR Certificate of Authorization No.: 24

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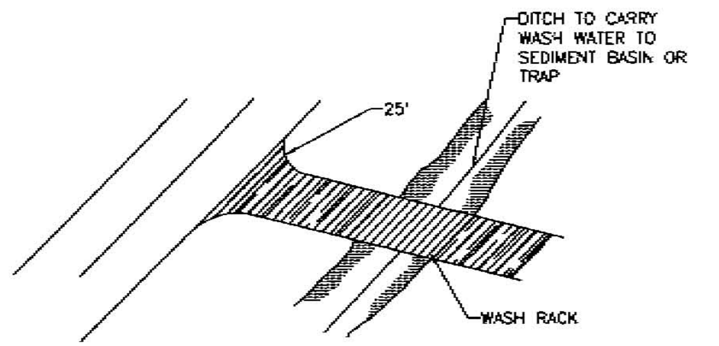
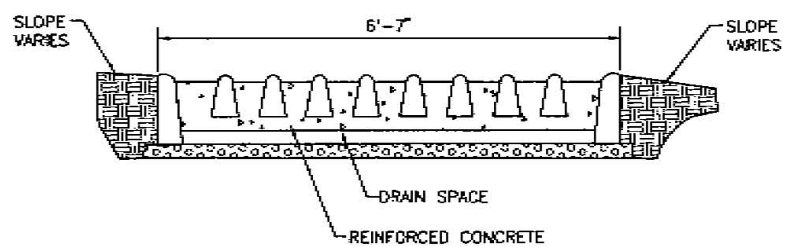
CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	S.W.P.P.P. DETAILS

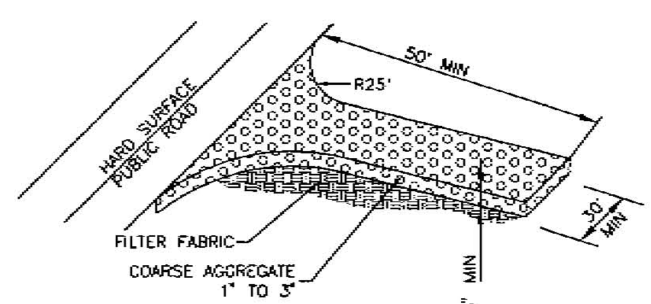
ORIGINAL DATE: 08/24/09
REVISIONS:
1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 ___ 7 ___ 8 ___ 9 ___ 10 ___ 11 ___ 12 ___

JOB NO. 100005632
DATE 10/13/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-503

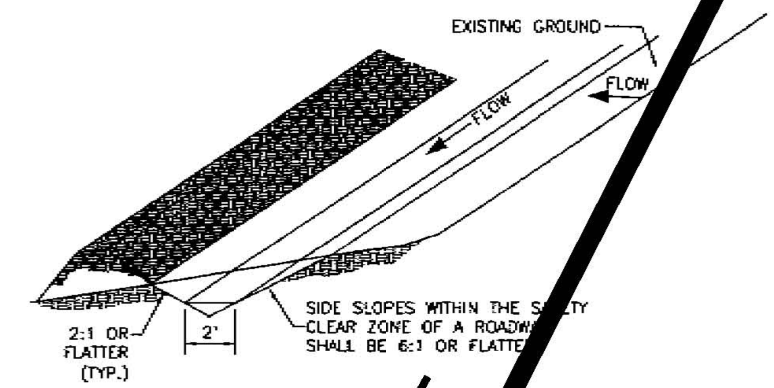




WASH RACK

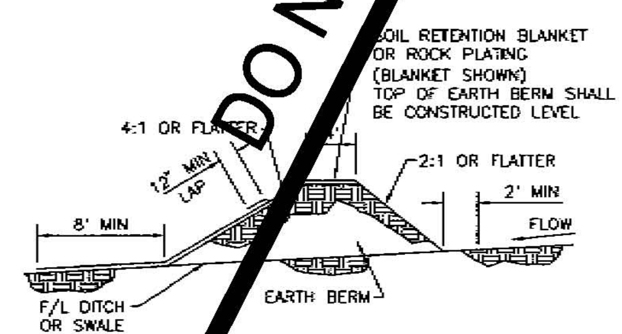


OFFSITE TRACKING PREVENTION



TYPICAL SWALE CONFIGURATION

DO NOT USE



FILTER FABRIC DIVERSION DIKE

DIVERSION DIKE

NO.	DATE	REV. BY	DESCRIPTION

REVISIONS (OR CHANGE NOTICES)

NEW MEXICO DEPARTMENT OF TRANSPORTATION STANDARD DRAWING

T.E.S.C.M. OFFSITE TRACKING PREVENTION & DIVERSION DIKE

APPROVED Raymunda Van Hoven 11/24/04 DESIGN ENGINEER DATE

DESIGNED BY ___ DRAWN BY ___ CHECKED BY ___

603-01-7/7 SHEET 7 OF 7

1 C-104 | C-504 T.E.S.C.M. OFFSITE TRACKING PREVENTION (NMDOT)

SCALE: NTS

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FBPR Certificate of Authorization No.: 24

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CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL	LOS ALAMOS NATIONAL	S.W.P.P.P. DETAILS
LABORATORY	LABORATORY	
LOS ALAMOS, NM	GRADE CONTROL STRUCTURES	

ORIGINAL DATE: 08/24/09
REVISIONS:
1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.

JOB NO. 100005632
DATE 10/13/2009
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-504

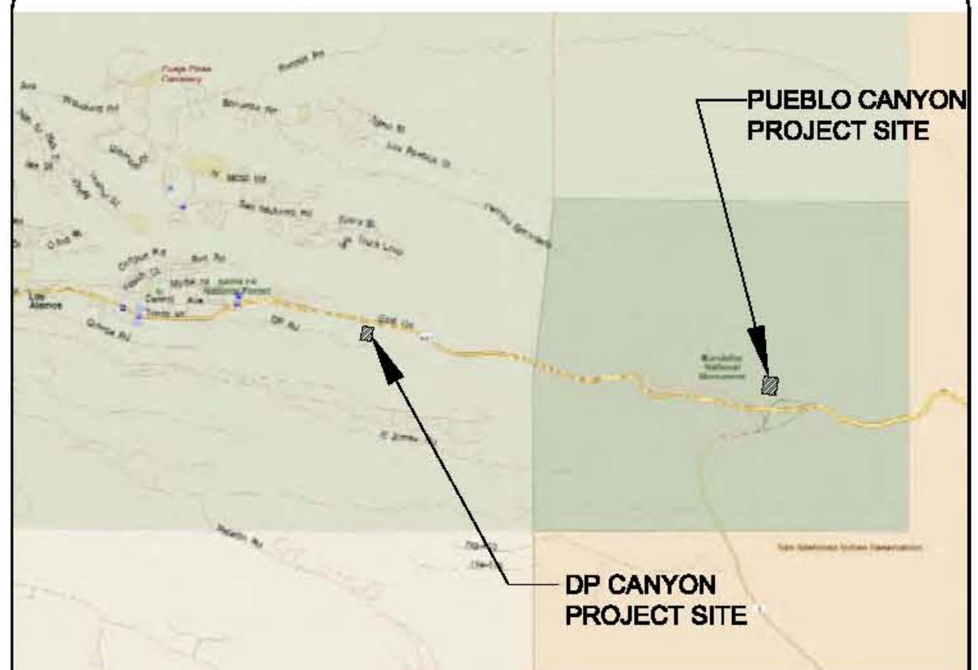
CONSTRUCTION PLANS FOR:

LOS ALAMOS NATIONAL LABORATORY STREAM GAGE

FOR DP CANYON
LOS ALAMOS, NEW MEXICO

INDEX OF DRAWINGS

LOCATION MAP



VICINITY MAP

DRAWINGS REVISED TO INCORPORATE CONTRACTOR AS-BUILT INFORMATION. REVISIONS ARE INDICATED AS REVISION 1 WHERE APPLICABLE. △1

PREPARED FOR:

LOS ALAMOS NATIONAL LABORATORY
P.O. BOX 1663
LOS ALAMOS, NM 87545

PREPARED BY:

PBSJ
CONSULTING ENGINEERS
101 ARTHUR ANDERSEN PARKWAY, SUITE 260
SARASOTA, FLORIDA 34232
(941) 378-0272 (VOICE)
(941) 371-0297 (FAX)

KBR
GOVERNMENT AND INFRASTRUCTURE
2451 CRYSTAL DRIVE
ARLINGTON, VIRGINIA 22202
(703) 526-7500

DATE:	SHEETS	BY:
05/05/2010	C-06, C-07, C-09 C-10, SG-01 TO SG-03	JVC

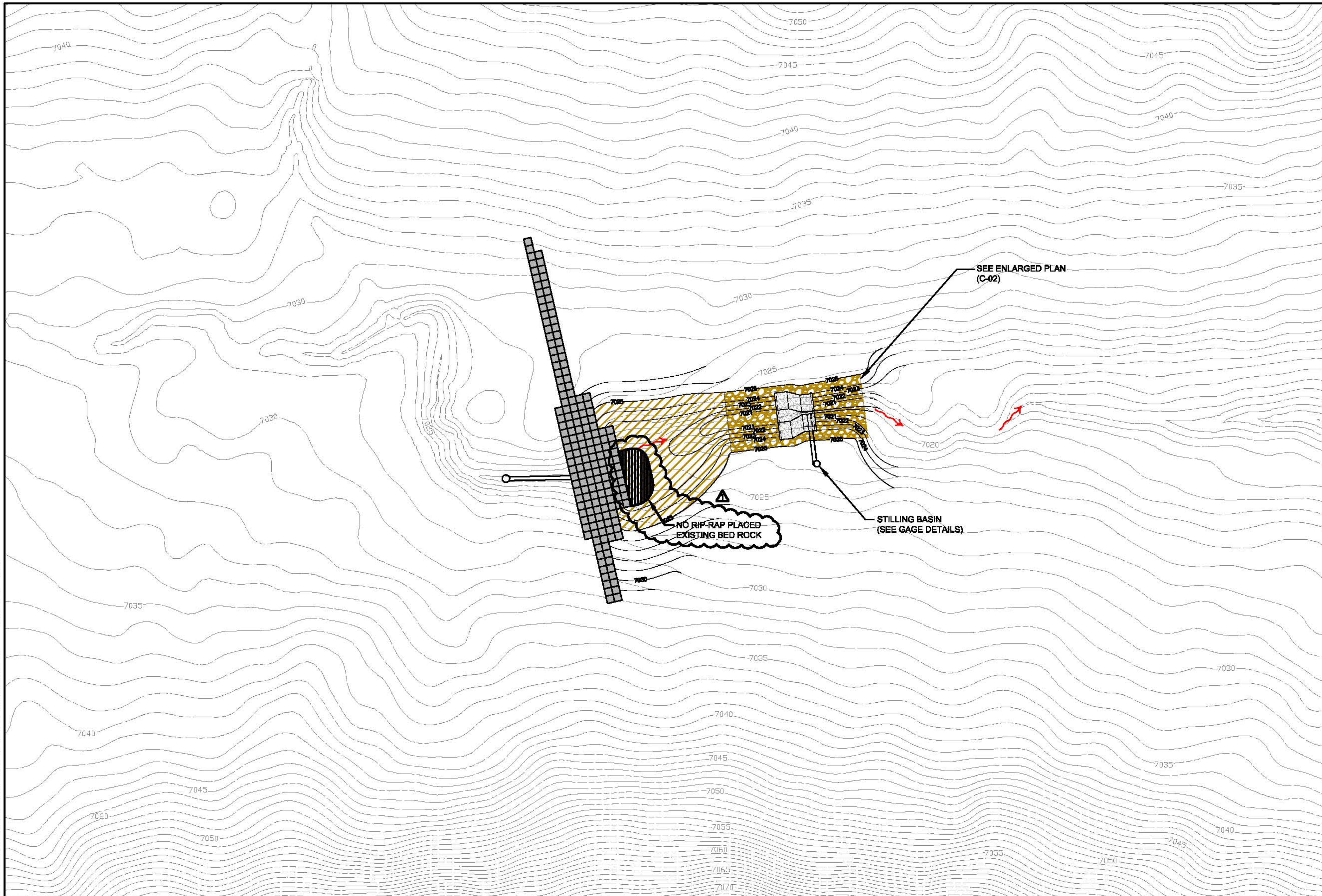
REVISIONS

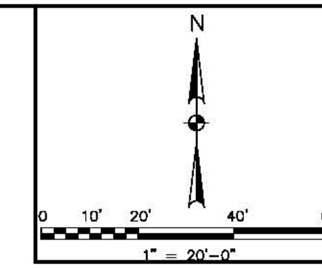
LOS ALAMOS NATIONAL LABORATORY STREAM GAGE

JOB NO. 100005632

DATE: 12/22/2009 SHT. 1 OF 9

User Name: 22180
Drawing Name: \\SARFS01\CONNOR\100005632 Los Alamos\Record Drawings\DP & Pueblo Canyon\C-000 - COVER Gages.dwg May 24, 2010 - 10:23am





NOTES:
1. REFERENCE N.M.D.O.T. STANDARD SPECIFICATIONS FOR HIGHWAY & BRIDGE CONSTRUCTION SECTION 602.
2. ALL DISTURBED AREAS, NOT RECEIVING RIP-RAP, SHALL BE STABILIZED WITH PERMANENT VEGETATION. SEE GRADE CONTROL STRUCTURE DRAWINGS & SPECIFICATIONS.
3. ALL FILL SLOPES SHALL BE PLACED IN 6"-10" LIFTS AND COMPACTED TO MIN. 95% MAX DRY DENSITY PER ASTM D1557.

LEGEND
- 7020 — EXISTING CONTOUR LINE
- 7025 — PROPOSED CONTOUR LINE
- RIP-RAP (CLASS "A"-SEE NOTE 1)
- RIP-RAP (CLASS "B"-SEE NOTE 1)
- INDICATES DIRECTION OF SURFACE RUNOFF

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FBPR Certificate of Authorization No.: 24

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CLIENT: LOS ALAMOS NATIONAL LABORATORY, LOS ALAMOS, NM

PROJECT: LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES

TASK: DP CANYON STREAM GAGE OVERALL SITE/GRADING PLAN

ORIGINAL DATE: 12/22/09
REVISIONS:
1 INCORPORATED CONTRACTOR AS-BUILT INFO 05/05/2010
2.
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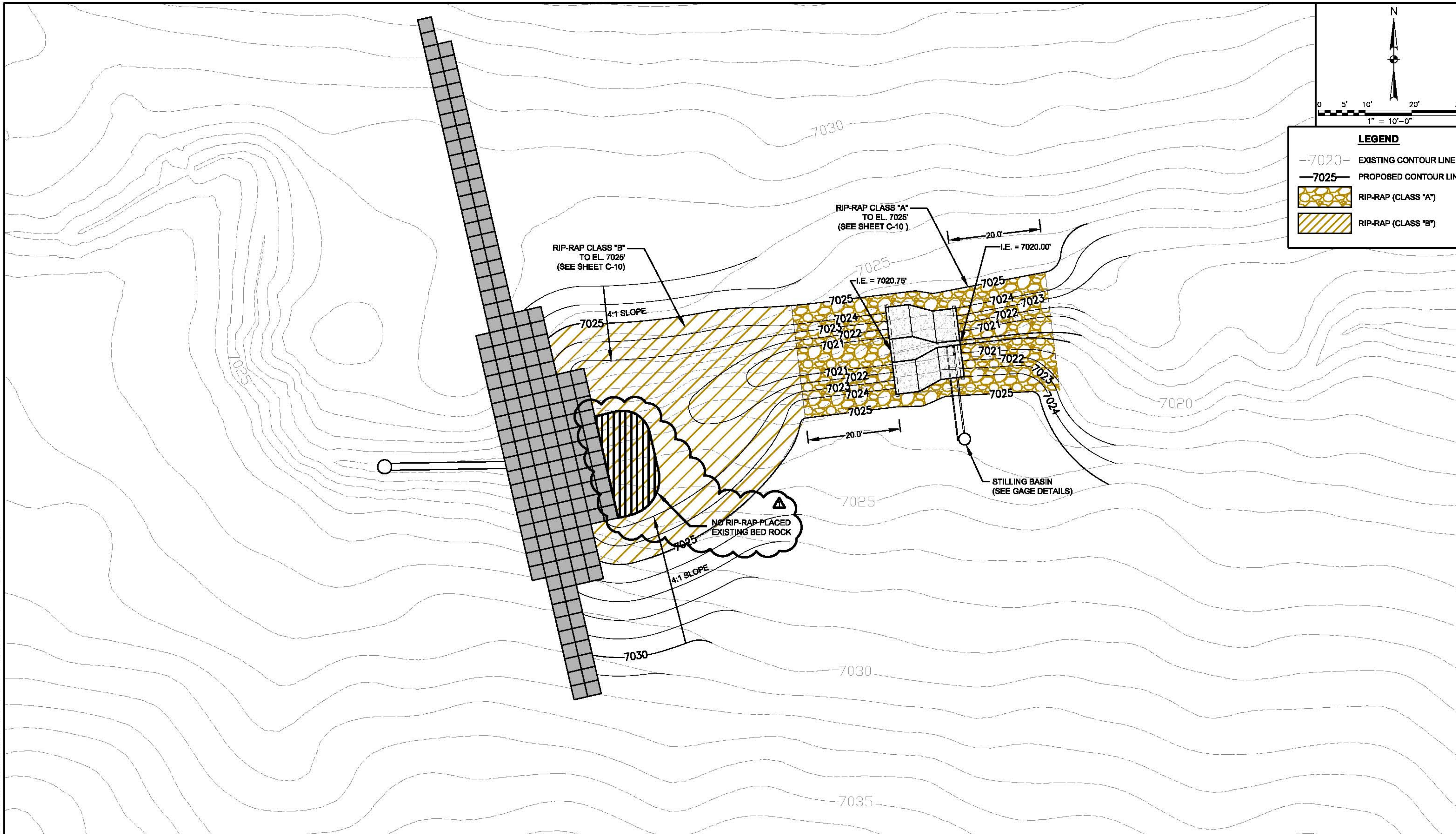
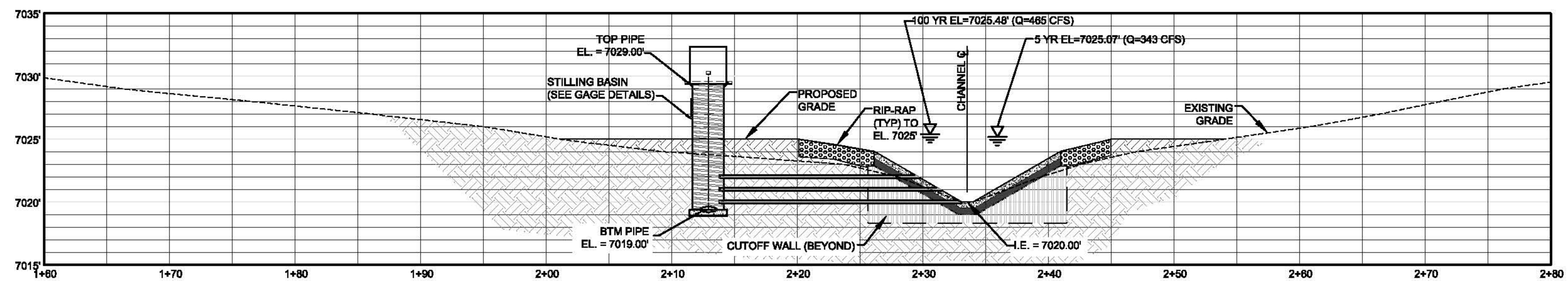
JOB NO. 100005632
DATE 01/05/2010
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-06



User Name: 22190
Drawing Name: \\SARFS01\COMMON\100005632 Los Alamos\Record Drawings\DP & Pueblo Canyon\C-06 - C-08 -DP-STREAM GAGE DETAILS.dwg May 06, 2010 - 9:55am

PBSJ 101 Arthur Andersen Parkway, Suite 260 Sarasota, Florida 34232 Ph. (941) 378-0272 Post Buckley Schuh & Jernigan, Inc., d/b/a PBS&J 5300 West Cypress Street, Suite 200, Tampa, Fl 33607 FBPR Certificate of Authorization No.: 24	KBR	CLIENT LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	PROJECT LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	TASK DP CANYON STREAM GAGE SITE/GRADING ENLARGED PLAN	ORIGINAL DATE: 12/22/09 REVISIONS: 1 INCORPORATED CONTRACTOR AS-BUILT INFO 05/05/2010 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.	JOB NO. 100005632 DATE 01/05/2010 DESIGNED DTW PE RMP CHECKED IMT QC MS SHEET C-07



A C-03 | C-03 **CROSS SECTION A-A**

SCALE: 1"=5'

		CLIENT	PROJECT	TASK		
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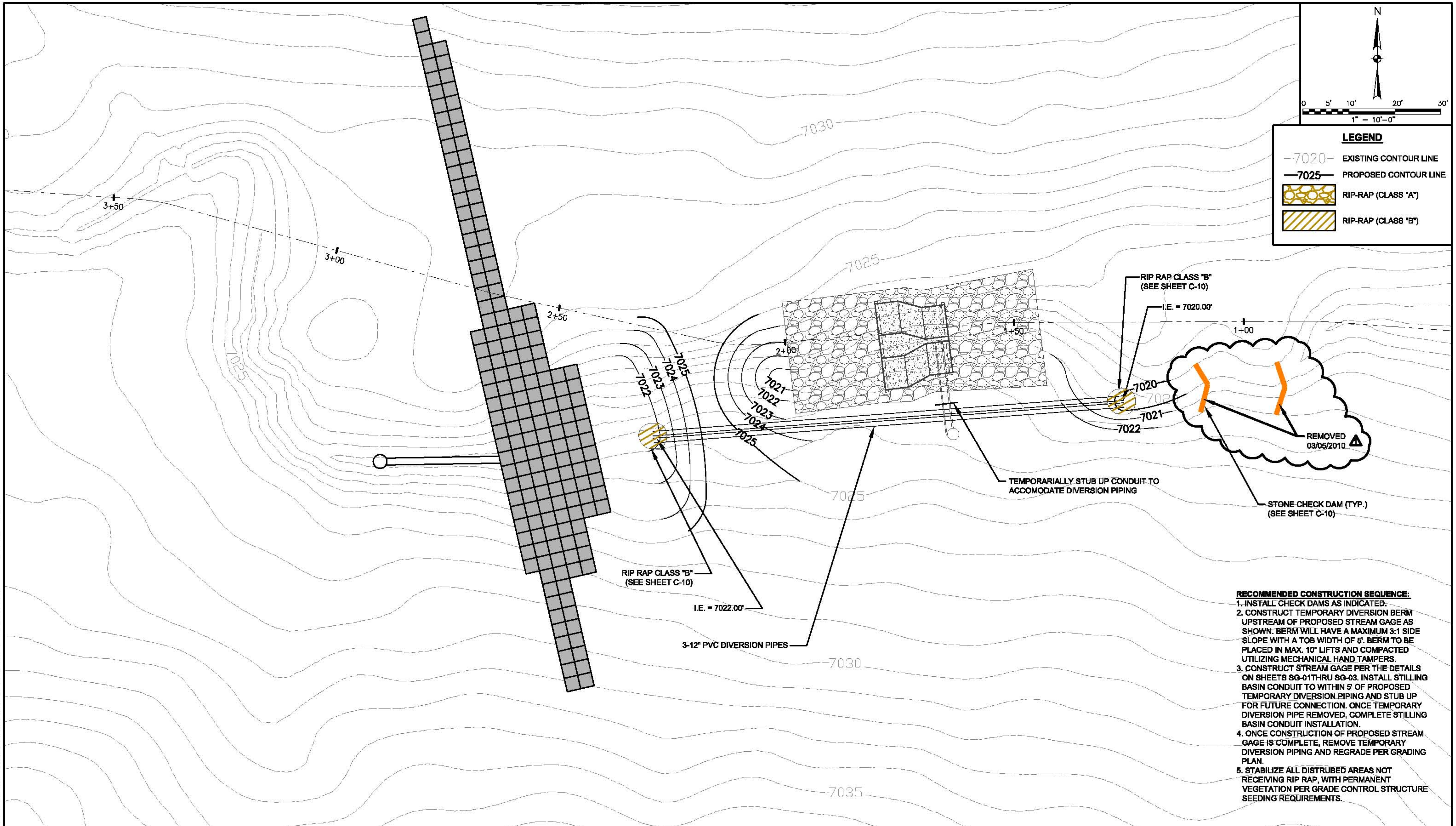

RECOMMENDED CONSTRUCTION SEQUENCE:

1. INSTALL CHECK DAMS AS INDICATED.
2. CONSTRUCT TEMPORARY DIVERSION BERM UPSTREAM OF PROPOSED STREAM GAGE AS SHOWN. BERM WILL HAVE A MAXIMUM 3:1 SIDE SLOPE WITH A TOB WIDTH OF 5'. BERM TO BE PLACED IN MAX. 10" LIFTS AND COMPACTED UTILIZING MECHANICAL HAND TAMPERS.
3. CONSTRUCT STREAM GAGE PER THE DETAILS ON SHEETS SG-01THRU SG-03. INSTALL STILLING BASIN CONDUIT TO WITHIN 5' OF PROPOSED TEMPORARY DIVERSION PIPING AND STUB UP FOR FUTURE CONNECTION. ONCE TEMPORARY DIVERSION PIPE REMOVED, COMPLETE STILLING BASIN CONDUIT INSTALLATION.
4. ONCE CONSTRUCTION OF PROPOSED STREAM GAGE IS COMPLETE, REMOVE TEMPORARY DIVERSION PIPING AND REGRADE PER GRADING PLAN.
5. STABILIZE ALL DISTRUBED AREAS NOT RECEIVING RIP RAP, WITH PERMANENT VEGETATION PER GRADE CONTROL STRUCTURE SEEDING REQUIREMENTS.

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5300 West Cypress Street, Suite 200, Tampa, Fl 33607
FBPR Certificate of Authorization No.: 24

KBR

CLIENT	PROJECT	TASK
LOS ALAMOS NATIONAL LABORATORY LOS ALAMOS, NM	LOS ALAMOS NATIONAL LABORATORY GRADE CONTROL STRUCTURES	DP CANYON STREAM GAGE TEMPORARY DIVERSION AND EROSION CONTROL PLAN

ORIGINAL DATE: 12/22/09
REVISIONS:
1 INCORPORATED CONTRACTOR AS-BUILT INFO 05/05/2010
2
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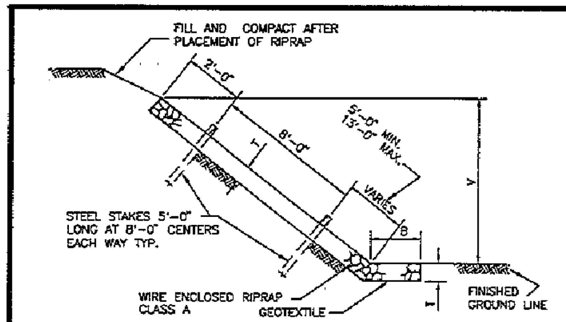
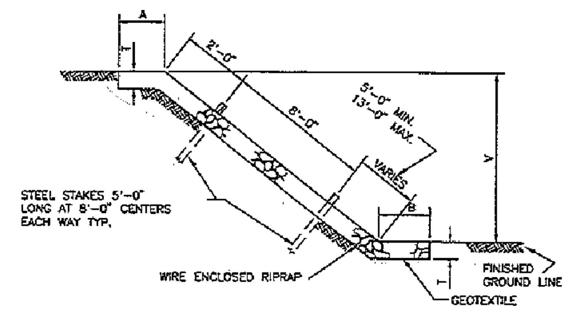
JOB NO. 100005632
DATE 01/05/2010
DESIGNED DTW
PE RMP
CHECKED IMT
QC MS
SHEET C-09



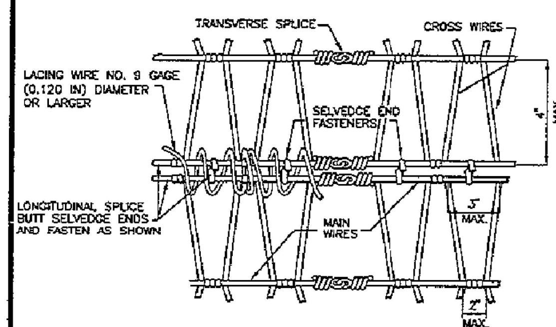
SECTION TYPE 1

QUANTITIES PER LINEAR FOOT	
SLOPE	RIPRAP CU. YARDS
1.5 : 1	$\frac{T}{27}(B + 1.803V + 0.303T)$
1.75 : 1	$\frac{T}{27}(B + 2.016V + 0.266T)$
2 : 1	$\frac{T}{27}(B + 2.236V + 0.236T)$
3 : 1	$\frac{T}{27}(B + 3.162V + 0.162T)$
4 : 1	$\frac{T}{27}(B + 4.123V + 0.123T)$

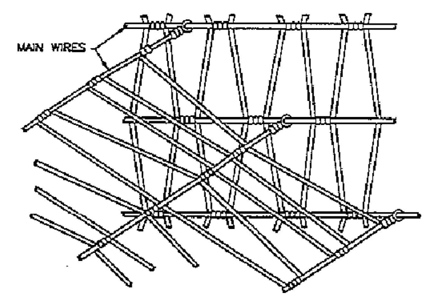


SECTION TYPE 2

QUANTITIES PER LINEAR FOOT	
SLOPE	RIPRAP CU. YARDS
1 : 1	$\frac{T}{27}(A + B + 1.414V)$
1.5 : 1	$\frac{T}{27}(A + B + 1.803V)$
1.75 : 1	$\frac{T}{27}(A + B + 2.016V)$
2 : 1	$\frac{T}{27}(A + B + 2.236V)$
3 : 1	$\frac{T}{27}(A + B + 3.162V)$
4 : 1	$\frac{T}{27}(A + B + 4.123V)$

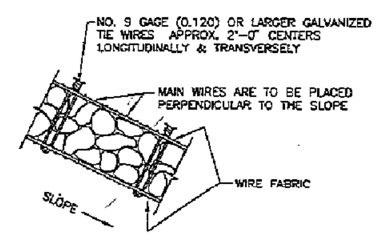


NORMAL INTERSECTION SPLICES



SKEWED INTERSECTION SPLICE

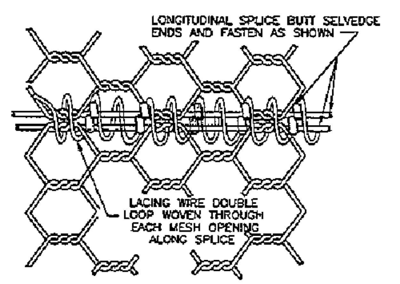
"W" MESH



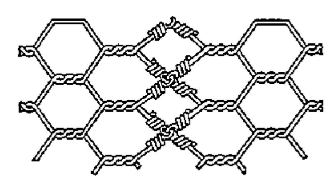
TYPICAL SECTION

GENERAL NOTES

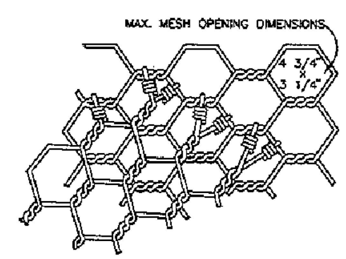
1. WIRE FABRIC FOR RIP RAP SHALL BE "W" OR HEXAGONAL MESH AND MEET THE REQUIREMENTS LISTED IN SECTION 602 OF THE STANDARD SPECIFICATIONS.
2. STEEL STAKES MAY BE RAILROAD RAILS WEIGHING NOT LESS THAN 30 LBS. PER YARD, 4" NOMINAL DIAMETER STANDARD STRENGTH GALVANIZED STEEL PIPE, OR L4"x4" x3/8" STEEL ANGLES. STEEL STAKES SHALL PROJECT 4" ABOVE TOP OF RIPRAP. STEEL STAKES ARE CONSIDERED INCIDENTAL TO THE COMPLETION OF THE WORK AND NO DIRECT MEASUREMENT OR PAYMENT WILL BE MADE THEREFOR.
3. IF LENGTH OF SLOPE IS 15 FEET OR LESS, ONLY ONE ROW OF STEEL STAKES 2 FEET FROM THE TOP EDGE OF RIPRAP WILL BE REQUIRED UNLESS OTHERWISE NOTED ON PLANS.
4. FOR DIMENSIONS A,B,V,&T SEE BRIDGE OR ROADWAY PLANS.
5. T=12" UNLESS OTHERWISE SHOWN ON PLANS, T= 18" AT BRIDGES.
6. FASTENERS FOR SPLICES AND/OR SELVEDGE END CON-NECTORS MAY BE WIRE TIES, INTERLOCKING WIRE CLIPS, HOG RINGS, OR LACING WIRE. ONLY FASTENERS WHICH APPEAR ON THE DEPARTMENT'S "APPROVED PRODUCT LISTING" MAY BE USED.
7. LACING SHALL BE CONTINUOUS AS FAR AS IS PRACTICAL AND SHALL PASS THROUGH EACH MESH OPENING.
8. WHERE SPLICING IS NECESSARY, AN OVERLAP OF LACING OF AT LEAST 1 FOOT SHALL BE PROVIDED.



NORMAL INTERSECTION SPLICE



TRANSVERSE SPLICE



SKEWED INTERSECTION SPLICE

HEXAGONAL MESH

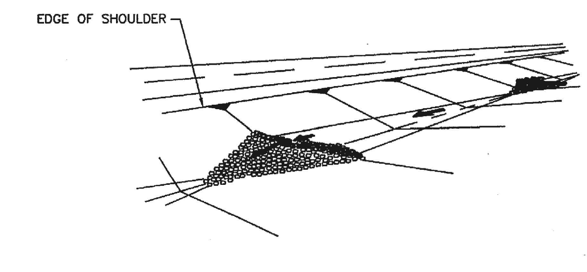
NO.	DATE	REV. BY	DESCRIPTION
REVISIONS (OR CHANGE NOTICES)			

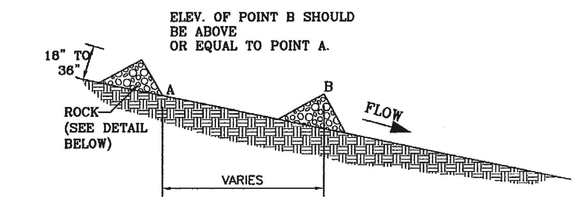
NEW MEXICO
DEPARTMENT OF TRANSPORTATION
STANDARD DRAWING

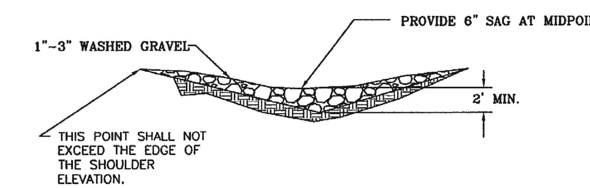
WIRE ENCLOSED RIPRAP
CLASS A

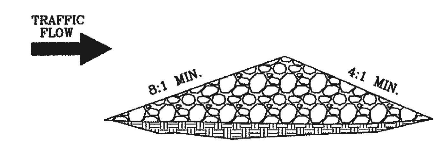
APPROVED — DESIGN ENGINEER — DATE
DESIGNED BY ___ DRAWN BY ___ CHECKED BY ___
602-01-1/1

A C-10 | C-10 CLASS A RIP RAP DETAIL
SCALE: NTS



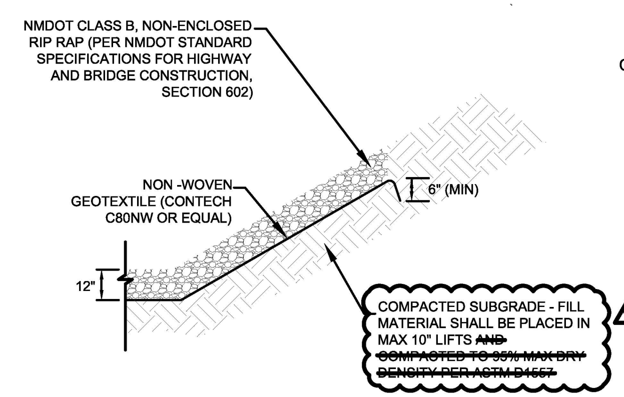






TYPE II
STONE DAM

C C-10 | C-10 CHECK DAM DETAIL (NMDOT)
SCALE: NTS



B C-10 | C-10 CLASS B RIP RAP DETAIL
SCALE: NTS

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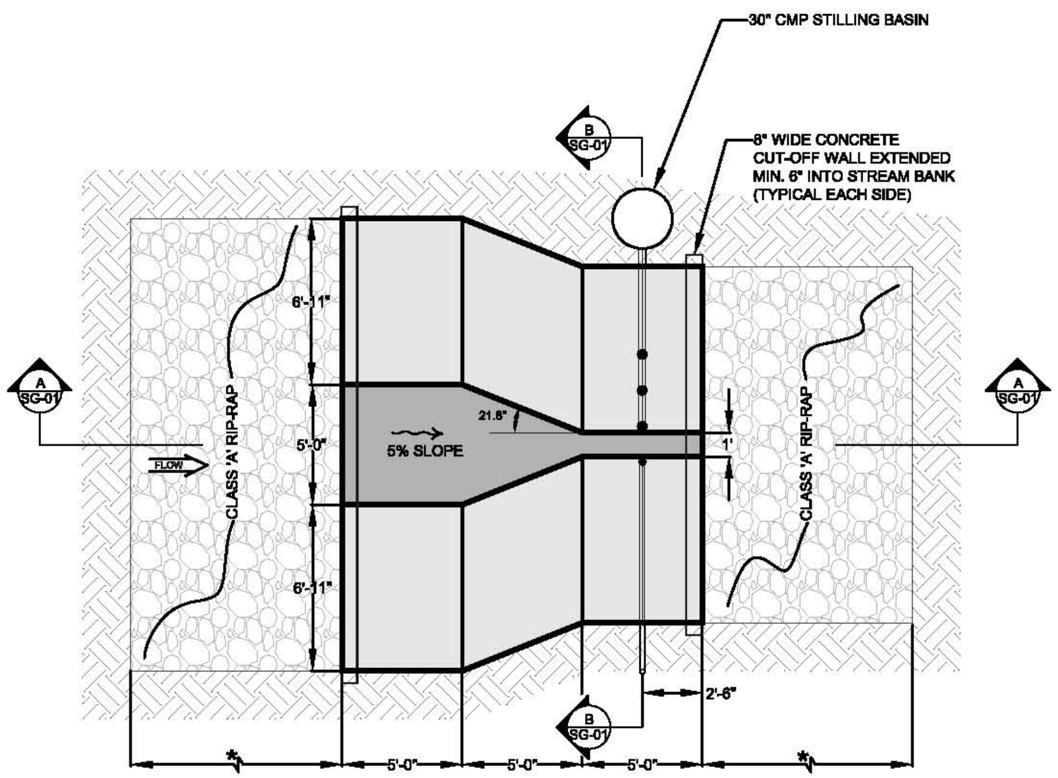
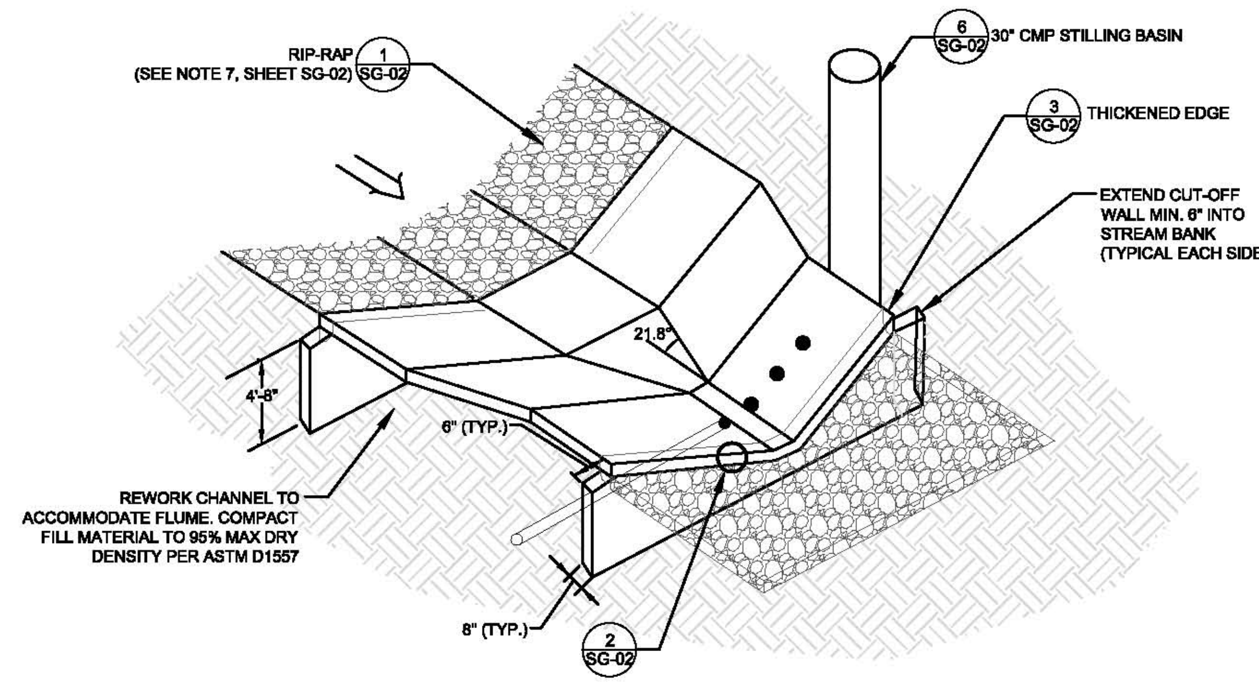
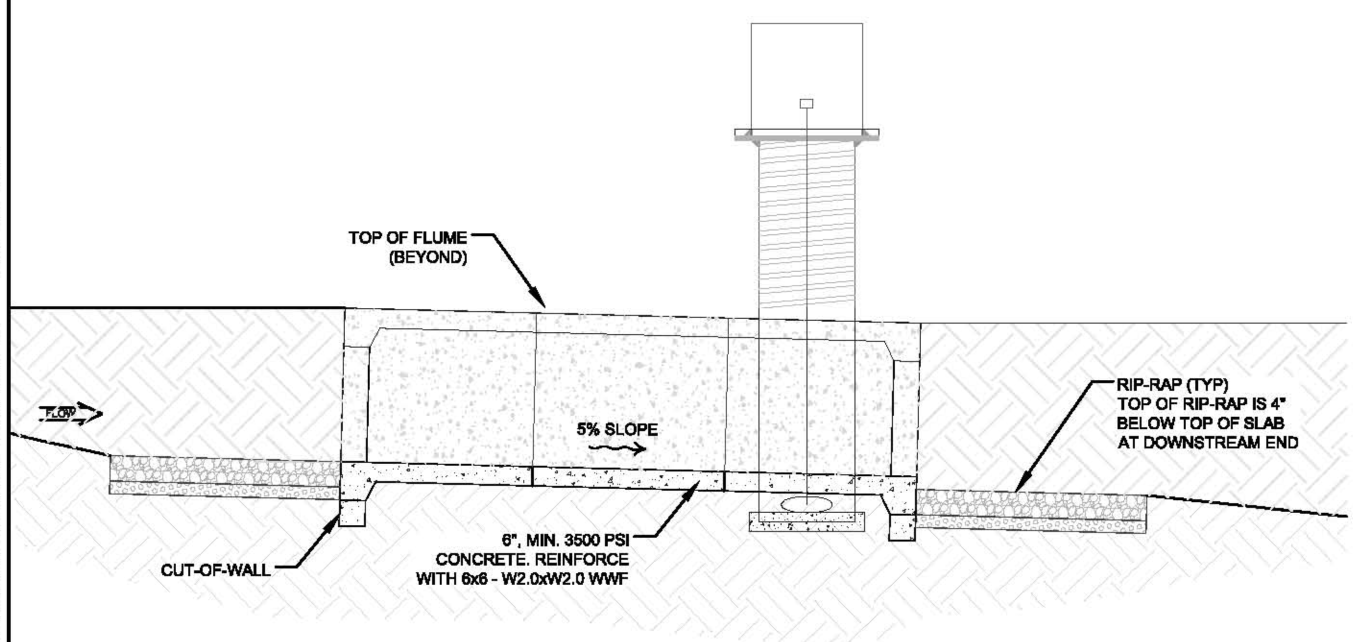


* RIP-RAP DIMENSIONS SHALL BE DETERMINED BASED ON LOCATION AND DESIGN CONDITIONS

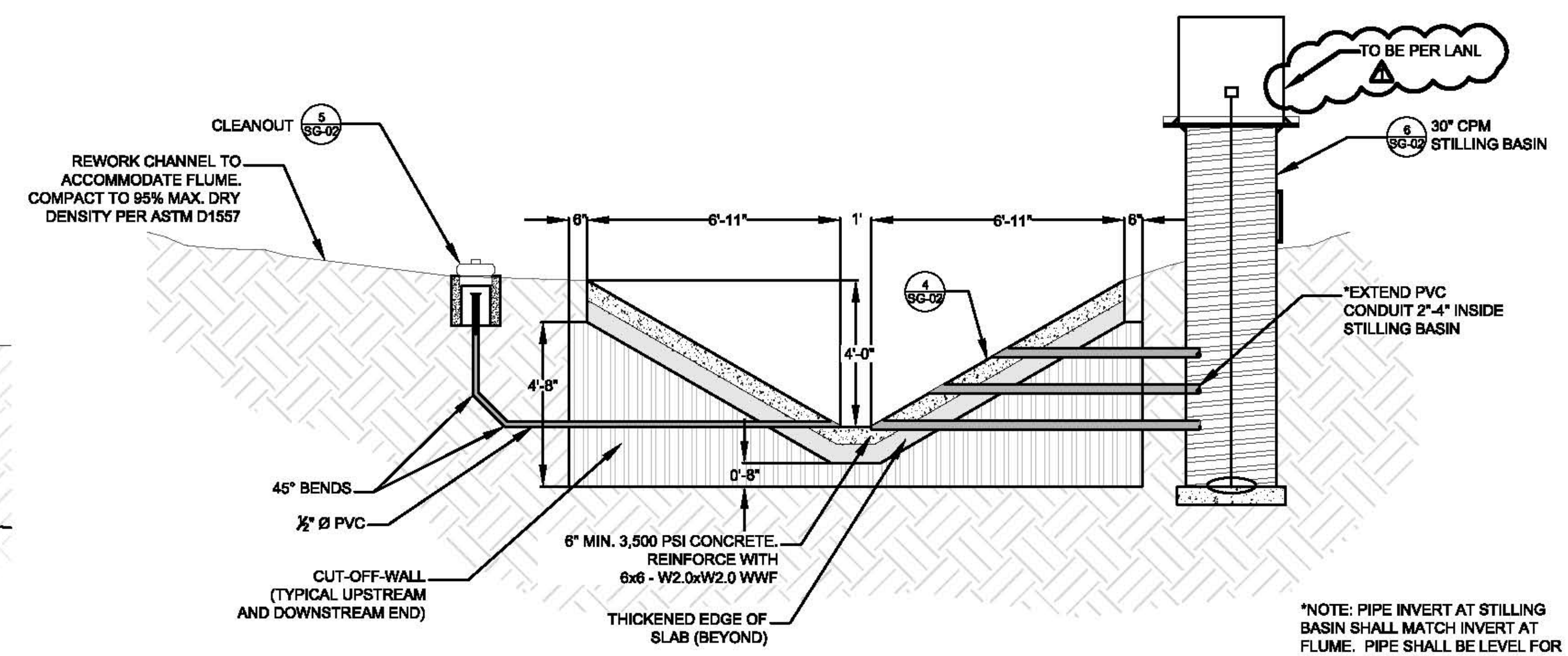
1 SG-01 **STREAM GAGE FLUME (PLAN VIEW)**
SCALE: N.T.S.



2 SG-01 **STREAM GAGE FLUME (ISOMETRIC VIEW)**
SCALE: NTS



A SG-01 SG-01 **STREAM GAGE (SECTION THRU ℄)**
SCALE: NTS



*NOTE: PIPE INVERT AT STILLING BASIN SHALL MATCH INVERT AT FLUME. PIPE SHALL BE LEVEL FOR ENTIRE LENGTH

B SG-01 SG-01 **STREAM GAGE (SECTION B-B)**
SCALE: NTS

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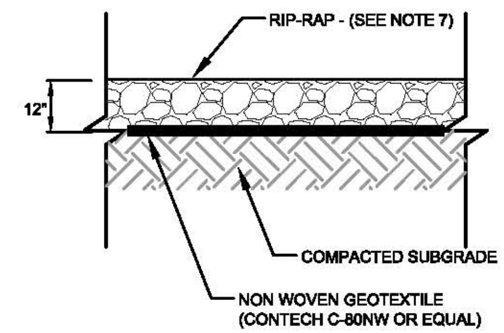
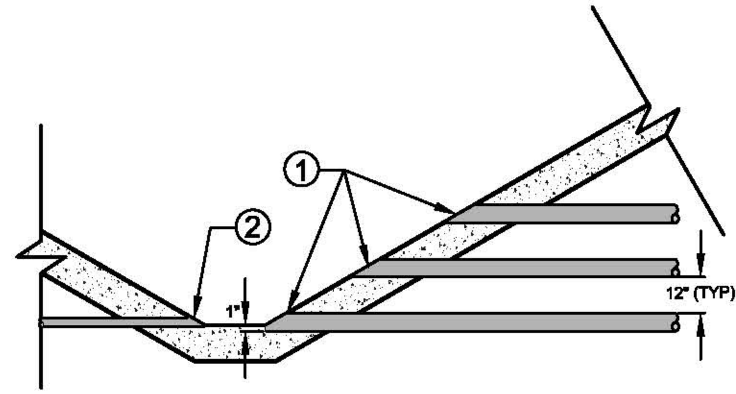
					JOB NO. 100005632 DATE 12/22/09 DESIGNED DTW PE RMP CHECKED IMT QC MS SHEET SG-01



1 RIP-RAP
SG-01 | SG-02 SCALE: NTS



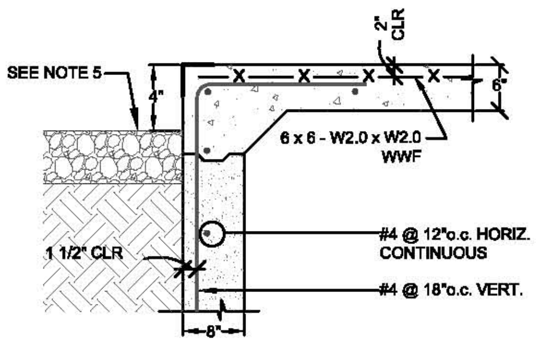
① 3-INCH Ø SCHEDULE 40 PVC. TRIM PIPE FLUSH WITH TOP OF SLAB. LOWER PIPE INVERT SHALL BE I-INCH BELOW FLUME INVERT.

② ½-INCH Ø SCHEDULE 40 PVC. TRIM FLUSH WITH TOP OF SLAB. INVERT APPROX. ½-INCH ABOVE TOP OF SLAB.

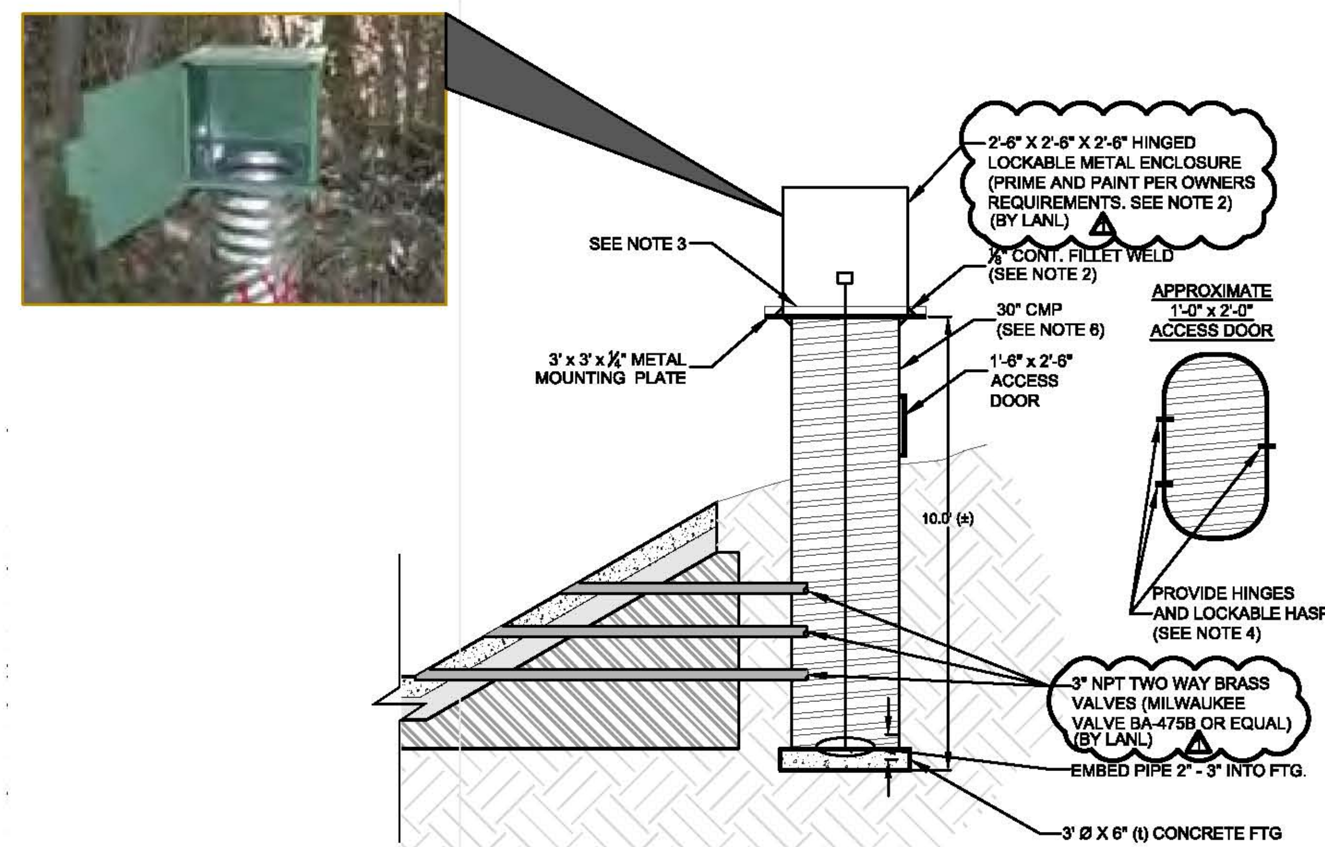
4 SECTION VIEW OF GAS PURGE STAGE MANOMETER CONDUIT & PIPE INTAKE
SG-01 | SG-02 SCALE: NTS

NOTES:

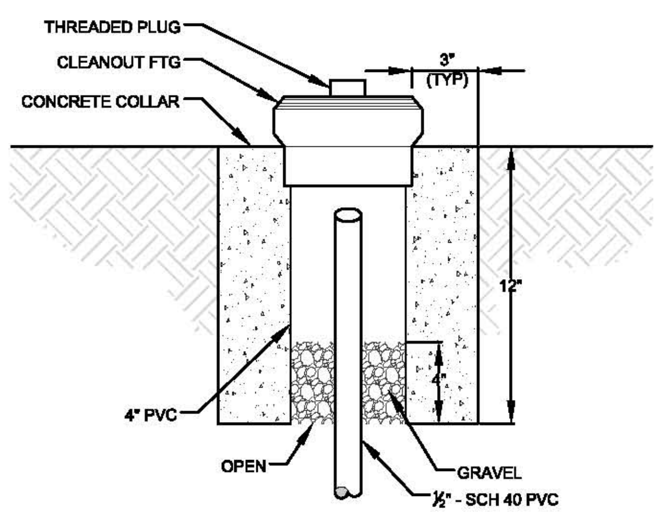
1. THE LENGTH OF STILLING WELL WILL BE DETERMINED DURING THE CONSTRUCTION OF THE STREAM GAGE.
2. METAL ENCLOSURE TO BE INSTALLED AS AN OPTION AT OWNER'S DIRECTION.
3. AS AN OPTION TO THE METAL ENCLOSURE INSTALL 3' x 3' x ¼" (t) METAL COVER PLATE. COVER PLATE SHALL BE PROVIDED WITH TWO HINGES AND A LOCKABLE HASP.
4. EXACT LOCATION OF ACCESS DOOR TO BE DETERMINED IN THE FIELD BY OWNER.
5. RIP-RAP SHALL BE FLUSH WITH TOP OF SLAB AT UPSTREAM END OF FLUME.
6. STILLING BASIN AND PIPE INTAKE SYSTEM MAY BE LOCATED EITHER SIDE OF FLUME. LOCATION TO BE DETERMINED BY OWNER ON A SITE SPECIFIC BASIS.
7. RIP-RAP SHALL BE DURABLE ROCKS OR ROUGH QUARRY STONE WITH NO MORE THAN 60% WEAR PER AASHTO T96. MINIMUM 70 TO 80 PERCENT OF STONE SHALL BE NO LESS THAN 4-INCHES AND NO MORE THAN 8-INCHES IN THE SMALLEST DIMENSION. RIP RAP SHALL BE CLASS A PER NMDOT STD. 602.



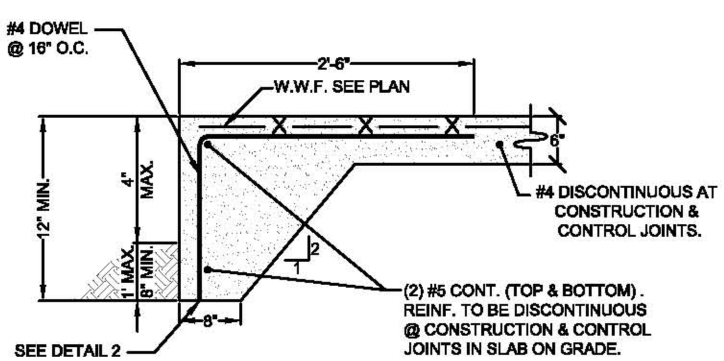
2 REBAR DETAIL
SG-01 | SG-02 SCALE: NTS



6 STILLING BASIN DETAIL
SG-01 | SG-02 SCALE: NTS



5 CLEANOUT DETAIL - GAS PURGE - STAGE MANOMETER CONDUIT
SG-01 | SG-02 SCALE: NTS



3 TYPICAL THICKENED EDGE
SG-01 | SG-02 SCALE: NTS

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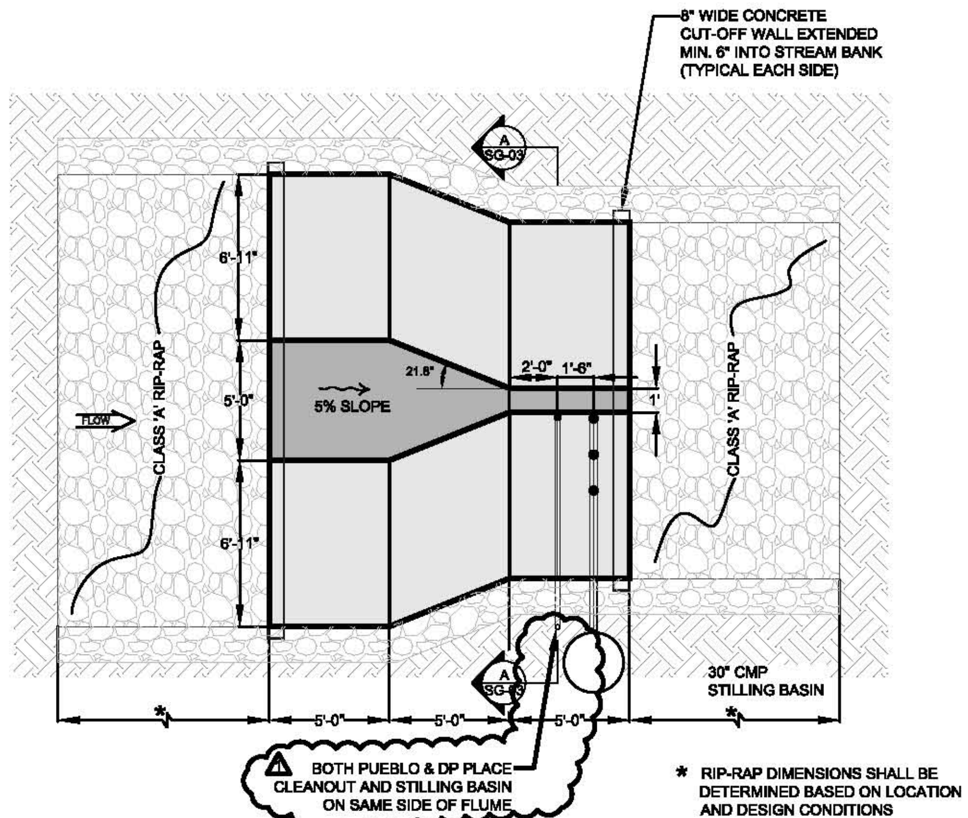
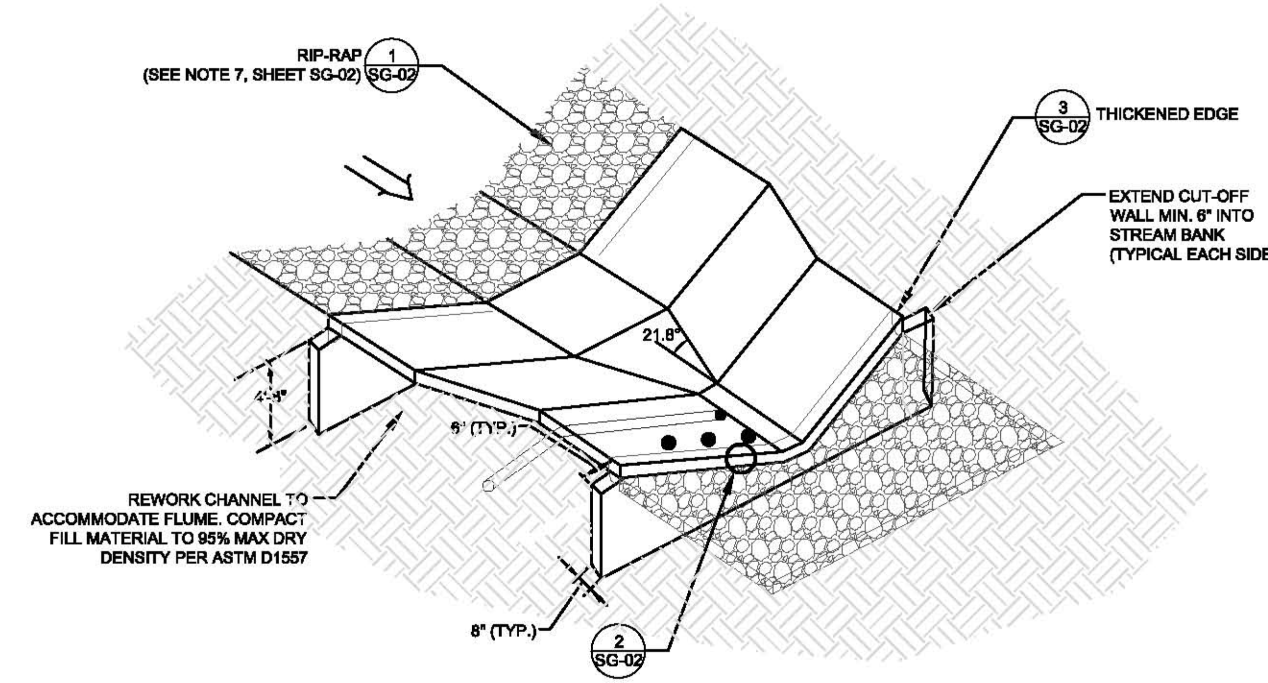
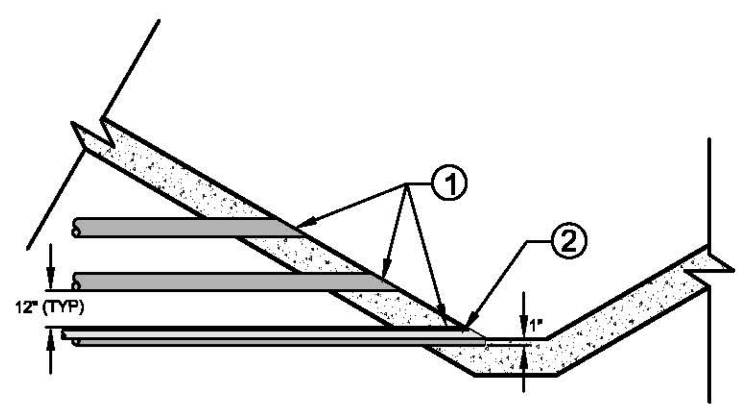


* RIP-RAP DIMENSIONS SHALL BE DETERMINED BASED ON LOCATION AND DESIGN CONDITIONS

1 SG-03 **STREAM GAGE FLUME (PLAN VIEW)**
SCALE: N.T.S.



2 SG-03 **STREAM GAGE FLUME (ISOMETRIC VIEW)**
SCALE: NTS

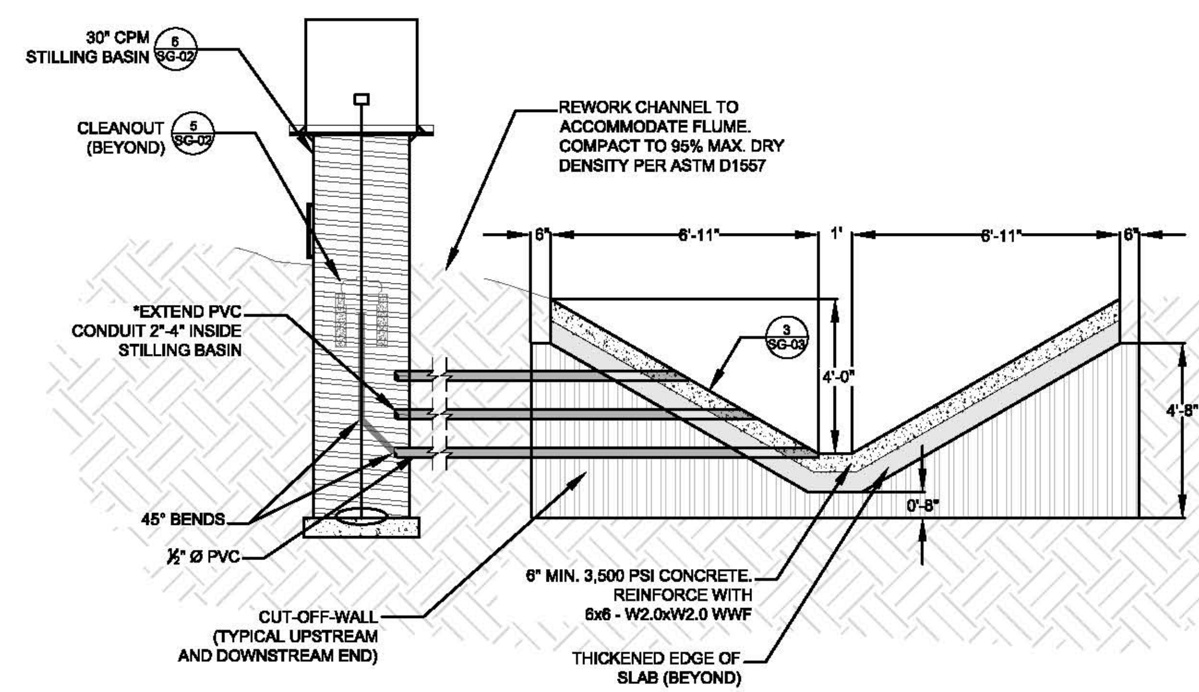


① 3-INCH Ø SCHEDULE 40 PVC. TRIM PIPE FLUSH WITH TOP OF SLAB. LOWER PIPE INVERT SHALL BE I-INCH BELOW FLUME INVERT.

② ½-INCH Ø SCHEDULE 40 PVC. TRIM FLUSH WITH TOP OF SLAB. INVERT APPROX. ½-INCH ABOVE TOP OF SLAB. (SEE PLAN VIEW)

3 SG-03 SG-03 **SECTION VIEW OF GAS PURGE STAGE MANOMETER CONDUIT & PIPE INTAKE**
SCALE: NTS

*NOTE: PIPE INVERT AT STILLING BASIN SHALL MATCH INVERT AT FLUME. PIPE SHALL BE LEVEL FOR ENTIRE LENGTH



A SG-03 SG-03 **STREAM GAGE (SECTION B-B)**
SCALE: NTS

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Appendix B

Geotechnical Engineering Report
(on CD included with this document)

Appendix C

HEC-RAS Calculations
(on CD included with this document)

Appendix D

Photo Documentation

This appendix contains a series of photographs depicting the work progress on the DP Canyon Grade Control Structure and associated Stream Gauge E039.1. Photos are representative of the work performed and completed as of the date noted. Although field work commenced October 26, 2010, photos were not allowed to be taken until November 14, 2009. These photos range from November 16, 2009 through final seeding on May 4, 2010.

November 16, 2009

Photo 1 Existing Stream Gage E039

Photo 2 Excavation for structure, looking northwest

Photo 3 Clearing for structure, looking south

Photo 4 Excavation for structure

November 16, 2009 (continued)

Photo 5 Structure excavation, looking north

Photo 6 Structure excavation, looking northwest

November 17, 2009

Photo 1 Gabion basket assembly area

Photo 2 Center line of structure length

November 18, 2009

Photo 1 Gabion stone stockpile area

Photo 2 Diversion channel

November 20, 2009

Photo 1 Structure construction, looking north

Photo 2 Gabion basket assembly area

Photo 3 Structure subgrade gabion baskets, looking north

November 28, 2009

Photo 1 Gabion basket assembly area

Photo 2 Gabion stone stockpile

Photo 3 North half of structure subgrade compaction, looking north

Photo 4 Structure subgrade compaction, north half, looking north

November 28, 2009 (continued)

Photo 5 Excavated north half of structure

Photo 6 Water intrusion in north-half excavation

Photo 7 Subgrade compaction, north half

December 3, 2009

Photo 1 Gabion assembly area, looking east

Photo 2 Access road and stone stockpile, looking west

Photo 3 Structure with geotextile fabric wrapped on upstream face, on north half of structure, pumping groundwater from stilling basin excavation

Photo 4 Structure with geotextile fabric wrapped on upstream face on north half of structure

December 5, 2009

Photo 1 Water intrusion in stilling basin excavation

Photo 2 Structure, looking north; subgrade and above grade gabion baskets

Photo 3 Water intrusion in stilling basin excavation

Photo 4 Structure construction, looking north/northwest

December 5, 2009 (continued)

Photo 5 North-half structure construction; water intrusion in stilling basin excavation

Photo 6 High water mark within stilling basin excavation area

Photo 7 Water intrusion, high water mark in stilling basin excavation

Photo 8 Stilling basin excavation, looking northeas

Photo 9 Stilling basin water intrusion

Photo 10 Structure construction, north half, pumping groundwater from stilling basin excavatio

December 17, 2009

Photo 1 Placing concrete cap on low-flow and overflow weir

Photo 2 Placing concrete cap on low-flow and overflow weir

Photo 3 Concrete cap covered for curing, structure facing north, water intrusion downstream of stilling basin

Photo 4 Concrete cap covered for curing, structure facing north, water intrusion downstream of stilling basin

January 3, 2010

Photo 1 Looking downstream at structure, concrete blankets covering concrete cap

Photo 2 Looking northeast at structure, concrete blankets covering concrete cap

Photo 3 Looking northeast at structure, concrete blankets covering concrete cap

Photo 4 Looking north at structure, ice covers stilling basin

January 7, 2010

Photo 1 Looking north, at structure and concrete cap

Photo 2 Riser pipe, before extension

Photo 3 Excavation for downstream installation of Class A and Class B rip rap

Photo 4 Structure, looking north; concrete cap on low-flow and overflow weir crests

January 9, 2010

Photo 1 Upstream face of structure, riser pipe before extension

Photo 2 Structure, looking north, downstream north slope prepared for Class B rip rap installation

Photo 3 Looking downstream towards flume location

Photo 4 Looking at upstream side of structure, flume location in backgound

January 9, 2010 (continued)

Photo 5 Downstream, facing side of structure, ice-filled stilling basin, looking northwest

Photo 6 Downstream, facing side of structure, ice-filled stilling basin, looking west

January 14, 2010

Photo 1 Structure, looking north

Photo 2 Upstream approach to structure

January 14, 2010 (continued)

Photo 3 Access road crossing southern confinement wall gabion baskets, looking east

Photo 4 Completed structure, looking south

Photo 5 Forms for flume headwall concrete placement, looking northeast from access road

Photo 6 Flume headwall forms, looking downstream from structure

January 26, 2010

No work due to weather.

Photo 1 Riser pipe (fully extended) looking northeast

Photo 2 Riser pipe looking northwest

February 18, 2010

Photo 1 Newly placed concrete headwall covered with blanket to cure

Photo 2 Excavation for Class B rip rap installation upstream of flume

Photo 3 Downstream side of structure rip rap installation work, fully extended riser pipe in foreground

Photo 4 Newly placed flume headwalls covered with concrete blankets to cure

February 18, 2010 (continued)

Photo 5 Flume headwall forms prior to placing concrete

Photo 6 Preparing north slope, downstream of structure, for rip rap installation

Photo 7 Preparing north slope, downstream of structure, for rip rap installation

Photo 8 Concrete blankets cover newly placed concrete headwalls

Photo 9 East headwall form, prior to concrete placement

Photo 10 West headwall form, prior to concrete placement

February 18, 2010 (continued)

Photo 11 Concrete for headwall placement

Photo 12 Headwall concrete slump test

Photo 13 Monitoring headwall concrete temperature

Photo 14 Setting up for concrete test

Photo 15 Concrete Test

Photo 16 Placing headwall concrete

February 18, 2010 (continued)

Photo 17 Placing headwall concrete

Photo 18 Placing headwall concrete

Photo 19 Placing headwall concrete

February 19, 2010

Photo 1 Class B rip rap installation, on north slope, downgradient of structure

Photo 2 Class B rip rap installation, on north slope, downgradient of structure; water being pumped from Class B excavation area

February 20, 2010

Photo 1 Class B rip rap on south slope, downgradient of structure

Photo 2 Class B rip rap on north slope, downgradient side of structure; pumping water from rip rap excavation area to keep flume subgrade dry

Photo 3 Preparing flume subgrade, concrete headwalls complete

Photo 4 Concrete headwall

February 20, 2010 (continued)

Photo 5 Class B rip rap, on south slope and downgradient of stilling basin, looking south

Photo 6 Looking upstream at downstream, facing side of structure from flume location

Photo 7 Preparing flume subgrade

Photo 8 Looking northeast from access road at flume subgrade preparation

February 21, 2010

Photo 1 Flume subgrade covered with concrete blanket to keep warm and dry

Photo 2 Removal of blanket from flume subgrade to continue preparation of flume subgrade

Photo 3 Compaction of flume subgrade

February 23, 2010

Photo 1 Grade control structure, looking south

Photo 2 Work on flume subgrade

February 24, 2010

Photo 1 Forming flume for concrete placement

Photo 2 Forming flume for concrete placement

Photo 3 Wire mesh reinforcement installed in flume form prior to concrete placement

Photo 4 Wire mesh reinforcement installed in flume form prior to concrete placement

Photo 5 Measuring concrete temperature for flume concrete placement

Photo 6 Measuring flume subgrade temperature prior to concrete placement

February 24, 2010 (continued)

Photo 7 Flume concrete placement

Photo 8 Concrete test of flume

Photo 9 Concrete test cylinders for flume concrete placement

Photo 10 Slump Test for flume concrete placement

Photo 11 Flume concrete placement and finishing

Photo 12 Flume concrete placement and finishing

February 24, 2010 (continued)

Photo 13 Gage Station stilling well placed in concrete

Photo 14 Finished flume concrete

Photo 15 Photo of water being pumped from upstream of flume to keep flume area dry

February 25, 2010

Photo 1 Flume concrete covered with concrete blankets to cure, looking northeast

Photo 2 Flume concrete covered with concrete blankets to cure, looking northeast from access road

February 26, 2010

Photo 1 Installation of Class A rip rap on upstream and downstream sides of flume

Photo 2 Installation of Class A rip rap on upstream and downstream sides of flume

February 27, 2010

Photo 1 Upstream face of structure with downstream rip rap and flume in background

Photo 2 Gage Station stilling well, looking northeast from access road

Photo 3 Completed Class B rip rap on north slope, on downgradient side of structure

Photo 4 Looking east, towards Stream Gage stilling well and access road

Photo 5 Completed Class B rip rap, upgradient of flume; Class A rip rap installation continues

Photo 6 Upstream face of structure; riser pipe in foreground and flume in background

March 5, 2010

Photo 1 Completed flume, looking east/northeast

Photo 2 Completed flume, looking west/northwest

Photo 3 Looking downstream at structure, riser pipe in foreground and flume in background

May 4, 2010

Photo 1 DP Canyon hydroseeding

Photo 2 DP Canyon hydroseeding

Photo 3 DP Canyon hydroseeding

Photo 4 DP Canyon hydroseeding

Photo 5 DP Canyon hydroseeding