THE NARRAGANSETT ELECTRIC COMPANY

RIPUC Dkt. No. 3732

Testimony of

Daniel McIntyre, P.E.

April 14, 2006

TESTIMONY OF DANIEL MCINTYRE, P.E.

Q. Please state your full name and business address.

A. My name is Daniel McIntyre. My business address is 55 Bearfoot Road, Northborough, MA.

Q. By whom are you employed and in what position?

A. I am a Principal Engineer in the Substation Engineering Group of the National Grid USA Service Company, which performs engineering and other services for the companies in the National Grid System, of which the petitioner is one.

Q. What are your professional qualifications?

A. I received a bachelor of science degree in Civil Engineering from Worcester Polytechnic Institute in 1981. I am a registered professional engineer in the States of Massachusetts, New Hampshire and Rhode Island with over 24 years experience in the civil engineering field. For the past 15 years I have worked for National Grid with the responsibility for providing civil engineering support to the permitting, design and construction of electric substations.

Q. What is your responsibility for this project?

A. I am responsible for the civil engineering design of the Tower Hill Substation.

Q. Were the designs prepared under your supervision?

A. Yes, they were.

Q. Have you previously testified on engineering matters for National Grid?

A. Yes. I have testified before the Massachusetts Department of Telecommunications and Energy as well as local zoning and planning boards in Massachusetts and Rhode Island.

Q. What is the purpose of your testimony?

A. My testimony will provide an overview description of the substation and site design details including storm water management, water resource protection measures, and potential community impacts, including noise, light and traffic. In addition I will provide information on our analysis of alternative sites considered for the substation.

Q. Will you please provide an overview of the Tower Hill site and the proposed substation design?

A. The Company is proposing to construct a 115/12.47 kV electric substation and ancillary facilities, which include transmission tap lines, on a site west of Tower Hill Road in North Kingstown. The land for the proposed substation site and transmission tap lines has been owned by the Company since the 1960's. A 34.5 kV line currently runs along the transmission tap line route and through the substation property.

The purpose of the substation is to maintain reliable electric power service to North Kingstown and the surrounding area by adding 12.47 kv distribution feeders to serve current and projected load in the area. The proposed substation will involve construction of a level yard measuring 155 feet by 250 feet and installation of the substation equipment and a control house measuring 14 feet by 36 feet within the yard. The substation yard will be surfaced with a layer of

crushed stone and there will be a perimeter fence around the yard. The substation has been designed for an ultimate layout of two transformers and eight distribution circuits. The control house will contain relay and metering equipment. The transformers will step down the 115 kV voltage to 12.47 kV, which is the distribution voltage used to supply customer load in the immediate area. A 1000 foot access driveway will be constructed from Tower Hill Road to the substation. Construction of a duct bank and installation of manholes is proposed within the access driveway for the 12.47 kV circuit getaway cables which will connect the substation to the Company's existing distribution circuits on Tower Hill Road.

Since the submittal of our Energy Facility Siting Board application, the Company has decided to use a metal clad substation design in lieu of the proposed open air substation design. The metal clad design encloses the 12.47 kV feeder positions in a building. This would be a single story building with plan dimensions of approximately 40 feet by 50 feet. The smaller control building would be eliminated and its equipment combined into the larger building. The transformers, 115 kV switch equipment and overall fence limits would remain the same. By enclosing some of the electrical equipment, the metal clad design may be considered more visually acceptable.

Q. What factors were considered in the layout of the substation yard on the Tower Hill site?

A. The parcel of land on which the substation is proposed to be constructed consists of approximately 13 acres. It is characterized by a large open field in its central

portion, a wooded area closer to Tower Hill Road and a 34.5 kV line which crosses the site on wood poles.

In general development of the site was dictated by the desire to locate the substation as far from abutting properties as possible. This allows screening of the substation from view as much as practical and has the added benefit of maintaining natural buffer areas for storm water management and reduces noise at the property line. In addition many of the mature evergreens growing around portions of the field will be preserved to serve as a natural screening.

Other considerations in designing the layout included the fact that the driveway alignment at the substation needs to accommodate delivery of equipment and subsequent maintenance or replacement of equipment. Also the existing 34.5 kV line will remain in service, so the substation yard needed to avoid this line.

An initial plan was to locate the substation in the western most part of the site. However based on input received from the Company's public outreach, the substation was re-positioned to a more central location on the site.

Q. Will you please provide a description of the stormwater management impacts of the proposed project?

A. A drainage analysis of the site was prepared for pre and post development conditions in accordance with State of Rhode Island Department of Environmental Management (RIDEM) "Stormwater Design and Installation Standards Manual". The site consists of approximately 13 acres of which only about 1.5 acres will be developed as part of the substation construction. More

importantly from a drainage aspect, impervious surfaces are limited to about 0.55 acres or less than 5% of the site. Due to their unique construction, substations typically do not generate large increases in stormwater runoff. Substations yards are constructed with well drained gravel to create a near level pad and surfaced with a layer of loose crushed stone. After storm events, the crushed stone surface and well-drained gravel will cause rainfall to infiltrate and prevent standing water. Impervious surfaces are limited to the concrete equipment foundations, access driveway and control building roof. Runoff from these areas will sheet flow into the crushed stone and infiltrate into the soil.

Due to the large undisturbed areas within the sub-watersheds, minimization of impervious surfaces, creation of a crushed stone surface within the substation yard and re-vegetation of disturbed surfaces, the expected storm water runoff under proposed conditions is essentially the same as existing conditions.

The site design also incorporates the use of vegetated filter strips. These are areas of natural vegetation maintained around developments which have the benefits of increasing infiltration and protecting water quality. This is a Best Management Practice (BMP) endorsed by RIDEM. The "Stormwater Design and Installation Standards Manual" recommends a minimum width of 25 feet for vegetated filter strips. For the Tower Hill site the filter strips are in excess of 100 feet.

Q. Will you please provide a description of the substation design features incorporated to protect water resources?

A. A potential water pollution source is the insulating fluid used in the transformers. The proposed substation will involve the installation of two (2) 115 kV to 12 kV transformers. Each transformer is cooled by circulating mineral oil dielectric fluid (MODF). Each transformer will contain approximately 5,000 gallons of MODF. In accordance with U. S. Environmental Protection Agency's (EPA) spill prevention, control and countermeasures (SPCC) requirements (Title 40 CFR Part 112), containment must be provided for the transformers. The proposed transformers will be supported on concrete foundations with a secondary containment system.

Secondary containment systems will be designed in conformance with guidelines developed by National Grid. A copy of the guidelines is Attachment DM-1 to this testimony. These guidelines and EPA regulations require that substation transformers containing oil must have secondary containment for the entire contents of the largest single container within the containment area, plus sufficient freeboard to allow for precipitation. A typical detail of the secondary containment system is provided as Figure 1 of the guidelines. Each transformer at the Tower Hill site will be surrounded by a system sized to contain at least 125% of its total volume. The regulators and breakers contain much smaller amounts of MODF. The crushed stone surfacing and a perimeter berm are used to contain any potential leak from these units.

EPA requires preparation of an SPCC Plan for the substation. These plans outline protocol and descriptive procedures for preventing spills and, in the event of a spill, reporting procedures, emergency contact telephone numbers and

cleanup procedures. As a standard operation procedure, an oil spill kit that contains material for conducting initial containment and cleanup of spills is located in each substation control building. Company employees are routinely trained to promptly contain, report and clean up any spills in accordance with these procedures. Due to the critical role substations play in the operation of its transmission and distribution system, Narragansett Electric performs regular inspections and maintenance of its substation equipment. In addition if a leak were to occur, the transformer is alarmed to notify our 24 hour a day trouble center to dispatch a crew to address the problem.

Although uncommon for substation sites given the measures in place to prevent contain and clean up spills, the Company is proposing installation of groundwater monitoring wells in conformance with Town of North Kingstown regulations. These wells will be tested annually for the presence of MODF.

The substation has batteries that contain acid similar to that found in automobile batteries. However, unlike automobile batteries, the substation batteries are located inside the control building and are provided with a secondary containment system of their own.

Q. What considerations has the Company given to other potential construction and operational impacts of this proposed project?

A. As part of the substation design we reviewed potential impacts of traffic, noise, visibility, lighting, waste disposal and Town utilities.

Traffic

The construction of the substation may have short term impacts similar to those associated with any construction site. Construction traffic is expected to have minimal impact on town streets as most of the work is located well off Tower Hill Road with adequate off street queuing, parking and off loading of construction equipment. Major construction at the site will be in accordance with local requirements. Construction of the ductline on Tower Hill Road will temporarily impact traffic. This work will require a Physical Alteration Permit (PAP) from Rhode Island Department of Transportation (RIDOT). All work will be done in accordance with any conditions imposed by the PAP and coordinated with local public safety officials. Once completed, the substation will be unmanned and traffic will consist of periodic inspection trips, generally on the order of once per week.

Noise

The Company conducted a sound survey for the proposed substation site to determine what effect the proposed equipment at the site would have on ambient noise levels in the vicinity. Daytime ambient noise measurements ranged from 47 dB to 49 dB and nighttime ambient noise measurements ranged from 31 dB to 33 dB. A simulation showed that the addition of the two transformers would increase nighttime noise levels by 4 dB at the property line closest to the Girard Lane residences. This would be considered just above the threshold of hearing. The nighttime noise impacts to the Pinecrest subdivision would be imperceptible. This analysis reflects the facts that the Company uses a reduced noise transformer

and the long distances between the transformers and the property lines. The results of the noise simulation are provided in Table 8-1 of the Southern Rhode Island 115 kV Transmission Project Environmental Report, Volume 1.

Visibility

The Company has developed an extensive landscape plan for the site to enhance existing vegetation. The substation has been sited to preserve many of the mature evergreen trees located around the open field area. Additional landscaping is proposed to complement these evergreens. Several earthen berms will be constructed as a physical barrier to nearby residences. These berms will also be planted with evergreen species for visual screening. The Landscaping Plan is Attachment DM-2 to this testimony.

Lighting

The Company is proposing to install emergency lighting within the substation yard. These lights are installed on 25 foot high poles and directed downward toward the substation equipment. The purpose of these lights is to allow safe working conditions in the event of an emergency customer outage that requires immediate equipment repairs at night. The lights are manually controlled and normally off. An entrance light will be above the control building door so Company personnel can see to unlock the door at night. This light will be mounted on the side of the building at about 8 feet and be activated by a motion sensor.

Utilities

The substation is un-manned and will not generate solid waste on a regular basis. During construction, dumpsters will be on site to collect trash and debris for proper disposal. Any wastes generated during construction or operation will be disposed of by a private contractor. The substation has no bathroom facilities so it does not require water, sewer or a septic system.

Q. What considerations has the Company given to public safety at the substation site?

A. The facility is designed to meet National Electric Safety Code (NESC) standards. The substation yard will be surrounded by a 7 foot high chain link fence with three strands of barbed wire at the top for a total height of 8 feet. The fence height exceeds NESC standards. The fence will also be posted with warning signs along its entire perimeter and the substation site will be posted with no trespassing signs. In addition the access into the driveway will be controlled by a metal barrier gate. Company personnel regularly perform visual and operational inspections of the equipment to maintain its safe operation. In addition certain equipment within the substation will be linked electronically to the Company's operation center. This will provide notification to company personnel of any unusual occurrences at the substation between the scheduled inspections.

Q. What criteria did the Company use in selecting the Tower Hill site as the preferred substation location?

A. This substation site, or any substation site for that matter, is evaluated against the following criteria.

1. The ability to tap into the 115 kV transmission line to supply the substation. A site that is not adjacent to the supply lines or transmission line right of way (ROW) would make siting a substation impractical due to the requirement for obtaining rights for extending the transmission lines to the site. In the case of the Tower Hill Road substation site there is an existing electric utility ROW that connects the substation parcel to the main 115 kV transmission line ROW.

2. The site must be located in the general vicinity of the load center and distribution feeders. Existing distribution feeders are located on Tower Hill Road. In addition the proximity of West Allenton Road and the 34.5 kV ROW allows the substation distribution feeders to spread in all directions from the substation. This allows efficient distribution of electricity and minimizes outage risks that result from having multiple feeders on one pole line.

3. The site must have a lot size and shape sufficient to allow construction of a 115 kV to 12.47 kV substation. Generally a 115 kV substation requires a minimum of approximately 4 acres but is highly dependent on physical constraints such as topography, wetlands and access. The Tower Hill site consists of 13 acres and is relatively flat and has easy access to a local road. There is a small isolated wetland in one corner of the site but the substation can be located so as not to disturb it.

4. The site selection should minimize environmental impacts. This would primarily be wetlands and water resources which are regulated by the RIDEM. The Tower Hill site will not disturb any wetlands. The parcel is within a

groundwater protection overlay district established by the Town of North Kingstown.

5. The site selection and layout should minimize visual impacts to abutters and the general public. Although the site is generally an open field, it is surrounded by mature vegetation to block views from the public. The site is large enough to position the substation away from property lines and allow construction of appropriate buffers for immediate abutters.

Cost is a significant factor in each of the foregoing criteria. The final site selection involves balancing the cost of the alternative and the factors discussed above.

Q. Would you describe the alternative sites investigated and their potential for use as a substation location?

A. Six alternative sites were evaluated for location of the substation location. Several of these sites were identified by the Company during its initial screening. Others were evaluated at the request of the Town of North Kingstown during our public outreach. All are shown on Figure 5-5 of the Southern Rhode Island 115 kV Transmission Project Environmental Report, Volume 2.

Indian Corner Road. This site is on the G185/L190 transmission line corridor. It is open space and is owned by the Town of North Kingstown. It contains approximately 62 acres and has frontage on Indian Corner Road. Locating a substation on this parcel would require acquiring it from the Town.

The substation supply lines would tap directly from the existing and proposed transmission lines. Distribution getaways would run underground along

Indian Corner Road and West Allenton Road for a significant distance to avoid overhead double circuiting, substantially increasing the distribution costs over the preferred alternative.

The site has no obvious environmental restrictions. The land is zoned as Open Space with a groundwater protection overlay district. Substations are prohibited in this zone. This site would require re-zoning from the Town of North Kingstown to be used as a substation.

The site includes Donald Downs Park and Liscio Field but appears large enough to minimize view shed impacts to residential abutters and the park users.

Due to the zoning restrictions and the increased costs of distribution and site acquisition, this site is not considered a practical alternative to the proposed substation site.

Tower Hill Tap Point. The site consists of two landlocked parcels owned by Narragansett Electric and containing approximately 14.2 acres. It is directly adjacent to the G185/L190 transmission line corridor at the proposed tap point for the Tower Hill Substation tap lines. The majority of the site is wetlands. The zoning is residential with a groundwater protection overlay district. Substations are allowed by Special Use Permit in this zone.

Due to the expanse of wetlands, a substation would be very difficult to design and permit at the Tap Point. Also the site is landlocked so access would need to be developed along Narragansett ROW to a local street, most likely Tower Hill Road. The length of the driveway would impact additional wetlands and the feeder ductline to Tower Hill Road would significantly increase costs.

Due to the wetland impacts, access and cost issues, this site is not considered a practical alternative.

Tower Hill East. The site contains approximately 62 acres located on the east side of Tower Hill Road. It is approximately 1 mile from the transmission supply lines but is along existing transmission line ROW. The site is owned by the Company and is currently crossed by a 34.5 kV line. There are significant wetlands on this site; however it appears there is enough upland area in the north central portion of the parcel (adjacent to the cemetery) where a substation could be constructed. The transmission taps would be approximately 6,000 feet long from the existing 115 kV transmission corridor. Distribution getaways would run out along Tower Hill Road to serve the load. There may be some wetland impacts due to construction of the access driveway from Tower Hill Road. The site is wooded and the topography is sloping which would increase site preparation costs.

A substation on this site would probably not be visible from public view; however the tap lines would be longer and visible as they cross over Tower Hill Road.

The site is zoned residential with a groundwater protection overlay district. Substations are allowed by Special Use Permit in this zone.

This site is comparable to the preferred site. However the longer transmission tap lines, additional earthwork, wetlands mitigation and tree clearing would increase costs by approximately $1.8 million over the preferred alternative.

Oak Hill Road Town Well Site. This site, located south of Oak Hill Road and east of Route 4, is Town-owned land that contains three town-owned, public drinking water wells. Each well has a 400-foot protective radius. The transmission line ROW traverses the property. The two parcels making up the water department site are zoned Rural Residential and Public Use. Both parcels are in the Zone 1 Groundwater Protection Overlay.

The site is large enough for a substation. The area near the old DPW garage would be a likely location for the substation. The substation would be directly up gradient of the town wells within the Zone 1 recharge area. Groundwater flows from west to east across the substation site towards the town wells. The North Kingstown Water Department, in consultation with the Rhode Island Department of Health, would have to approve the substation use on this site. According to the North Kingstown Water Department, the existing water department driveway is within Zone I (a 400-foot protective radius of the wells) and it cannot be used to access a proposed substation. A new driveway must be constructed off Oak Hill Road along the transmission ROW that would impact wetlands within the Groundwater Protection Zone 1 overlay. In addition, security of the wellheads is a priority of the Water Department.

The Water Department property would require a subdivision to create a legal parcel for Narragansett Electric and a portion of the land would need to be acquired from the Town. Substations are allowed by Special Use Permit. Distribution feeders would need to be constructed underground for a distance of approximately 1.6 miles along Route 4 and West Allenton Road. RIDOT would

need to approve this construction. As part of RIDOT approval, other alternative sites for the substation would be reviewed.

Distribution feeders would cross a fairly large stream flowing under Route 4 toward the wells. This crossing has not been designed and may impact costs. Site investigation and possible remediation would be required for the former DPW garage area. The cost of such work has not been determined.

The lengthy underground distribution system and subdivision survey, possible removal of DPW garage, wetlands mitigation and tree clearing would increase costs by approximately $3.3 million over the preferred alternative and would significantly add to the time required to complete the needed electrical improvements.

Due to the proximity of the town wells, wetlands impacts and substantial increase in cost, this site is not considered a practical alternative to the proposed substation site.

Route 4 Town Well Site. This site, located west of Route 4 and north of the existing transmission line ROW, is Town-owned land that contains one town well. The well has a 400-foot protective radius. The transmission line ROW traverses the southern portion of property, outside of the 400 foot radius. The parcel of interest is zoned Rural Residential and is in a Zone 1 Groundwater Protection Overlay.

Development of this parcel is restricted by the following language in the deed conveying the property to the Town: “the use of the premises hereby conveyed shall be restricted in perpetuity to conservation purposes for public

drinking water protection pursuant to Rhode Island General Laws section 46-15.3." Removal of this restriction would require, at a minimum, agreement of the Town and the former owner of the property. Transfer of the property to Narragansett would require approval of the Town at a general or special election pursuant to section 314 of the North Kingstown Charter.

Most of the site is wetland. There is a wooded upland area that would need to be cleared for a substation. Access to the site is severely restricted. According to the North Kingstown Water Department, the existing water department driveway off Route 4 would not be allowed for substation access because it is within the 400-foot protective radius and the Town is concerned about maintaining security of the wellhead. A shared driveway would also require extensive wetlands impacts to access an area for the substation. Therefore a new driveway must be constructed off Route 4. Because this is a limited-access section of Route 4, it is unlikely that RIDOT would approve access if there were other feasible alternative locations for the substation.

If the Company were issued a curb cut approval from RIDOT, an acceleration and deceleration lane on Route 4 would be necessary for access and egress. The driveway would require wetlands filling within the Groundwater Protection Zone 1 of the well. Water Department property would require a subdivision to create a legal parcel for Narragansett Electric and a portion of the land would need to be acquired from the Town. The North Kingstown Water Department, in consultation with the Department of Health would have to approve the substation use on this site.

Distribution feeders would be constructed underground along Route 4 and West Allenton Road. RIDOT would need to approve this construction and compare it against other alternative sites for the substation.

Due to the development restrictions placed on this land, it is not considered a practical alternative to the proposed substation site. Even if the restriction could be lifted, the lengthy underground distribution system and subdivision survey, additional earthwork, wetlands mitigation and tree clearing would increase costs by approximately $1.8 million over the preferred alternative and would significantly add to the time needed to complete the needed electrical improvements.

Narragansett has also examined a parcel it owns which is located adjacent to the Route 4 Town Well Site (Assessor's Plat No. 75, Lot 8). This Narragansett property is not subject to development restrictions and it would not be necessary to subdivide it for use as a substation. However, the other constraints and costs discussed above would also be constraints to the use of the Narragansett parcel for the substation.

RIDOT Property. This parcel which is located west of Route 4 at West Allenton Road was purchased by RIDOT for future safety improvements to the Route 4 and West Allenton Road intersection. RIDOT anticipates that the intersection improvements will occur within three to five years and that there will be no excess land beyond that needed for the highway improvements.

In addition, there is not an existing ROW from the existing transmission line ROW to the site for the transmission tap lines into the substation. The land

between the transmission line right of way and the site is residentially developed so it would be very difficult if not impossible to secure new ROW for overhead tap lines.

Because of unavailability of the lot and the difficulty in obtaining a ROW for the tap lines, this site was rejected as a feasible alternative at a screening level.

Q. In summary, are any of these alternative sites preferable to the proposed Tower Hill Road site?

A. No. Each of the alternative sites would have greater wetland impacts than the Tower Hill site. Two of the alternative sites, Route 4 and Oak Hill Road, are within a groundwater protection 1 overlay district and much closer to the Town well sites. These two sites also require installation of facilities along a limited access highway, making construction and future maintenance more difficult and is discouraged by RIDOT. A portion of the Route 4 Town Well site is subject to deed restrictions that prevent any development at all. The Indian Corner Road site is open space where a substation is prohibited. The RIDOT parcel is needed for highway improvements and does not have access to the 115 kV supply lines.

The proposed Tower Hill substation site does not have wetland impacts, has easy access from a local road, is close to the existing electric distribution network and has the least earthwork, least tree clearing requirements and least cost. In addition the substation can be set well off the public way and can be effectively screened from abutters.

Q. Does this conclude your testimony?

A. Yes, it does.

LIST OF ATTACHMENTS

DM-1 Design Philosophy – Power Transformer Secondary Containment

DM-2 Drawing H-78457-0, Landscaping & Erosion Control Plan

National Grid

DESIGN PHILOSOPHY
POWER TRANSFORMER SECONDARY CONTAINMENT

CONTENTS

Prepared by
National Grid USA Service Company
55 Bearfoot Road
Northborough, MA 01532

DESIGN GUIDELINES
POWER TRANSFORMER SECONDARY CONTAINMENT

1.0 Background

Power transformers are used to change the voltage through a portion of the electrical transmission or distribution system. The transformers are filled with Mineral Oil Dielectric Fluid (MODF) which is used for cooling and provides electrical insulation for the transformer. Because the transformers generally contain large quantities of MODF and may be located in close proximity to surface waters, certain measures have been taken to prevent and control a potential release of MODF. These measures include: the development of Spill Prevention Control and Countermeasure (SPCC) Plans that outline spill preventative measures and spill response procedures, the installation of spill detainment structures, and the installation of electrical equipment protective/warning devices.

2.0 Potential Failure Modes

In order to evaluate the risk of a MODF release, the potential failure modes of a transformer must be understood. Experience indicates that the potential modes of power transformer failure that would result in a release of MODF include:

(a) Discharge from the pressure release device. There is a small potential for an MODF discharge through the pressure release device. If a release did occur during a transformer malfunction, it would be in the range of 1 to 50 gallons.

(b) Rupture of the transformer tank. There is a very small potential for a MODF discharge through rupture of the transformer wall due to catastrophic failure. In this case the entire MODF content could Potentially be released.

(c) Leak at a bolted flange or fitting. Most releases from a transformer are incidental and occur as small drips which develop over time in joint seals, bolted flanges, valves or other fittings.

3.0 Spill Prevention and Control

3.1 Prevention

Our primary objective is to prevent an MODF release. This section describes several measures in place to prevent an MODF release.

3.1.1 Electrical Equipment Protective/Warning Devices

MODF-filled equipment may be provided with one or more type of electrical protective/warning devices. These devices are designed to prevent or minimize damage to the electrical equipment in the event of a malfunction. Protection of the equipment minimizes the potential for a release of MODF. Certain types of devices are remotely alarmed to the local Dispatch Center. The devices are described below.

Breather or Vent - These devices are designed to either allow the equipment to operate at atmospheric pressure or at a minimum positive or negative pressure. This prevents a rupture of the equipment as a result of increased internal pressure.

Pressure Relief Device - This device relieves large volumes of pressure to prevent a rupture of the equipment as a result of increased internal pressure.

Sudden Pressure Relay - This device senses a rapid build-up of internal pressure within the transformer. The relay will cause an interruption of the electrical supply to the transformer and remove it from service to prevent rupture of the equipment.

Level Indicator - This mechanism allows visual monitoring of the MODF level in the equipment.

Low Level Alarm - This device will cause a remote alarm when the MODF level in the equipment drops below a set point.

Low Level Trip Device - This device will cause the transformer to be removed from service when the MODF level drops within the equipment to the minimum operational level.

3.1.2 Inspections and Maintenance

Substation Operations and Maintenance (O&M) personnel are responsible for the maintenance and inspection of the equipment associated with the substations. Two types of inspections are conducted by O&M: Visual and Operational Inspections and Diagnostic and Maintenance Inspections. These inspections are described below.

Visual and Operational Inspections (V&O)-A bi-monthly V&O inspection which includes a visual check of all equipment and an operation check of automatic equipment such as regulator controls, air compressors, and transformer cooling fans. Visual inspections of the electrical apparatus include a check of level indicators. The Substation is also inspected for evidence of leakage.

Diagnostic and Maintenance Inspections- A diagnostic and maintenance inspection is performed on apparatus at periodic intervals established by system maintenance standards. Each piece of equipment is tested and operated to ensure that all components are functioning properly and efficiently. Results from these tests determine whether a piece of equipment will undergo additional maintenance or overhaul.

3.1.3 Training

Substation O& M personnel are instructed on the proper operation and maintenance of equipment in order to prevent a discharge of MODF. This instruction is provided through classroom and on the job training. Training topics include:

* Work methods and safe work practices;
* Spill prevention and notification procedures
* Emergency procedures for equipment and systems including response to fires and spills;
* Spill clean up procedures;
* Protecting sensitive receptors;
* Communication and alarm systems within the facility;
* Applicable environmental regulations and responsibilities to public and regulatory agencies.

Early detection of small drips is accomplished by our maintenance crews. Since transformers are a vital part of our electric distribution system, a preventative maintenance program requires thorough inspection of transformers each month. Leaky fittings are identified and repaired.

3.2 Spill Control

3.2.1 Design Criteria

In the unlikely event our preventive measures fail to stop a release, the following design criteria has been established specifically for our electric substations.

(a) Secondary containment is intended to mitigate releases and minimize any threat to the public safety or environment.

(b) The system shall allow for safe access around the transformer for maintenance personnel.

(c) In the event of a significant releases the system shall contain the total MODF volume for a sufficient time to allow emergency response crews to arrive at the site.

(d) The system shall minimize the threat or spread of fire in order to speed clean up and ensure safety of responding personnel.

(e) The system shall be located above the water table as far as possible but no less than 12 inches.

(f) In the event of a small releases the system shall extend beyond the physical dimensions of the transformer to contain a leak from any portion of the transformer.

(g) The system shall be designed to minimize spread and clean up of small leaks or drips.

3.2.2 Design Description

The containment system selected consists of a sump, or moat, constructed around the transformer foundation and above groundwater. The sump is lined with a 12 inch layer of compacted silty sand material sandwiched between two layers of polypropylene fabric. Perforated PVC standpipes are installed in each corner of the sump. The sump is then backfilled with 1-1/2 inch size trap rock.

Each component of the system performs a specific function related to the specified design criteria.

Trap Rock. The sump is sized so the voids in the trap rock layer provide sufficient volume for 100% of the MODF in the equipment plus an additional 20% to account for rainfall. In addition the trap rock will minimize fire potential by trapping free MODF away from the oxygen source. For small releases the MODF tends to adhere to the large surface area of the angular traprock, thereby preventing migration and easing clean up.

Polypropylene Layers. Polypropylene is a geotextile fabric selected for its ability to allow rainwater passage and maintain separation between the compact soil liner and native soils on the bottom and trap rock on the top. In addition the top layer of fabric will contain small releases which may migrate through the trap rock.

Silt Sand Soil Liner. The soil liner is intended to provide a low hydraulic conductivity or permeability. Therefore under conditions expected during a release, any MODF would be detained by the soil liner. Based on the Company's early detection and response systems, this approach is considered reasonable. This semi permeable liner has the added benefit of allowing rainwater that

falls onto the sump to drain away and eliminates the need to continually monitor and pump off water accumulation.

PVC Standpipes. After a significant release, the standpipes will be used by the clean up contractor to vacuum out the free MODF from the trap rock voids. The trap rock will then be removed and disposed. If the liner is contaminated it will also be removed and replaced. Although clean up is expensive with this type of containment, it is not considered a significant life cycle cost given the low probability of a major release and ensures full cleanup of the site.

4.0 Spill Response Procedures

The following section describes the response actions that will be taken in the event that there is a release of MODF to the environment. This information is also described in the Spill Prevention Control and Countermeasure(SPCC) Plans that have been developed in accordance with federal oil pollution control regulations for facilities that have any potential to release oil into "waters of the U.S.". Although the SPCC plans address spills to surface water, it should be noted that the same response measures are taken for any spill.

a. Personnel Roles and Responsibilities - All appropriate staff is trained in spill response procedures according to their job responsibilities.

Substation O&M personnel have the responsibility to:

- Be familiar with the contents of spill response plans for the substation and know how to respond upon discovery of a spill;
- Be aware of the potential failure modes of the Substation equipment and report to their supervisor any conditions which may lead to a failure.

O&M Supervisors are also responsible to:

- Supervise the containment and cleanup effort in accordance with spill response plans;
- Assess the spill to determine the appropriate action in accordance with the contingencies established in the plan;
- Instruct responding personnel on the methods to be employed for containing and cleaning up the spill;
- Enlist the assistance of outside contractors if it is determined that the spill cannot be managed by O&M personnel; and
- Inform other company officials including the district environmental engineer and the appropriate local, state, and federal agencies.

- Ensure that the personnel identified in this section attend training classes. The training classes will be conducted annually and will cover the topics listed in the section above.

b. Notification Procedures - All appropriate personnel are training in the proper notification procedures in the event that a release is discovered or in the event a substation alarm is activated. The in-house notification procedures include notification of a supervisor, an environmental engineer, Company Environmental and Safety Department staff members, and the operations manager, if necessary. If a release over a "reportable quantity" has occurred, the environmental engineer or supervisor contacts the appropriate regulatory agencies. Depending on site conditions, an outside spill response contractor, such as Clean Harbors and/or environmental consultant may also be contacted for assistance.

c. Spill Response Procedures - In the event of a release, the following steps are taken:

Upon discovery of a release, notification procedures as presented above and outlined in the spill response plans are implemented. The first O&M personnel responding to the release will attempt to isolate and repair the leak or to stop the flow using mechanical methods.

If the release occurs during a transfer operation, the transfer will be immediately stopped and measures taken to stop the leak and contain the flow will commence immediately. Notification procedures will be initiated as soon as practical.

Sorbent materials will be used to the maximum extent possible to contain and remove the spilled MODF. The first O&M personnel to arrive at the spill location will respond to the spill using available spill response equipment and materials consistent with their training. Upon arrival, the supervisor or environmental engineer will determine whether additional resources will be needed.

If the supervisor or environmental engineer determines that the response to the release requires assistance from a licensed oil and hazardous waste cleanup contractor, one or more will be contacted immediately.

If enough MODF is released to saturate the crushed stone in a portion of one of the detainment structures, the cleanup contractors will be instructed to remove the discharged MODF and any contaminated debris. Smaller releases into containment structures can be handled by O&M personnel. With an emphasis on worker safety, the supervisor will determine whether to resume station operations prior to completion of cleanup operations. Any

transfer operations that were occurring at the time of the release will not resume until the discharge is contained and the cleanup procedure is initiated.

All containment and cleanup operations shall be performed in accordance with safe work practices. Personnel shall utilize personal protective clothing and equipment when appropriate.

Once a spill has been contained and the leak repaired, cleanup crews may begin to remove the spill using oil sorbent materials. On permeable surfaces, this will include removing the affected surface material around the spill site. The spill area will be cleaned up to visible traces.

All cleanup materials including protective clothing (if contaminated) will be placed in standard Department of Transportation (DOT) open-top drums. Drums should be filled with sufficient absorbent material to eliminate liquids.

Full drums should be covered with the appropriate lid and ring. The drum is labeled with material name, hazard identification, and date.

The removed MODF and contaminated debris will be disposed at a licensed Treatment, Storage, and Disposal Facility. Upon completion of the spill cleanup, the supervisor prepares an in-house spill report for submittal to the Operations Manager, the District Environmental Engineer and the Environmental and Safety Department.

These actions, as well as the procedures for notifications, are summarized in the Contingency Plan Flow Chart that is posted at each facility.

MATERIALS REQ'D

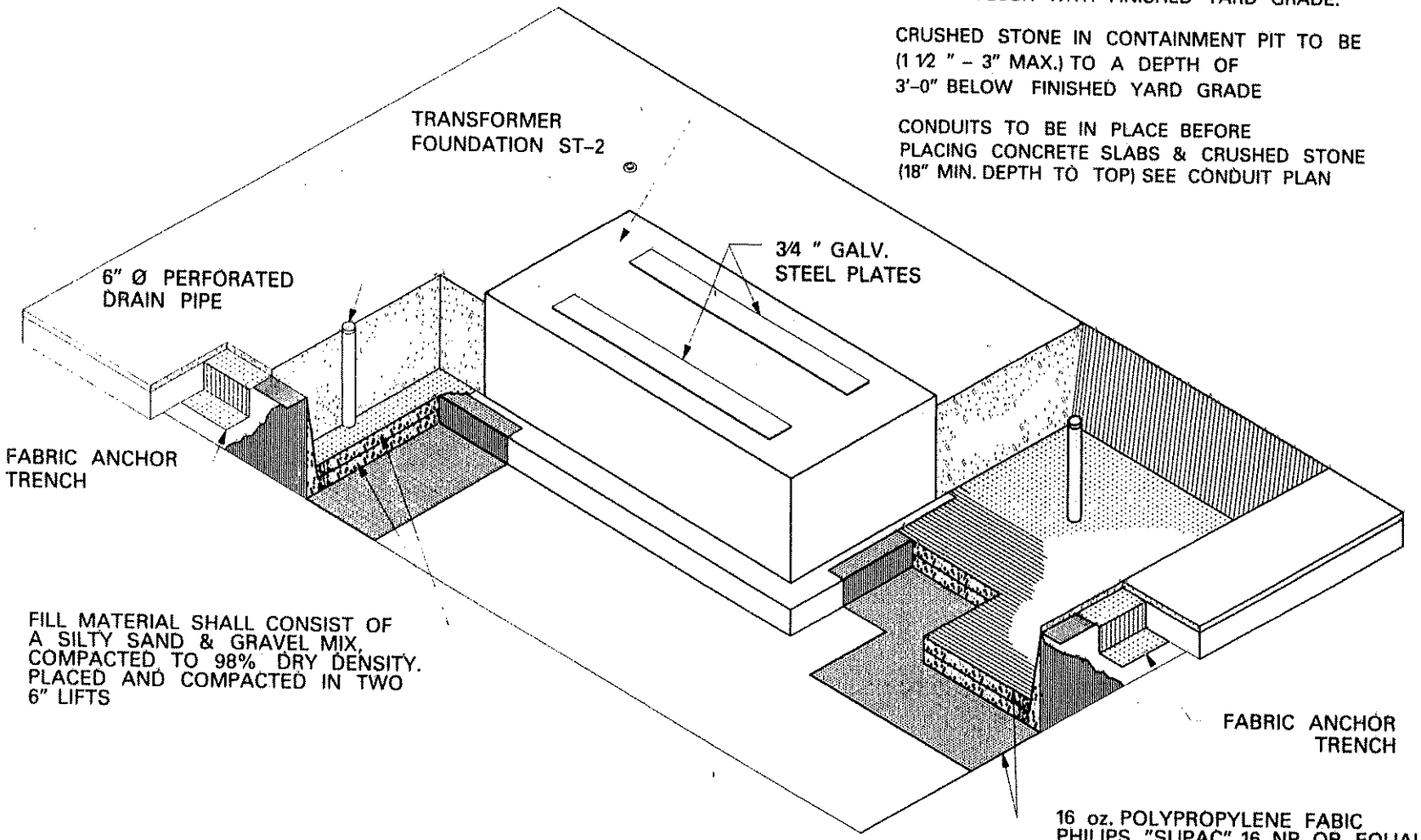
4 Pc.– 6" PVC – DWV SOCKET WITH FEMALE ADAPTER
4 Pc.– 6" Ø PVC PIPE PLUG
4 Pc.– 6" Ø x 3'–0" LG. PVC PIPE

NOTES

FIELD TO INSTALL 4 – 6" Ø x 3'–0" LG. VERTICALLY SET PERFORATED PLASTIC DRAIN PIPES WITH REMOVABLE CAPS OR PLUGS. CAPPED END TO BE SET FLUSH WITH FINISHED YARD GRADE.

CRUSHED STONE IN CONTAINMENT PIT TO BE (1 1/2 " – 3" MAX.) TO A DEPTH OF 3'–0" BELOW FINISHED YARD GRADE

CONDUITS TO BE IN PLACE BEFORE PLACING CONCRETE SLABS & CRUSHED STONE (18" MIN. DEPTH TO TOP) SEE CONDUIT PLAN



TRANSFORMER OIL SUMP CONTAINMENT PIT

No.	DATE	BY	REVISION

TITLE
STANDARD LO PROFILE
TRANSFOMER OIL SUMP
CONTAINMENT PIT

SCALE NTS

DRAWN DWG
DESIGNED DWG
CHKD
REVIEWED

INSPECTED
APPROVED
REV.

FIGURE 1

H-78457-0

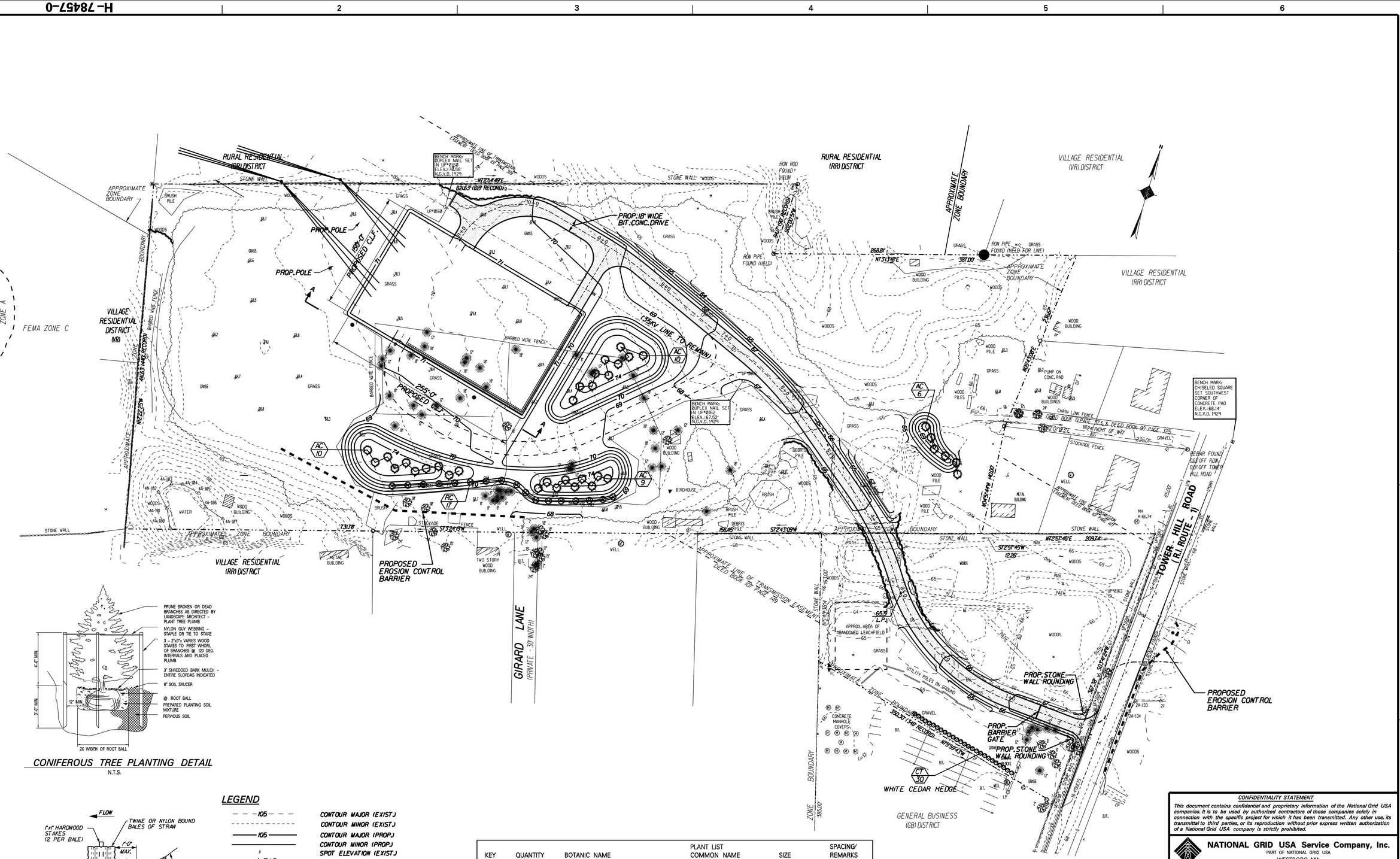
REVISIONS

REV.	DATE	DESCRIPTION	MADE	CHKD	INSP	REVD	APVD	APVD
1								
2								
3								
4								
5								
6								
7								
8								

FILE: E:\S1 Pierre Charles\Power Mill\H78453.dgn

ORIGINAL	DATE
DRAWN	
DESIGNED	
CHECKED	
INSPECTED	
REVIEWED	
APPROVED	
APPROVED	

"0" ISSUE ON # 90048-900000210



CONIFEROUS TREE PLANTING DETAIL

N.T.S.

EROSION CONTROL BARRIER

N.T.S.

LEGEND

105	CONTOUR MAJOR (EXIST.)
	CONTOUR MINOR (EXIST.)
105	CONTOUR MAJOR (PROP.)
	CONTOUR MINOR (PROP.)
x 74.5	SPOT ELEVATION (EXIST.)
	SPOT ELEVATION (PROP.)
t	TELEPHONE CONDUITS
w	WATER MAIN
g	GAS LINE
OHW	ELEC. OVERHEAD WIRES
	TREELINE
C.L.F.	CHAIN LINK FENCE
	PROP. BIT. CONC. PAVEMENT

KEY	QUANTITY	BOTANIC NAME	PLANT LIST COMMON NAME	SIZE	SPACING/ REMARKS
TREES					
AC	35	ABIES CONCOLOR	WHITE FIR	6' – 8' B&B	15' O.C.
CT	30	CHAMAECYPARIS THYOIDES	ATLANTIC WHITE CEDAR	6' – 8' B&B	6'-8' O.C.
SHRUBS					
RC	17	RHODODENDRON CAROLINIANUM	COMPACT INKBERRY	3' B&B	8' O.C.

0 50 100 150 200
Scale In Feet

NATIONAL GRID USA Service Company, Inc.
PART OF NATIONAL GRID USA
WESTBORO, MA

THE NARRAGANSETT ELECTRIC COMPANY
TOWER HILL SUBSTATION
NORTH KINGSTOWN, RHODE ISLAND
PLAT 72 LOTS 42 & 69

LANDSCAPING /EROSION CONTROL

SCALE 1"=50'

NOTED

H-78457-0