



Title: Land Acquisition and Regulatory Compliance	Authors: L. Watson	Date: 2024-01-29
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Land Acquisition and Regulatory Compliance

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Change Record

Version	Date	Author	Notes/Changes
1	2018-9-15	J. Bolyard	Initial Draft
2		J. Bolyard	All
B	2022-11-14	L. Watson	All
B.1	2023-03-10	L. Watson	Addressed internal review comments; revised figures
C	2024-01-29	W. Hojnowski	Updates for Conceptual Design Review release



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I Introduction

The next generation Very Large Array (ngVLA) project is targeted for the National Science Foundation (NSF) Major Research Equipment and Facility Construction (MREFC) and requires National Science Board (NSB) approval. The ngVLA project requires compliance with the NSF policies for the planning and managing of large facilities. This document describes the process National Radio Astronomy Observatory (NRAO) has identified to ensure the ngVLA project meets regulatory compliance with indigenous nations and federal, state, provincial and local environmental regulations, including international.

This document identifies relevant regulatory requirements that could impact the construction project scope, schedule and budget. This document does not attempt to describe the revisions that may be necessary to NRAO’s Environment, Safety, and Security Policy and Program Manual (Safety Manual). Based on the scope and complexity of activities for the proposed ngVLA project, it is beyond the scope of this document to develop specific safety plans and programs.

I.1 Project Background

NRAO proposed ngVLA project is to design and build an astronomical observatory that will operate at centimeter wavelengths (25 to 0.26 centimeters, corresponding to a frequency range extending from 1.2 GHz to 116 GHz). The observatory will be a synthesis radio telescope of reflector antennas operating in a phased or interferometric mode.

I.1.1 Applicable Documents

Design documents that contain detailed civil design and infrastructure information on the proposed ngVLA project provide applicable information for land acquisition and regulatory compliance (LA/RC) activities. In case of a conflict between the documents referenced in Table I-1 and this report, the documents listed in the table shall be considered a superseding requirement. The ngVLA project and the scientific merits are described in the system and functional requirement documents.

Table I-1 Related Land Acquisition and Regulatory Compliance Documents

Ref No.	Document Title	Doc. Number
AD 01	FY2023-FY2027 ngVLA Project Development Plan	020.05.00.00.00-0004 PLA
AD 02	ngVLA Product Assurance Plan	020.05.20.00.00-0002 PLA
AD 03	Project Execution Plan	020.05.00.00.00-0006 PLA
AD 04	Systems Engineering Management Plan	020.10.00.00.00-0001 PLA
AD 05	Assembly, Integration, and Verification (AIV) Concept	020.10.05.00.00-0005 PLA
AD 06	System Environmental Specification	020.10.15.10.00-0001 SPE
AD 07	ngVLA System Electronics Specifications	020.10.15.10.00-0008 REQ
AD 08	Preliminary System Architecture Description	020.10.20.00.00-0002 REP
AD 09	System Conceptual Design Description	020.10.20.00.00-0005 REP
AD 10	Array Configuration: Design Description Design Description	020.23.00.00.00-0002 DSN
AD 11	Security Management Plan and Security Requirements	020.80.00.00.00-0003 REQ
AD 12	LI Safety Requirements	020.80.00.00.00-0001 REQ
AD 13	Civil and Infrastructure Subsystems: Design Description	020.60.00.00.00-0004 DSN

I.1.2 Reference Documents

Design documents that contain detailed civil design and infrastructure information on the proposed ngVLA project provide reference information for LA/RC activities. In the event of conflict between the documents



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referenced in Table I-2 and this report, this report shall be considered as a superseding requirement for site selection, and local stakeholders.

Table I-2 Land Acquisition and Regulatory Compliance Reference Documents

Ref No.	Document Title	Doc. Number
RD 01	ngVLA Operations Plan	020.10.05.05.00-0001 PLA
RD 02	System Conceptual Design Description	020.10.20.00.00-0005 REP
RD 03	Stakeholder Requirements	020.10.15.01.00-0001 REQ

1.2 Land Acquisition and Regulatory Compliance Scope

This document describes LA/RC requirements for the proposed ngVLA through the project life cycle defined in NSF Research Investment Guide (RIG) (NSF Large Facilities Office, 2021). Requirements for regulatory compliance, permitting, and rights-of-way acquisition through the proposed ngVLA project life cycle of development, construction, commissioning, operation, and divestment are described in this report. LA/RC involves federal, state, provincial, and local agencies in the United States, partner nations and stakeholder engagement during the project life cycle. This document describes the approach to meeting indigenous nations, federal, state, and local environmental permitting regulatory compliance requirements for a project where the core sub-array antenna sites are located in the southwest United States.

This requirements document follows NSF’s Research Infrastructure Guide’s defined life cycle stages:

- **Design Stage** – includes site selection, environmental review, permit applications, and community engagement.
- **Construction Stage**– includes the acquisition of rights-of-way grants, leases, variance process, and grievance management.
- **Operation Stage** – includes the environmental management system, renewal of rights-of-way grants and annual reports, and community engagement.
- **Divestment Stage** – includes termination of rights-of-way grants, leases, site reclamation, and communication with the community.

Figure I-1 shows the relationship between NRAO’s design process and rights-of-way applications, and National Environmental Policy Act (NEPA) process. Work packages associated with LA/RC activities are environmental regulatory compliance, permit applications, and the acquisition of rights-of-way grants, easements, and land leases. Refining project design or changing proposed antenna locations may require revising the list of permits and approvals.

1.2.1 Project Description

The following sections describe the ngVLA project which support development of this report. Additional information on proposed facilities is found in the Civil and Infrastructure Subsystem Design and the Preliminary System Architecture reports referenced in Table I-2.

1.2.1.1 Antenna Locations

The outer antennas of the main array that expand from ~15 km out to ~1000 km baselines are distributed in a rough spiral, extending into Mexico and Texas. One 18-meter (59.1 feet) or 6-meter (19.6 feet) antennas would be installed at each site except for the long baseline sub-array sites. Three antennas would be installed at each of the 10 long baseline sub-array antenna sites.

- Main Interferometric Array - 214 antenna sites
- Short Baseline Sub-Array - 19 antenna sites



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- Long Baseline Sub-Array 10 antennas sites

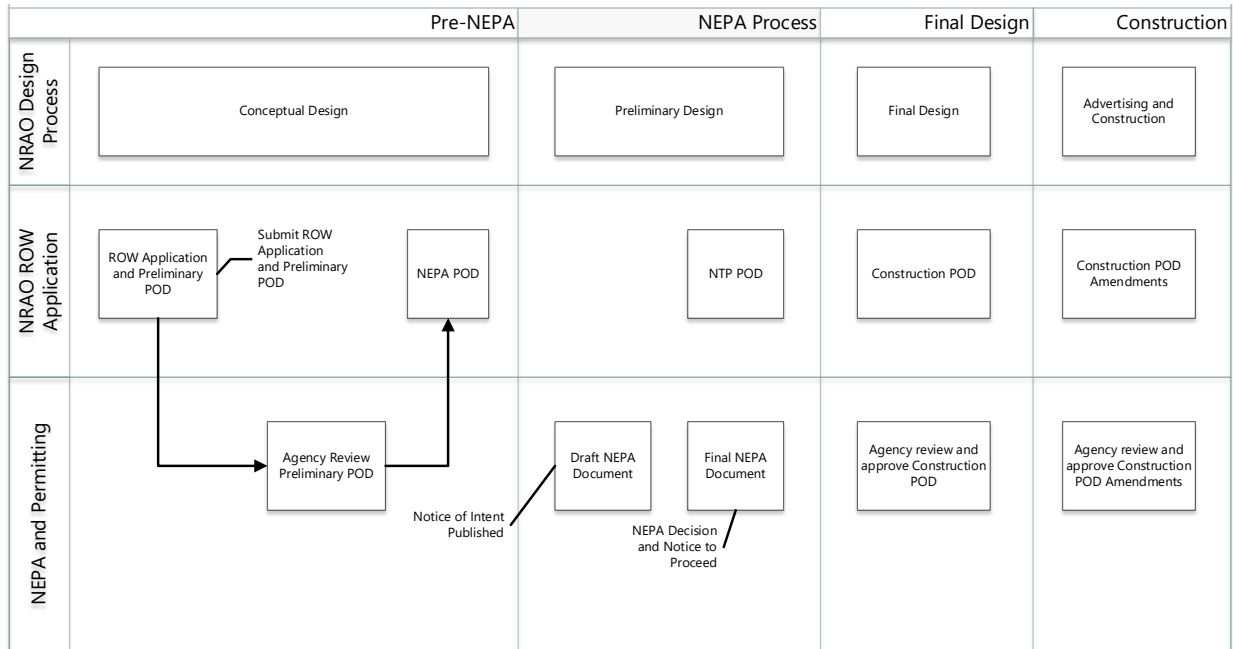


Figure I-1 Land Acquisition and Regulatory Compliance Overview

1.2.1.2 Facilities

Facilities needed to support the proposed ngVLA project include buildings near the array center, remote support stations, science operations, and science data center. These buildings would support maintenance, science, and outreach operations and would be constructed to meet Gold Leadership in Energy and Environmental Design (LEED) standards (see Civil and Infrastructure Subsystems: Design Description report). Table I-3 summarizes the buildings necessary to support the proposed ngVLA project during the construction, operation, and divestment stages.

Table I-3 Proposed ngVLA Facilities

Building	Description	Purpose
Site Buildings	Central Electronics Building (CEB)	Central signal processor, central IT infrastructure, time and frequency, generation, and distribution equipment
	Storage	Storage for heavy equipment, equipment garages
	Security facilities	Site security personnel
Operations Buildings	Maintenance Center	Central duty station for safety, security, and maintenance personnel
	Array Operations Center	Office and laboratory space Storage and transfer capabilities Computer infrastructure operations staff
	Repair Center	Diagnostic repair and test activity
	Remote Support Stations	Operations buildings for antennas that cannot be serviced from the Maintenance Center
	Science Operations	Research, development, and software operations

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Building	Description	Purpose
Science Operations and Data Center	Science Data Center	Computing equipment for post-processing data products and data archive

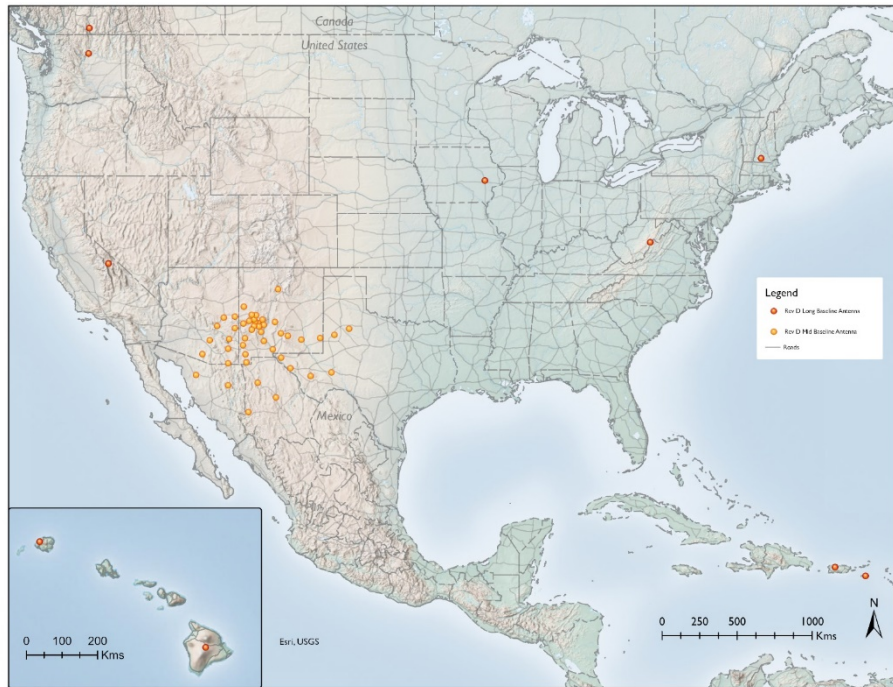


Figure I-2 Proposed ngVLA Antenna Locations

1.2.1.3 Access Roads

Access roads connect to antenna sites and facilities during all project stages. The primary objectives when designing the access roads are to use existing roads where possible and to locate infrastructure with suitable geologic and soil conditions. The single-lane gravel access roads must be passable at all times.

1.2.1.4 Utilities and Other Infrastructure

The proposed ngVLA infrastructure consists of civil works such as roads and drainage, antenna foundations, fiber optic, underground or overhead power distribution lines, switchyards, and transformers. Utilities required for the operations include electrical infrastructure, generators, fiber optic lines, and weather stations. In addition, emergency generators may be installed to provide emergency backup electrical power in the event of a power interruption to support the operation of the Site Buildings listed in Table I-3. The mid, short, and long baseline antenna sites would also have emergency generators.

2 Design Stage

The environmental review process for an MREFC project, such as the proposed ngVLA project, is conducted during the Design Stage. The regulatory compliance work packages include the environmental review and assessment and other activities necessary to meet regulatory compliance with the environmental, cultural, and historic statutes (NSF Large Facilities Office, 2021). These design stage LA/RC work packages incorporate the initial rights-of-way, lease, and easement acquisitions steps:

- Site Selection



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- Compliance with Environmental, Cultural, and Historic Statutes
- Community Engagement

2.1 Site Selection

Environmental effects, safety, and health, are considered during site selection for antennas, facilities, access roads, utilities, and other infrastructure. Selecting potential sites for the proposed ngVLA project starts with defining selection criteria and desired conditions (Rikalovic, Cosic, & Lazarevic, 2014). LA/RC selection criteria include geotechnical, environmental conditions, and land uses. The site selection process is iterative with the permit applications described in Section 2.2. Table 2-1 lists LA/RC criteria applicable to the proposed antenna sites, access roads, and utilities and support facilities. The criteria and considerations listed in Table 2-1 are used to evaluate proposed ngVLA antenna sites and facilities in terms of development cost, regulatory approval, and community acceptance based on the RIG.

Table 2-1 Site Selection Criteria and Considerations

Criteria	Site Selection Considerations
Science ¹	Latitude Elevation Radio Frequency Interference (RFI) Weather (i.e., humidity, severe storm events)
Geotechnical	Slope Topography Geologic and soil stability
Environmental	Critical wildlife habitat Water resources Paleontological resources Visual resources
Land Use	Cultural and historic resources Indigenous lands and interests Existing and planned land use Mineral ownership, leases, and rights Protected areas, including developed recreation sites

Table Note: 1. Science criteria were derived from primary science requirements described in Murphy et al. 2018. During the site selection process, NRAO will assess antenna sites and supporting infrastructure consistent with the information described in the *Organization Environmental Impacts Checklist (Checklist)* (National Science Foundation, 2020). The Checklist will include additional information on the potential environmental effects and unique circumstances associated with the proposed ngVLA project. NRAO will provide the site selection results to NSF to support their determination of the appropriate environmental review level as described in 40 Code of Federal Regulation (CFR) Section 1501.1(a).

NRAO would conduct site selection using publicly available information such as geological maps and reports, geophysical reports, topographic maps, wetlands maps, flood zone maps, proposed development maps, and aerial photographs. Site selection involves integrating this information using standard Geographic Information System (GIS) data.

2.2 Compliance with Environmental, Cultural, and Historic Statutes

NRAO’s work packages for compliance with environmental, cultural, and historic statutes described in the following sections reflect NSF’s environmental review process. The activities NRAO conduct in the work package meet regulatory compliance requirements for environmental, cultural, and historical statues (National Science Foundation, 2021).



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While it is too early in the design process to have a detailed understanding of all the permits and approvals required for the proposed ngVLA project, a review of the permits and approvals provide information used in design refinement. Additional permits and approvals may identify during the analyses associated with the environmental reviews and further project engineering design.

At the current time, ngVLA development outside the United States would be the responsibility of any ngVLA partners, and the project does not intend to construction antennas or facilities outside the US. International treaties, agreements between the U.S. and the host nation, and any applicable US laws and Executive Orders govern environmental compliance if the proposed ngVLA project includes antenna sites outside of the US. The following Executive Orders provide direction regarding the evaluation of antenna sites outside of US jurisdiction.

- Executive Order 12114 *Environmental Effects Abroad of Major Federal Actions - Environmental effects abroad of major federal actions* sets out environmental impact analysis requirements applicable to specific categories of major federal actions having significant effects on the environment outside the geographical borders of the United States, its territories and possessions which significantly affect natural or ecological resources of global importance.
- Executive Order 11752 *Prevention, Control, and Abatement of Environmental Pollution at Federal Facilities - Prevention control and abatement of environmental pollution at federal facilities*, Sec. 3.(c) – ‘Heads of federal agencies responsible for the construction and operation of federal facilities outside the United States shall ensure that such facilities are operated so as to comply with the environmental pollution standards of general applicability in the host country or jurisdiction concerned.’
- Executive Order 12088 *Federal Compliance with Pollution Control Standards; Section 1-801* that the head of each Executive agency responsible for the construction or operation of federal facilities outside the United States shall ensure that such construction or operation complies with the environmental pollution control standards of general applicability in the host country or jurisdiction.

Antennas and facilities located outside of the United States would be developed with input from partner organizations.

2.2.1 Land Acquisition and Regulatory Compliance Asset Management

Asset management for LA/RC responsibilities is a systemic approach to meeting environmental, cultural and historic statutes during the construction, operation, and divestment of the proposed ngVLA project. The LA/RC asset management responsibilities are related to rights-of-way grants, special use permits, easements, and relationships with associated stakeholders, may be included in the Maintenance and Support Subsystem. The Maintenance and Support Subsystem is described in the Preliminary Architecture Description, report number 020.10.20.00.00-0002-REP. The objective of the LA/RC asset management system to be developed under Work Breakdown Structure item 020.03.70.01.15 is to integrate data/information/attributes of spatial information and stakeholder information relevant to permits, rights-of-way, special use permits, and easements. LA/RC proposes an asset management system structured to address five questions:

1. What geographic area or resource is relevant?
2. What are the terms and conditions?
3. What are the reporting requirements?
4. Who are the direct stakeholders?
5. Does the permit, right-of-way grant, special use permit, or easement require renewal during the 20-year ngVLA operation stage?

In addition to NRAO’s ngVLA enterprise-level GIS data repository, each generated permit and land use agreement is entered into the LA/RC asset management system. The information in the LA/RC asset management system is

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included to ensure that renewals of permits and compliance with terms and conditions are addressed in a timely basis for the continuity of site operations.

The following sections describe environmental regulations that are applicable to the proposed ngVLA project. Contracting provides NRAO with flexibility in satisfying the NSF's requirements for compliance with environmental, cultural, and historic statutes. In the following sections, NRAO would be responsible for developing and issuing approved proposal requests, contracting consistently with financial regulations and guidance, and overseeing contracts to support environmental permit applications.

In the following sections, elements of work packages may be performed by NRAO staff or qualified contractors with oversight by NRAO staff. NRAO will ensure that the project is completed according to the stated terms in the contract and meets regulatory requirements.

2.2.2 United States Environmental Review

The National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. Section 4321 et seq., requires federal agencies to identify and evaluate the impacts of "major Federal actions significantly affecting the quality of the human environment." The Council on Environmental Quality (CEQ) oversees NEPA implementation per Environmental Protection, 40 CFR Parts 1500-1508 (The Council on Environmental Quality, 2022). NRAO is seeking funding for the proposed ngVLA project from NSF and NSF as a federal agency is therefore responsible for compliance with NEPA and other environmental, cultural, and historic statutes.

The "NEPA umbrella," as depicted in Figure 2-1, illustrates the framework within which US Federal agencies address multiple related federal laws and executive orders. As shown in Figure 2-1, compliance with environmental, cultural, and historic regulations under NHPA, Clean Water Act (CWA), Clean Air Act (CAA), and Endangered Species Act (ESA) is coordinated in conjunction with the NEPA process. Federal agencies coordinate these reviews concurrently to increase efficiency and avoid duplication (Council on Environmental Quality & Advisory Council on Historic Preservation, 2013).

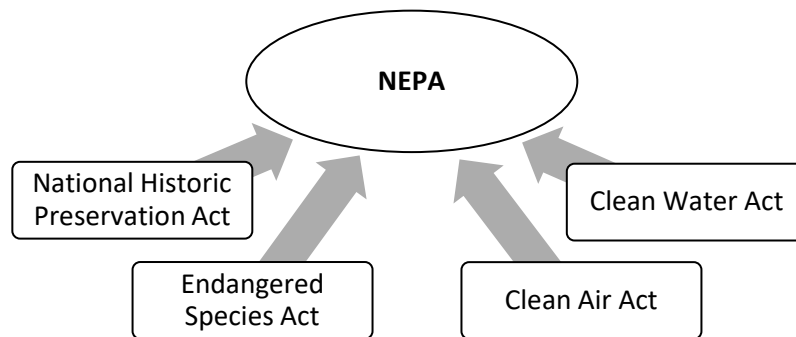


Figure 2-1 Concurrent Environmental, Cultural, and Historic Statutes Project Review

NSF would consult with other federal and state agencies over the proposed ngVLA project. Bringing these requirements under the NEPA umbrella helps streamline the overall environmental review process. NRAO would provide NSF with a draft letter identifying NSF as the lead Federal agency for NEPA compliance, with the requirements of this role defined in 40 CFR Section 1501.7 and a list of potential cooperating agencies per 40 CFR Section 1501.8. In addition, NRAO would submit a preliminary Environmental and Site Permitting plan to NSF along with the draft letter that identifies NSF as the lead federal agency.



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Before initiating the environmental review process, the ngVLA Project Management and LA/RC team would develop a draft Memorandum of Understanding (MOU) for NSF and the cooperating agencies. The purpose of the MOU is to establish an understanding between the NSF, cooperating agencies, and ngVLA Project Management regarding the responsibilities, conditions, limitations, and procedures to be followed during the NEPA and permit application reviews. NRAO will prepare the draft MOU for review by NSF and the cooperating agencies. The MOU would indicate that signature by a cooperating agency would assist in fulfilling the cooperating agency’s environmental review requirements and meet NEPA’s intent of reducing duplication and delay between agencies. Consistent with CEQ guidance on joint agency review of NEPA documents, the list contains the proposed draft MOU sections:

1. Introduction/Purpose
2. Goals/ Benefits
3. Defining the Aspects of the Project's Environmental Review/Roles and Responsibilities
4. Issue Resolution
5. Amendments/Changes to the MOU
6. Post NEPA/Cooperating agency Collaboration and Cooperation

This list is not comprehensive, and every item listed may not be necessary for a joint MOU between NSF and the cooperating agencies (Council on Environmental Quality, 2014).

2.2.2.1 National and State Environmental Policy Acts

2.2.2.1.1 Pre-NEPA Activities

During the Pre-NEPA phase, conceptual design tasks will be initiated and carried forward to progress applications and prepare a Plan of Development (POD) while compiling relevant environmental resource data used in the NEPA process. Pre-NEPA activities, including NEPA document level determination and Pre-NEPA Scoping, are described in the following paragraphs.

CEQ's Regulations for Implementing the Procedural Provisions of NEPA (Title 40 CFR Parts 1500-1508) provide for programmatic NEPA reviews in Section 1500.4(k) and Section 1501.11(c). Consistent with guidance to streamline the NEPA process, NRAO uses eight criteria shown in Figure 2-3 to prepare an analysis to determine if the most efficacious approach to NEPA compliance is project specific, programmatic, or a hybrid NEPA document (Eccleston, 1995). NRAO would review the analysis results with NSF during a Pre-NEPA scoping workshop before initiating engagement with other regulatory agencies. The workshop results would be a memorandum summarizing the discussion and NSF’s NEPA document recommendation.

The lead agency must create a coordinated project plan, among other procedural requirements applicable to covered projects. The coordinated project plan includes a permitting timetable with intermediate and final completion dates for action by each participating agency on any federal environmental review or authorization required for the project. Fast-41 projects have the same environmental review requirements but receive priority processing.

During the Pre-NEPA phase, the NRAO ngVLA project team will regularly coordinate with the NSF and agency representatives during regularly scheduled meetings. Additional meetings would be scheduled as needed to address specific topics if requested by NSF or other agencies.

2.2.2.1.2 NEPA Process

NEPA requires federal and state agencies to “take a hard look at environmental consequences” of their proposed actions, consider alternatives, and publicly disseminate such information before implementing the proposed action. As the lead federal agency, NSF determines the appropriate level of NEPA review per Environmental Protection, 40 CFR Section 1501.3 and 45 CFR Chapter VI National Science Foundation Section 640(b). In addition to NEPA, states also have environmental review requirements. For example, if the proposed ngVLA project includes sites in states with environmental effects regulations,



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such as California's Environmental Quality Act (CEQA). Federal and state environmental policy acts advise preparing a joint environmental document (Council on Environmental Quality, 2014).

NRAO, as a non-federal entity, will conduct activities to

1. provide technical assistance and support related to the successful completion of the NEPA process for integrated and interdisciplinary environmental planning;
2. support disclosure of information to the public; and
3. support government environmental planning and decision-making during the NEPA process by providing technical and environmental information used in the analysis of direct, indirect, and cumulative effects.

NRAO may contract with one or more private companies to prepare required technical documents and analyses. NRAO would prepare an MOU to establish an understanding between the contractors and NRAO regarding the respective responsibilities, conditions, and procedures to be followed during the preparation of technical assistance and support.

2.2.2.2 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) requires Tribal consultation when a federal action may affect historic properties located on tribal lands; or when any Native American tribe or Native Hawaiian organization attaches religious or cultural significance to a historic property. Under Section 106, each federal agency must consider public views and concerns about historic preservation issues when making final project decisions. Federal agencies and stakeholders follow four steps to fulfill Section 106 requirements:

1. Initiate consultation by notifying the appropriate consulting parties. Consultation is between the federal agency, the State Historic Preservation Officer (SHPO) or Tribal Historic Preservation Officer (THPO), and other consulting parties.
2. Identify properties that may be affected by the project and determine if the property or properties are historic as determined by eligibility or listing in the National Register of Historic Places.
3. Assess the effects of the undertaking on the resources in consultation with interested parties and establish if they are adverse. Determining adverse effects on historic resources is based on criteria established by the 36 CFR Part 800 of the Advisory Council on Historic Preservation (ACHP) regulations.
4. Resolve adverse effects by developing and evaluating alternatives that could avoid, minimize, or mitigate these impacts on historic resources. The result of consultation may be a Memorandum of Agreement (MOA) or a Programmatic Agreement (PA). The MOA or PA is a legally binding document that evidences the agency's compliance with Section 106 and records the outcome of the consultation and the effects of an agency's project on historic resources.

NRAO would request NSF delegate NRAO the authority to invite, identify, and document the appropriate SHPOs, THPOs, and other consulting parties under Section 106 for early informal consultation. NSF would identify who would participate in reviewing historic properties resulting from a potential NSF investment in the proposed ngVLA project. Section C.1.2 Environmental Reviews/Consultation under Section 106 of the National Historic Preservation Act contains a preliminary list of Tribal Nations and Native Hawaiian Groups that may have an interest based on current and ancestral interests.

With NSF's approval, NRAO and NSF would follow a NEPA Substitution for Section 106. The regulations at 36 CFR Section 800.8 provide for the use of the NEPA process to fulfill a Federal agency's NHPA Section 106 review obligations in place of the procedures outlined in 36 CFR Section 800.3 through 800.6. This process is known as NEPA substitution for Section 106 and is shown in Figure 2-1. The key differences



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between the standard NRHP Section 106 approach and the NEPA substitution approach for Section 106 review include the following:

- NSF would seek formal consultation earlier, during significant NEPA milestones; consulting parties may comment throughout the development of the NEPA document.
- The identification of historic properties, finding of effects, and resolution of adverse effects will be documented in the NEPA document rather than in separate documentation of a Section 106 Finding.
- NSF will provide the reports documenting the identification of historic properties and the NEPA document circulated for review. These reports include:
 - Terrestrial Archaeological Resources Assessment(s),
 - Report of Visual Effects on Historic Properties, along with viewshed analyses and visual simulations.
- Resolution of adverse effects will be documented in a binding Record of Decision (ROD) and conditions approval of construction and operation plans. This step differs from the standard NHPA Section 106 process where a MOA is developed to resolve adverse effects. The combination of NSF and other agency's decisions after the NEPA process and application of conditions approval of construction and operation plans provide effective and equivalent compliance.
- NSF's government-to-government consultation responsibilities to Federally recognized tribes remain unchanged.

During information consultation, NRAO would share a description of the proposed ngVLA project with NSF-approved consulting parties and solicit input from consulting parties (Council on Environmental Quality & Advisory Council on Historic Preservation, 2013).

2.2.2.3 Federal Permit Applications

Environmental, cultural, and historic statute compliance for the proposed ngVLA project requires federal permit applications under the CAA, Rivers and Harbors Act (RHA), CWA, ESA, and FLPMA. When a proposed action such as the proposed ngVLA project, statutes or regulations for that permit also may provide opportunities to comment in addition to the NEPA public involvement opportunities. In order to have an effective and efficient decision-making process these permit and NEPA processes can be concurrent.

1.1.1.1 State Trust Land Permit Applications

In the United States federal land grants were awarded to states to assist in the funding of public education facilities and other governmental programs. The beneficiaries of state trust land vary from state to state depending upon the purposes for which the lands were granted. Revenues from state trust lands are held in a perpetual trust to support specific beneficiaries. Figure 2-3 illustrates state trust land area in the United States and Arizona and New Mexico respectively. Per state legal statutes, Arizona and New Mexico trust lands may only be sold to the "highest and best bidder at public auction." This means that all lands and leases must be appraised at their "true value" before being offered; and lands cannot be disposed for less than the appraised value (Culp, Laurenzi, Tuell, & Berry, 2015). State land parcels can be leased for a single use, or for a variety of uses under separate and distinct leases, such as agriculture and recreation leases for the same area. Appendix C, Section C.4 provides additional information regarding state trust land leases and acquisition.

State land commissioners can authorize rights-of-way for a defined area of trust lands for a prescribed purpose and duration if it is determined to be in the best interests of the state trust lands (Culp, Laurenzi, Tuell, & Berry, 2015). Figure 2-2 shows an overview of the state trust land application process. The application describes the purpose and general location of the land subject to proposed rights-of-way.



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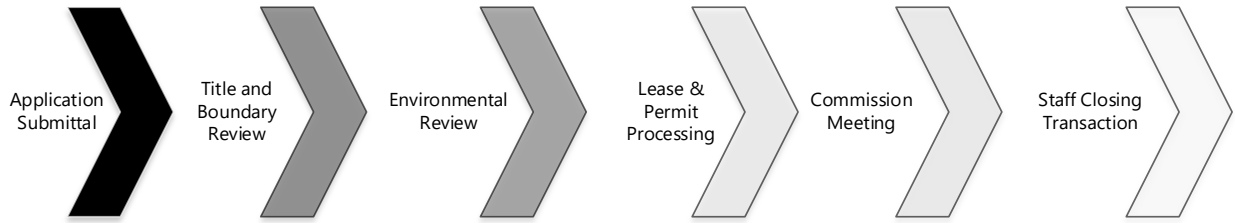


Figure 2-2 State Trust Land Application Process

The Commission's authorization serves as permission for the proposed use of state trust lands contingent upon approval from other agencies. Environmental review of state trust lands would be conducted as part of the NEPA process. State Trust Land managers require copies of environmental review documents and may request Cooperating Agency status.

As part of the pre-NEPA activities described in Section 2.2.2.1, NRAO would request rights-of- entry from the Commissioner for entry for prior to conducting survey activities. The request would include written notice of intent to conduct resource surveys which are used to establish baseline resource conditions. Lease and permit processing of state trust land rights-of-way, commission meeting and agency staff closing the transaction would be completed during the Construction Stage (see Section 3.3.1).

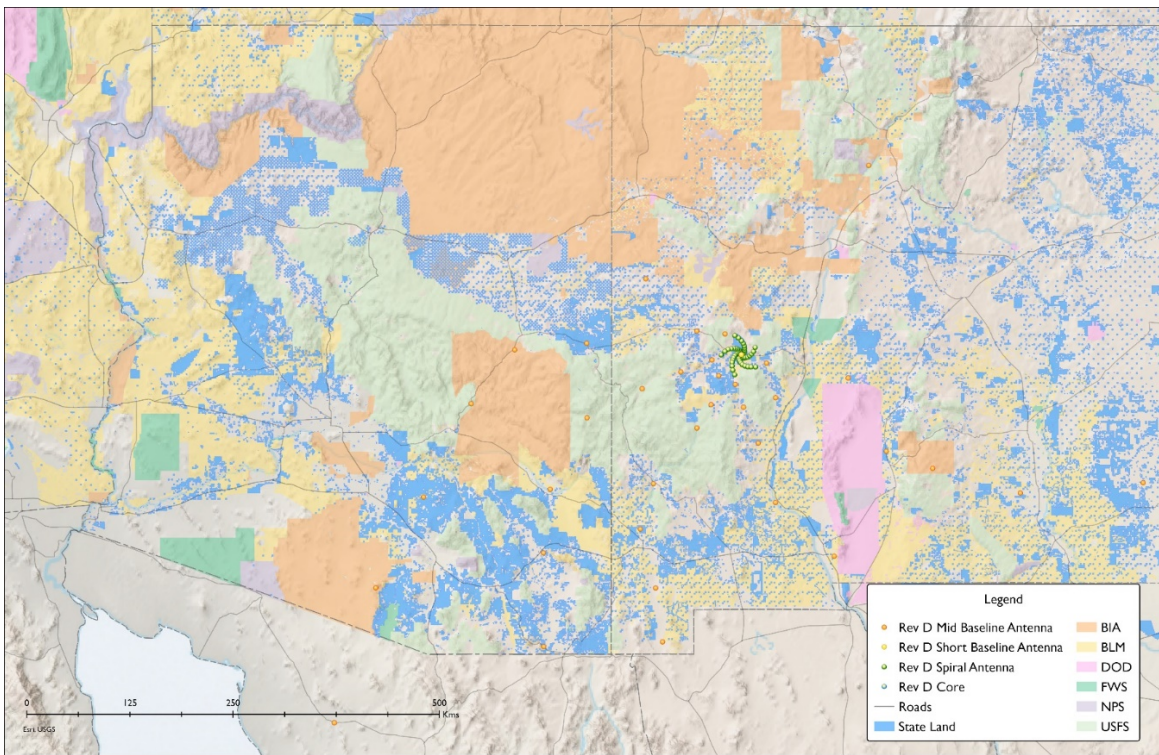


Figure 2-3 Arizona and New Mexico Land Jurisdiction

2.2.2.4 County and Municipalities Permit Applications

Zoning is "a system of land use regulation that controls the physical development of land. It is a legal mechanism by which local government is able to regulate an owner's right to use privately owned land for the sake of protecting the public health, safety, and/or general welfare." Land is mapped into different zones with the primary purpose of promoting compatible land uses and to separate incompatible uses. Decisions regarding how land is zoned are determined, in part, by a county's or municipality's master plan,



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which lays out broad policies to implement a shared vision for the future, and adopted community plans (Chandler & Dale, 2001).

Zones may be defined for a single use (e.g. residential, light industrial), or govern the density, size and shape of allowed buildings. The planning rules for each zone determine whether permission for a given development is granted. The facilities and infrastructure described in Section 1.2.1 may require NRAO to apply for a zoning ordinance variance or waivers from counties or municipalities zoning board.

Based on the results of site selection process NRAO would evaluate the proposed ngVLA project consistency with the County and Municipal zoning ordinances. Examples of variances or waivers are:

- Constructing or altering a building in a manner that would change the building's classification.
- Change how a current building is being used.
- Proposed land use for a different purpose than the one stated in the zoning classification.

The zoning board will review NRAO’s application and conduct a public review.

2.2.2.5 Preliminary Private Land Agreements

NSF may purchase or acquire land and interests in land including easements if acquisition is supported by proposed ngVLA project requirements. Acquisition of lands and easements would only be for lands where there are no title defects, hazardous materials, or other issues. Legal Requirements for lands acquisition are outlined in the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as Amended (Uniform Act). Lands may also be acquired through donation; such offers may be accepted as a gift to the United States. Acquiring land through donation may provide the landowner an income tax deduction based on the appraised value of the donation.

Using guidance from the Uniform Act, BLM’s *Acquisition Handbook*, and *The Procedural Guide for the Acquisition of Real Property* Table 2-2 outlines the steps NRAO would undertake as during preliminary design to develop preliminary land agreements with private landowners (Bureau of Land Management, 2002) and (DOJ1972). The 12 steps listed in Table 2-2 are consistent with requirements for using federal grant funds to acquire property or easements as described in the Uniform Act. The acquisition of real property or an easement does not need to be federally funded for the rules to apply. If Federal funds are used in any phase of the program or project, the rules of the Uniform Act apply.

Table 2-2 Design Stage Private Land Agreement Actions

Step	Description
1	Develop a property map that clearly delineates the land to be required
2	Consult with the project design information and Infrastructure IPT to verify that proposed parcels (real property) are identified as potential acquisitions.
3	Verify environmental requirements of the National Environmental Policy Act (NEPA) are met
4	Prepare surveys and plans for proposed property acquisition.
5	Order preliminary title search to confirm ownership and encumbrances on property title.
6	Select and negotiate contract for qualified appraiser and review appraiser.
7	Select and negotiate contract for Environmental Site Assessment (ESA) consultant (if not completed in project planning phase).
8	Select and negotiate contract for qualified land acquisition and relocation consultant, if required.
9	Conduct Environmental Site Assessment of property.
10	Prepare relocation plan if there are any persons to be displaced.



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Step	Description
11	Perform appraisals and appraisal review and approve appraised fair market value. The property owner shall be given the opportunity to accompany the appraiser on the inspection of the property.
12	Submit appraisal and review appraisal reports to the ngVLA project manager.

Prior to initiating the federal permit process described in Section 2.2.2.3, NRAO’s LA/RC staff and the ngVLA Project Management team would develop a preliminary agreement rights-of-way or easement for NSF’s review and approval. Developing a standard preliminary agreement reduces the number of iterations needed between the signatories. The preliminary agreement would include terms and conditions, access, and contingency if there is funding failure. Each agreement is expected to detail the following:

- Contact information;
- Legal details of the agreement;
- Effective period and any limitations on the planned use;
- Preliminary design of areas to be acquired or easements;
- The planned location(s) of the ngVLA project infrastructure; and
- Renewal period information and remuneration details.

NRAO would disclose that permanent easements would be necessary for the operation, maintenance, and divestment stages of the proposed ngVLA project. The standard agreement will address reclamation requirements upon completion of the expected operation phase of 20 years. For properties where the agreement form required is different from NSF’s approved agreement, site-specific land use agreements will be prepared. While preliminary agreements may be initiated, only after receipt of construction funding may the project enter into the final agreements. Section 3.4 describes the process NRAO would follow for obtaining final agreements. NRAO or a realty agent acting on NRAO’s behalf would request permission to enter landowners’ property to conduct surveys and studies. In cases where a person on behalf of NRAO is hired to pursue the acquisition of real property “officially or unofficially”, the person must satisfy the applicable voluntary acquisition requirements of Uniform Relation Act Section 24.101(b)(1)-(5).

A combination of aerial and land surveys, environmental and engineering field studies, and geologic investigations would be used to areas to be acquired or used for easements in conjunction after obtaining access permission from the landowner. Parcel and easement acquisitions would be located at sites that satisfy the proposed ngVLA project design criteria, minimize effects on properties being crossed, and landowner conditions to the extent practicable.

NRAO, as a non-federal entity, will contract with one or more private companies to prepare required technical documents and analysis needed to support the development of the Environmental Assessment and conduct stakeholder outreach. NRAO would prepare MOU with federal and state agencies to establish an understanding between the contractors and NRAO regarding the respective responsibilities, conditions, and procedures to be followed during the preparation technical assistance and support. NRAO will develop and implement a grievance mechanism prior starting construction.

3 Construction Stage

The LA/RC Construction work packages incorporate the terms and conditions from the NEPA process, permitting, and stakeholder engagement activities conducted during the design stage. In addition, community engagement during the construction stage includes a grievance mechanism. These activities may be conducted in phases based on the final design and construction plans. Environmental, Cultural, and Historic Statutes are incorporated into the following work packages during the construction stage:

- Plan of Development (POD) Updates



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- Notice to Proceed POD
- Construction POD and Amendments to the Construction POD
- Notice to Proceed
- State and Private Land Acquisition
- Construction Activities and Permits
- Construction activities include construction surveys and geotechnical investigations
- Construction permits include state, county, and municipal permits
- Community Engagement
- Grievance Mechanism

If there is conflicting information between the documents referenced in Table 1-2 and this report, the documents listed in Table 1-2 shall be considered a superseding requirement.

3.1 Plan of Development Updates

3.1.1 Notice to Proceed Plan of Development

The second POD phases are the NTP POD and the Construction POD. The NTP POD includes mitigation and environmental protection measures developed during the NEPA and permit approval process, construction plans and final design. NRAO would prepare the NTP POD, which can be used to craft terms and conditions governing construction consistent with 43 CFR 2805.15(e).

The NRAO prepared NTP POD will also describe the processes and procedures NRAO will use to comply with the requirements of the NEPA decision document(s) and permits for the proposed ngVLA project and include the Environmental Compliance Management Plan, Variance Process, and Environmental Monitoring and updates to the plans listed in Section 2.2.2.3. NRAO would also prepare additional plans as appendices to the NTP POD developed specifically to meet compliance with environmental, cultural, and historic statutes during construction. These additional plans may include:

- Environmental Compliance Monitoring Plan
- Biological Resources Conservation Plan
- Health and Safety Program (update)
- Reclamation Plan (update)
- Native Plant Salvage Plans
- Historic Properties Treatment Plan (sections may be redacted)

NRAO will submit the NTP POD to land managing agencies per the Section 2.2.2.1 MOU, and approval of the NTP POD will be obtained from these agencies before NRAO submits the project-level NTP described in Section 3.1.3. The following elements describe environmental compliance monitoring and the variance process, ensuring that NRAO construction activities meet all mitigation and environmental protection measures.

3.1.1.1 Environmental Compliance Monitoring Plan

NRAO will prepare an ECMP that provides direction for the Compliance Monitoring Team on conducting inspections, evaluating compliance or noncompliance with the project measures and conditions during project construction, and documenting compliance or noncompliance. This plan will include fully defined roles, responsibilities, and procedures for monitoring and ensuring the project's environmental compliance with the right-of-way grant, special use permits, and easement terms, conditions, and stipulations.

Federal agencies typically use their staff or third-party contractors to monitor NRAO's construction and environmental monitoring activities independently. Federal agency compliance monitors respond to specific issues or concerns, review and approve any project changes, and review and approve periodic and



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specific reports and documents consistent with the variance process. In accordance with federal regulations, if NRAO does not identify a CIC that NSF and the federal land management agencies find suitably qualified, these agencies may retain their own CIC.

3.1.1.2 Variance Process

The need for extra workspace or access roads may be identified throughout project construction. Similarly, changes to the project requirements (e.g., mitigation measures, specifications) may be needed to facilitate construction or provide more effective protection of resources (e.g., installation of additional erosion control outside of approved disturbance areas). The process for requesting and obtaining variances would be included in the Construction POD and detailed in the Environmental Construction Monitoring Plan (ECMP) NRAO prepares as described in Section 3.1.1.1.

The variance process section in the ECMP would identify how requests for a construction variance would be tracked, approved, or not approved and how it would be ensured that the analysis has covered the requests during the NEPA process. Requests not covered by the analysis during the NEPA and environmental, cultural, and historic permit process will be considered in the context of guidance at 40 CFR sections 1501.6(a) and 1502.9(c).

Variances are evaluated for consistency with 40 CFR Sections 1501.6(a) and 1502.9(c), if (i) substantial changes in the proposed action that are relevant to environmental concerns; or (ii) there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts, supplemental NEPA analysis would be required.

3.1.2 Construction Plan of Development

The Construction POD provides information for construction in specific areas or for components of the proposed ngVLA project described in Section 1.2.1. Construction PODs comprehensively identify environmental, cultural, and historic requirements for construction activities in a specific area. Each Construction POD is tailored to the issues, jurisdictions, and regulations relevant to the specific area. This can include terms and conditions by incorporating mitigation and environmental protection measures and other applicable stipulations for avoidance, minimization, and mitigation of the environmental impacts for the specific area.

Construction PODs maintain consistency with the NEPA decision document and permits from which they originate. These include the design features of the proposed ngVLA project for environmental protection. Construction PODs also include design features that have been updated or modified in response to final design refinements and/or agency input. In addition, Construction PODs may include the area or ngVLA project component plans as appendices that contain construction specific requirements.

- Environmental and Safety Training Plan update
- Environmental Compliance Management Plan update
- Flagging, Fencing, and Signage Plan update
- Traffic and Transportation Management Plan
- Area or ngVLA component Construction Plan

Variance requests could affect areas outside the previously approved work area, or the request would change the function, structure, technology required, or another previously approved aspect of the project. The Variance Level NTP described in Section 3.1.3 will be submitted with the request. If the request modifies rights-of-way grant or special use permit, the amendment to the Construction POD would require approvals from federal and state authorized officers. Construction POD amendments would be submitted with the corresponding NTP for approval by NSF before submission to federal and/or state-authorized officers.



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3.1.3 Activities

Federal and state agencies issuing rights-of-way grants, special use permits, or access agreements would review construction plans to ensure the plans meet required federal, state, or local standards, as well as the intent of mitigation measures adopted in the NEPA decision document and permits. Construction activities would be conducted in phases consistent with construction plans for the proposed ngVLA project. Pre-construction activities are completed as described in the NTP POD before land managing agencies authorize a Construction NTP. Before surface-disturbing activities are authorized, NRAO would receive written notification from federal, state, local, and private landowners that authorized rights-of-way grant, special use permit, parcel acquisition, or an easement.

NRAO will use the checklist approach to assign who is responsible for ensuring compliance with mitigation and environmental protection measures contained in the Construction POD (EPA Office of Compliance, 2005). The construction checklists help:

- Recognize, implement, and monitor mitigation and environmental protection measure requirements.
- Designate the responsible party who will be responsible for implementing and monitoring mitigation and environmental protection measures.

3.1.3.1 Geotechnical Investigation

Where necessary, NRAO will complete detailed geotechnical investigations before completing the final design for project components. The detailed geotechnical investigation addresses data gaps not addressed by the preliminary investigation and collects sufficient geotechnical data to complete the final design(s). Typically, the detailed geotechnical investigation includes a single boring at each proposed location, compaction tests along roadways, and test pit excavations near the proposed substations and underground utility locations. Detailed geotechnical investigations would begin after a right-of-way is granted, a special-use authorization is issued, or an area's encroachment permit and easement grant are issued. Any alternative approaches to the detailed geotechnical investigation will require approval from the antenna vendor and must meet manufacturer specifications and warranty requirements.

3.1.4 Permits

Where construction permits are required, LA/RC works with the construction team to identify which permits will be obtained by the contractor. The reports listed in Table I-2 provide general design details of the facilities, access roads, facilities, and infrastructure; however, the location in a specific county or municipality is not final. In ngVLA locations where building permits are not required, the ngVLA project contract will specify that the structure will be built according to plans and specifications that comply with national or state building codes. Generally, any facility and telescope design will be prepared by a consultant and meet all relevant building codes. NRAO construction contracts will specify the contractor to obtain these permits.

3.1.4.1 Federal Permits

Following the successful completion of the environmental review process, inventories, and reports, the BLM will issue a Record of Decision, either granting or denying the ROW application. If granted, the applicant also receives a Notice to Proceed (NTP), allowing the construction phase to begin.

3.1.4.2 State Permits

Based on thresholds, states have responsibility for air, vapor recovery, ground and surface water withdrawals, water pollution, boiler safety, brownfields, and solid and hazardous wastes. In addition to permits states have approvals associated with wildlife and fish management, noxious weeds and invasive plant species. States also review projects, activities, and actions for any records of rare species or significant natural communities in their database that could be impacted by a project or action.



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3.1.4.3 County and Municipal Permits

Ordinances are laws, often found within county and municipal codes, that provide various degrees of control to local governments. Based on the reference documents in Table I-2, the LA/RC anticipates that the proposed ngVLA project could require conditional use permits, zoning permits, and building permits from counties and municipalities. Municipalities for example may require all construction plans that limit the amount of surface disturbance and approve environmental protection measures to control dust, traffic and comply with noise ordinances.

NRAO would be responsible for coordinating compliance with county and municipal ordinances but will rely on the architect and contractors to outline the plans and secure the permits described in the following paragraphs. NRAO and the applicable contractor would attend a pre-application meeting with the county or municipal department. NRAO would review and approve contractor-prepared permit applications before their submittal. Appendix C.6 contains an excerpt from New Mexico’s *Building Permit Guide for Commercial Construction* (Construction Industries Division, 2013). Although the proposed ngVLA facilities would not be a “commercial” building, the buildings described in Section 1.2.1.2 would not be used as residences.

3.2 Notice to Proceed

Under 43 CFR Section 2807.10, a written Notice to Proceed (NTP) must be issued before a federal agency authorizes ground-disturbing activities. In addition, other cooperating agency conditions or requirements that must be satisfied prior to construction or during construction if those terms and conditions were not received during the NEPA and permitting process would be included in the NTP, and the NTP POD described in Section 3.1.1. Due to the complexity of the proposed ngVLA project, multiple NTPs are anticipated; therefore, NRAO would organize the preparation and submission of NTPs as follows:

1. Project level NTP: this NTP will address compliance with mitigation requirements and stipulations and conditions of approval common to the entire project. It will identify the antenna sites, infrastructure, and facilities approved for construction and construction practices and compliance plans common to the project. In addition, the project-level NTP will contain permit requirements outlined in the NEPA decision documents, rights-of-way grants, and special use permits.
2. Construction NTPs consist of area-specific descriptions for the area covered by request for an NTP. Construction NTPs include final engineering plans for the area, construction locations, access road layouts for approved roads, temporary work areas, area-specific construction practices and updated environmental compliance plans, and stipulations and conditions of approval.
3. Variance Level NTPs will be submitted if changes to the final design could require surface disturbance outside the rights-of-way grants and special use permits area. Variance Level NTPs would include the variance request and the same information as the Area Specific Construction NTP corresponding to the variance request. As shown in Figure I-1 and described in Section 3.1, Variance Level NTPs may require an amendment to the Construction POD.

3.3 State Trust Land Acquisition

If authorized in a state’s enabling act, trust lands may be available for acquisition through public auction. State land department authorize the sale of trust lands to the highest and best bidder per state’s statutes. Prior to lands being offered for auction, the respective state land department provides information that identifies what lands specifically are offered for sale (Sale Parcel). In addition to the legal description of the Sale Parcel, the state land office also provides an appraised value, information on existing leases, and an



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environmental site assessment within the scope of Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (42 U.S.C. §9601) and petroleum products.

A water auction is the process to obtain an agreement allowing the pumping of water from State Trust land to be used off State Trust land. Additional agreements such as a right-of-way, or commercial lease, may be required in addition to the water agreement to move water off State Trust land.

3.3.1 State Trust Land Leases

State trust lands leased for agriculture, mining, commercial, or military purposes are not open to recreational use. Other Trust lands may be closed to some or all recreational uses due to hazardous conditions, dust abatement, in coordination with the respective state game and fish agency, or based on certain State, County or local laws or ordinances.

Trust land management activities are typically divided into three types: surface uses, subsurface uses, and sales. Surface uses comprise the largest portion of trust land activities, and are primarily grazing, agriculture, commercial leases, and rights-of-way. Grazing and agricultural leases are managed through short term, ten-year lease programs. While leases are required to be bid competitively at auction, the ASLD may give existing short-term grazing lease holders a “preference right” if they are in good standing on their lease.

Commercial leases may be awarded anywhere from ten-year lease terms to 99-year lease terms, and these leases must go through competitive bid at auction and be awarded to the “highest and best bidder.” Subsurface uses encompass mineral development and mining activities on state trust lands. Mineral leases on state trust lands are awarded at auction for twenty-year periods, along with a requirement for payment of royalties to the ASLD.

3.3.2 State Trust Land Rights-of-Way Agreements

Upon completing the NEPA process described in Section 2.2.2.1, NRAO would request survey permission from the respective State Land Commissioner before entering for plat surveying activities. Easements and rights of way are granted for a specific term, which the commissioner, in their discretion, deems in the trust's best interests. If a survey is produced in conjunction with the application, applicants will be expected to design the project so as to avoid any cultural properties found by the survey. The survey must include avoidance and protection measures if cultural properties are discovered within the area of potential effects (APE). Appendix C.4 provides additional information on the process for obtaining a right-of-way on state trust lands.

3.4 Private Landowner Agreements

Upon award of construction funds, the LA/RC would initiate formal negotiations with property owners and legal representatives. Land Use Agreements allow for all future access, site characterization, construction, operations, and maintenance. Because the proposed ngVLA project would be federally assisted, NRAO’s acquisition of easements or private land parcels is subject to the Uniform Act. The acquisition itself does not need to be federally funded for the rules to apply. If Federal funds are used in any phase of the project, the rules of the Uniform Act apply. Acquisition of private land parcels and easements would be acquired voluntarily. A non-profit organization such as NRAO typically does not have recourse to acquire land through eminent domain.

4 Operations Stage

The LA/RC Operations work packages incorporate the terms and conditions from the NEPA process, permitting, and stakeholder engagement activities conducted during the design stage. These activities may



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be conducted in phases based on when construction is complete in an area. In addition, the operation state work packages incorporate compliance with environmental, cultural, and historic statutes.

- Compliance Monitoring
- Mitigation and Environmental Protection Measures
- Environmental Safety and Health updates
- Permit Renewal
- Community Engagement

4.1 Permit Renewal

NRAO anticipates the proposed ngVLA project would operate for 20 or more years. During initial discussions with federal and state land managing agencies NRAO would request consideration for the rights-of-way grant and special use permit terms to be 20 years. Both the BLM and Forest Service can authorize linear perpetual rights-of-way grants and special use permits under 43 CFR 2806.24(b). Under 36 CFR 251.56(b)(1)(v), for special use permits where the term is longer than 30 years, the Forest Service "... shall provide for revision of terms and conditions at specified intervals to reflect changing times and conditions."

NRAO would file an application at least 120 days prior to the expiration for renewal of a right-of-way grant or special use permit on BLM or Forest Service administered lands per 43 CFR 2807.22. The agencies authorized officer will review the application for renewal to ensure the holder is complying with the terms, conditions, and stipulations of the existing authorization instrument and applicable laws and regulations. If renewed, the right-of-way or special use permit authorization will become subject to the regulations existing at the time of renewal and any other terms and conditions the authorized officer deems necessary to protect the public interest (Bureau of Land Management, 2018). Renewal of permits during operation would be managed by the relevant operation group. LA/RC would support renewal of operation permits if requested.

5 Divestment Stage

The divestment stage starts when there is a change in what facilities meet NSF priorities of remaining at the research frontier. Divestment plans at this time could include a range of options including partnership funding, or transfer of ownership.

If NSF elected to discontinue or reduce ngVLA operation funding and partnership funds or a transfer of ownership were not obtained, NRAO would develop a divestment plan that reflects the divestment model and transition goals consistent with NSF guidance in the Research Infrastructure Guide and Internal Management Plan.

NRAO's Divestment Plan would include a structure specific decommissioning plan, that includes termination of rights-of-ways, special use permits, and easements. Divestment work packages for LA/RC include:

- Divestment Plan
 - Environmental, Cultural, and Historic statute compliance
 - Termination of Rights-of-Ways and Special Use Permits
 - Release of Easements
- Decommissioning Compliance Monitoring
- Community Engagement
 - Grievance Management



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Abbreviations & Acronyms

Acronym	Description
ACHP	Advisory Council on Historic Preservation
AD	Applicable Document
AUI	Associated Universities Incorporated
BLM	Bureau of Land Management
CDR	Conceptual Design Review
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
EA	Environmental Assessment
EAO	Environmental Assessment Office
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EPPA	Puerto Rico Environmental Public Policy Act
ESA	Endangered Species Act
ES&S	Environmental, Safety, and Security
FLPMA	Federal Land Planning and Management Act
FWS	US Fish and Wildlife Service
GIS	Geographic Information System
HEPA	Hawaii Environmental Policy Act
IAA	Impact Assessment Act
IPT	Integrated Product Team
LA/RC	Land Acquisition and Regulatory Compliance
LEDPA	Least Damaging Practicable Alternative
LRMP	Land and Resource Management Plan
MOU	Memoranda of Understanding
MREFC	Major Research Equipment and Facility Construction
NEPA	National Environmental Policy Act
ngVLA	Next Generation Very Large Array
NHPA	National Historic Preservation Act
NRAO	National Radio Astronomy Observatory
NSF	National Science Foundation
RD	Reference Document
RIG	Research Investment Guide
SHPO	State Historic Preservation Office
SEMARNAT	Federal Ministry of Environment and Natural Resources
THPO	Tribal Historic Preservation Office
VLA	Jansky Very Large Array











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Final Audit Report


2024-06-04

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