



**NORTH DAKOTA
STATEWIDE INTEROPERABLE RADIO NETWORK
SIRN 20/20
FEASIBILITY STUDY**

FINAL REPORT

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Table of Contents

EXECUTIVE SUMMARY 5

STUDY BACKGROUND AND OBJECTIVES.....5

STAKEHOLDER SURVEY AND TECHNICAL SYSTEMS AUDIT FINDINGS6

Baseline Operational Needs and Participation Criteria.....8

PROPOSED SIRN 20/20 FRAMEWORK.....9

ESTIMATED ANNUAL COSTS AND POTENTIAL FUNDING SOURCES11

STATE AND LOCAL COST-SHARING MODELS12

SIRN GOVERNING MODELS13

NEAR-TERM STATE-LED/REGIONAL INITIATIVES14

Communications Initiatives.....14

Advancing the SIRN Study.....14

INTRODUCTION 15

STUDY METHODOLOGY 17

THE NEED FOR AN EVOLUTION 18

OVERVIEW AND BACKGROUND18

Population Growth and Public Safety Operations Evolution.....18

Continued Use of Aging and Legacy Systems.....18

The SIRN 20/20 Vision.....20

STAKEHOLDER SURVEYS AND OUTREACH.....20

SIRN 20/20 Highly Desired with Conditions21

Baseline Operational Needs.....22

COMMUNICATIONS SYSTEMS OVERVIEW AND CONSTRAINTS23

Limitations and Constraints24

WHY TACKLE THIS ISSUE NOW?.....26

PROPOSED SOLUTIONS FRAMEWORK/OVERVIEW..... 28

SIRN 20/20 SYSTEM ARCHITECTURE SOLUTIONS AND OPTIONS28

Systems Architecture Overview.....28

Hybrid Spectrum - Urban Area 800 MHz Layers.....32

User Base Options – Public Service Agencies32

SIRN 20/20 Coverage and Infrastructure Plan33

Very High Frequency (VHF) Spectrum Availability, Risks and Opportunities.....34

Other Ancillary and Neighboring State Systems36

SIRN 20/20 IMPLEMENTATION & MIGRATION APPROACHES.....36

SIRN 20/20 Program Development.....36

Migration Plans.....37

Operations and Sustainment38

SIRN 20/20 ACQUISITION STRATEGIES.....39

SIRN 20/20 FINANCIAL OVERVIEW..... 41

ESTIMATED CAPITAL AND OPERATIONAL COSTS.....41

Annual Capital Phase Outlay.....43

FUNDING SOURCES AND REVENUE MODELS44

What Have Other States Done?45

Potential Self-Funded Sources.....45

<i>Federal Grants</i>	47
<i>911 Funds</i>	47
<i>Natural Resources Revenue Outlook</i>	47
COST-SHARING MODELS	48
<i>Other Cost-Sharing Considerations</i>	49
SIRN 20/20 GOVERNANCE	51
CONSIDERATIONS AND RECOMMENDATIONS OVERVIEW	51
SIRN 20/20 USAGE AND PARTICIPATION FRAMEWORK	54
NEXT STEPS AND OTHER NEAR-TERM STATE-LED/REGIONAL COMMUNICATIONS INITIATIVES	55
COMMUNICATIONS INITIATIVES.....	55
ADVANCING THE SIRN 20/20 STUDY	55
CONCLUSION	56
SUPPLEMENTAL DOCUMENTS	57

List of Figures

Figure 1: North Dakota Radio Communications Systems and Devices.....	5
Figure 2: Likelihood of Joining SIRN (Left); Affordability as a Barrier to Adoption (Right)	6
Figure 3: Conceptual Integrated SIRN Architecture	9
Figure 4: Proposed Cost-Sharing Models.....	13
Figure 5: Recommended Structure for SIRN Governance	13
Figure 6: Population and Public Safety Incident Trends (2006 – 2015).....	18
Figure 7: Mid-West and North Central Region State and Local Trunked Systems	19
Figure 8: Likelihood of Joining SIRN 20/20 (Left); Affordability as a Barrier to Adoption (Right).....	21
Figure 9: Conceptual Illustration of State and Local Towers	24
Figure 10: Lack of Mobility Management.....	25
Figure 11: Current Disparate Systems in comparison to SIRN 20/20	25
Figure 12: SIRN 20/20 Functional Elements	29
Figure 13: High Level Architectural Block Diagram.....	30
Figure 14: Network Based or Relay Centric Service.....	30
Figure 15: Predicted On-Street VHF Portable Service	34
Figure 16: Transitional and Final VHF Channel Examples.....	35
Figure 17: Ancillary SIRN 20/20 Systems	36
Figure 18: Proposed SIRN 20/20 Implementation Timeline and Phases	37
Figure 19: SIRN 20/20 Legacy Radio Network Migration Strategy	38
Figure 20: Management and Operations Organization Staff.....	39
Figure 21: Local Share of SIRN Costs – County Survey.....	48
Figure 22: Recommended Structure for SIRN 20/20 Governance.....	52

List of Tables

Table 1: Technical and Financial Service Objectives	9
Table 2: SORN Options and Lifecycle Costs (in Millions)	11
Table 3: Estimated Annual Costs (in Millions)	11
Table 4: Potential SORN Funding Sources	12
Table 5: SORN 20/20 Outreach Overview	20
Table 6: SORN 20/20 Solutions Options Evaluation Matrix.....	32
Table 7: Estimated SORN 20/20 Radio Quantities	33
Table 8: Possible VHF Spectrum Mitigation Strategies and Next Steps.....	36
Table 9: Capital and operational SORN 20/20 Goods and Services.....	40
Table 10: SORN 20/20 20/20 Estimated Lifecycle Ownership Costs	42
Table 11: Potential Milestone-Based Annual Outlays	43
Table 12: Financed or Bonded Annual CapEx and OpEx (in Millions).....	44
Table 13: Funding Strategies Used by Other States	45
Table 14: Potential Funding Sources and Estimated Annual Revenue	47
Table 15: Total Oil & Gas Tax Revenue (Biennial).....	47
Table 16: Potential Cost-Sharing Models.....	49
Table 17: Governance Groups and Responsibilities	53

EXECUTIVE SUMMARY

STUDY BACKGROUND AND OBJECTIVES

Public safety communications systems in the State of North Dakota are at a critical juncture. The State’s current mission critical networks are comprised of a patchwork of dozens of aging and disparate systems that have not kept pace with the public safety community’s evolving needs for increased reliability, performance, and interoperability. These land mobile radios, illustrated in Figure 1, serve as an essential communications tool for over 900 public safety and other public sector agencies comprised of 20,000 users and devices and 23 Public Safety Answering Points (“PSAP”, “Dispatch”, or 9-1-1 Call Centers”) distributed across all 53 counties and several state agencies. Many of these systems—primarily anchored on 1970s technology, and implemented individually by State, local, and municipal entities over the past three decades—will soon reach the end of their functional lifecycle and, as the vendors begin to sunset old technologies, will no longer be supported by their manufacturers.

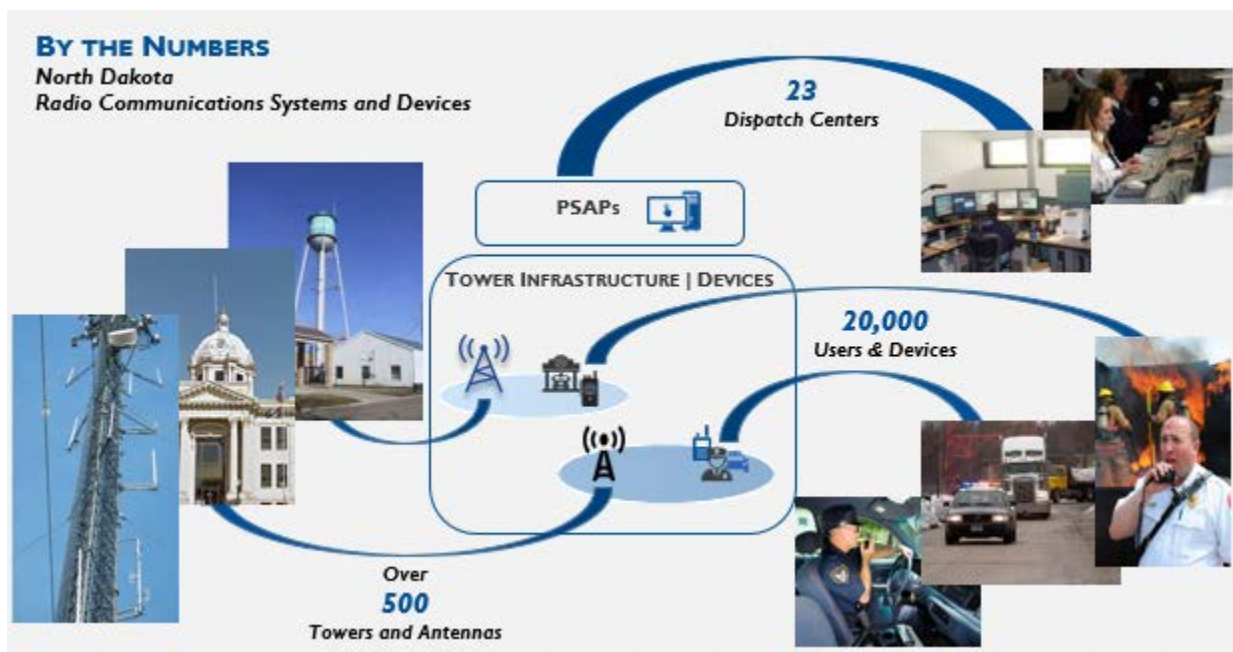


Figure 1: North Dakota Radio Communications Systems and Devices

Further, the State’s population—the fastest growing in the nation over the past decade—continues to place a higher demand on all facets of public safety response and mitigation. Over this timeframe, as the state’s population increase has led to a rise in public safety incidents, first-responders’ daily operational needs, procedures, federal regulations and overall technology expectations have also evolved. Across the nation, higher emphasis is placed on planned and well-coordinated response to small and large incidents alike, which require more robust and modern interoperable technologies. Virtually all other states have implemented one or more networks anchored on the APCO Project 25 (P25) standard at the State, local, or municipal levels. While some statewide entities have made economical investments to sustain their legacy radio systems, many of these aging systems do not fulfill the evolving needs of public safety. Therefore, it becomes increasingly vital to determine an optimal path for modernizing these disparate legacy communications systems.

In response to these issues, the 64th State Legislature charged “the [North Dakota] Information Technology Department [ITD], under the direction of the Statewide Interoperability Executive

Committee¹, [to] determine the *feasibility* and *desirability* of implementing” of a *Statewide Interoperable Radio Network* (or SIRN 20/20)—a holistic evolution of the State and Local communications networks into a single integrated statewide solution. The SIRN 20/20 plan is designed to address the demand from population and emergency incident growth, enhance statewide interoperability and other prevailing first-responder safety expectations, and prevent technology obsolescence, all in a cost-effective and timely manner, and under a sustainable and well-governed framework.

A statewide technology initiative of SIRN’s scale warrants a consensus-based process to clearly articulate the requirements of the public safety community, to define unmet gaps and limitations, and to assess the operational benefit and value of a modern, statewide solution. The Study employed a multi-pronged approach to fulfill these objectives: a technical capability and lifecycle audit of the existing state and local communications systems; thorough engagement and survey of virtually all North Dakota county public safety disciplines and representatives; and technical, operational and financial investigations of prospective solutions. Based on this thorough approach, the Study concluded that SIRN is a solution that is *desired* by State and local entities if perceived as an adequate and affordable replacement for local networks, and is *feasible* with sustainable funding streams and proper governance that provides transparency and responsiveness to local partners.

STAKEHOLDER SURVEY AND TECHNICAL SYSTEMS AUDIT FINDINGS

Essential to the Study was an extensive outreach and engagement effort to inform the public safety community of the prospective SIRN 20/20 solution, to evaluate current system gaps, and to determine the extent to which SIRN 20/20 is considered a “desirable” and “feasible” solution. The efforts identified current and future communications needs, and evaluated whether SIRN addresses unmet mission-critical gaps, yields operational enhancements, and provides overall value to the public safety community. Further, the outreach effort evaluated the factors and criteria that would affect local participation, and assessed the level of local adoption and the financial and jurisdictional conditions under which local agencies would do so.

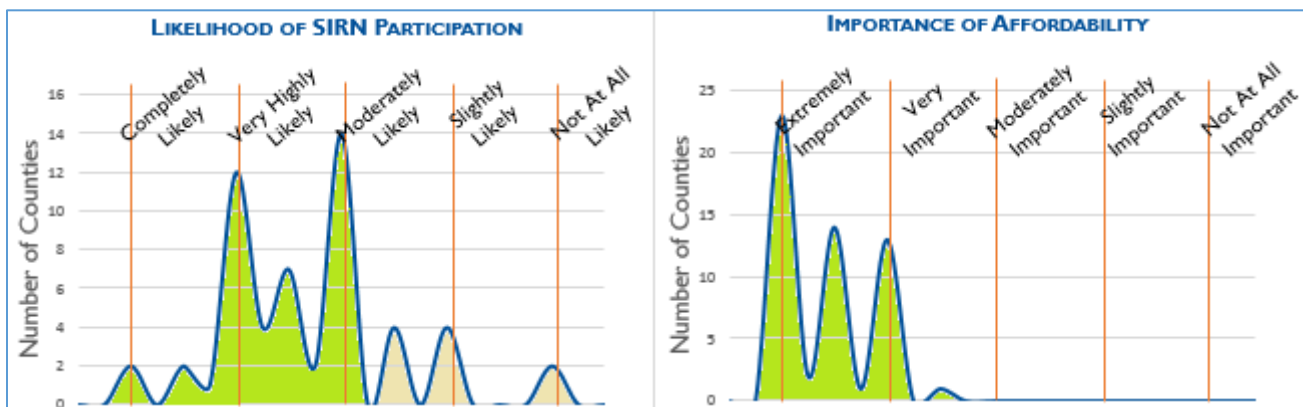


Figure 2: Likelihood of Joining SIRN (Left); Affordability as a Barrier to Adoption (Right)

North Dakota counties vary in their operational needs and financial capabilities; therefore, the SIRN 20/20 study yielded a range of opinions. However, as illustrated in Figure 2, the majority of counties, including over 90% of the State’s population, acknowledge the value of, and *would participate in an integrated statewide*

¹ The SIEC is the governing oversight committee responsible for advancing voice and data interoperability for North Dakota and is composed of local and state representatives from law enforcement, fire, EMS, emergency services, 9-1-1, transportation, and other first responder disciplines.

solution and contribute their assets, provided that it is affordable and has equitable local (urban and rural) governance representation. Stakeholders cited various reasons including aging systems, deficient coverage, lack of interoperable capabilities, and funding constraints in supporting the need for a coordinated and sustainable statewide effort.² Not surprisingly, cost was cited as a primary factor influencing a county's overall ability and desire to participate; historical funding constraints have primarily restrained the modernization of the local systems. However, all but nine counties³ indicated that locals should have a financial stake of up to 30% in SIRN 20/20, thus demonstrating their interests and obligations while acknowledging their financial constraints.

The system limitations cited by the stakeholder community were corroborated by comprehensive systems data collection and a technical evaluation effort. As previously noted, many of the systems in the State are nearing their serviceable lifespan—a primary impetus for the SIRN 20/20 Study; however, several technical and operational limitations are imposed by the ecosystem of disparate and legacy systems summarized below:

- **Abundance and Duplication of Systems:** This extensive ecosystem of local disparate systems deployed by State, Local, and Municipal entities over a period of 40 years has grown to comprise hundreds of public and private infrastructure elements. This practice has been perpetuated for many reasons including varied funding streams and constraints, and lack of established unified policies and procedures. This approach has led to a proliferation of numerous small networks which, in many cases, duplicate services and add a layer of operational complexity in supporting seamless communications, sustainment, and interoperability. Under the proposed SIRN 20/20 architecture, the infrastructure elements would be significantly reduced and largely leverage the existing infrastructure, thereby exploiting past investments, better managing cost, and enabling an accelerated deployment.
- **Interoperable Communications Constraints:** Because the current ecosystem of disparate systems is not networked and lacks mobility management, mutual aid communications among users from different systems is challenging. Mutual aid communications are typically conducted via a single repeated channel or a set of “off-network” or “unit-to-unit” channels (referred to as Bank 5⁴); under this configuration, first responders in the field lose access to their home Public Safety Answering Point (PSAP) or dispatchers. PSAPs are a critical element of the overall first response structure; dispatchers are responsible for overseeing field personnel, managing and distributing critical resources and information. Loss of contact with a home PSAP puts first responders in the field at risk, particularly if an emergency arises, and support personnel need to be dispatched. Under the proposed SIRN 20/20 solution, all users in the field as well as PSAPs would be connected and be able to maintain communications among all personnel.
- **Inefficient and Intensive Manual Operations:** Similarly, legacy technologies create an increased burden on field users and dispatchers, requiring constant awareness and announcement of their location with respect to a communications tower, along with changing channels as they move about their jurisdiction (or between towers). This aspect is typically handled by automated controllers in modern systems, allowing first responders to focus on their primary task.

² The 2015 Preliminary Study Report focused on the gap analysis of the current state and local systems; surveys during that Study identify gaps and operational risks with current systems, while the SIRN 2016 Feasibility surveys sought to determine whether an integrated solution was the desired approach in addressing these gaps.



³ These counties were also less likely to support the concept of SIRN.

⁴ Bank 5 are a set of repeated/direct frequencies used on a regional or statewide basis for multi-jurisdictional use.

- Coverage Issues and Reliance on Vehicular Repeaters:** Coverage is the most important attribute of a radio system. Despite the large number of radio towers, because a given user group only has access to their agency’s subset of the overall infrastructure, many field users experience coverage gaps throughout the state. Vehicle mounted relays—commonly referred to as Vehicular Repeaters (VR)—are widely used to extend the range of networks for portable device communications. While a cost effective means of filling network coverage gaps, overreliance on VRs has many technical and operational constraints. Primary among them is the first responders’ increasing operational expectation to use a portable (or handheld) communications device freely rather than the decades-old approach of “radioing in” from a vehicle-mounted mobile device. Many surveyed stakeholders noted their dissatisfaction with overreliance on VRs.

Baseline Operational Needs and Participation Criteria

Through work sessions, surveys, and interviews, the participating stakeholders collectively outlined and examined various SIRN 20/20 technical and operational attributes that maximize broad adoption, fulfill first-responder needs, and are necessary for SIRN to serve as a replacement of all current and planned county and municipal systems. These *baseline operational needs*, summarized in Table I, present the technical and financial *service objectives* driving the development of a successful SIRN framework.

ATTRIBUTE	BASELINE OPERATIONAL NEEDS	SERVICE OBJECTIVES
 <p>RADIO COVERAGE</p>	<ul style="list-style-type: none"> Equal or Better overall coverage than current systems (“Coverage Equivalence”) 95% Mobile Radio coverage in each county Portable Radio service along roadways and in populated areas Reliable in-building coverage in dense areas of the State 	<ul style="list-style-type: none"> Provide continuous and similar coverage experience for state, local, and municipal users and services Leverage mobility management to enable seamless roaming and transition from tower to tower for all approved users Support individual agency or function, and “announcement” communications capabilities
 <p>FEATURES MAINTENANCE</p>	<ul style="list-style-type: none"> Interoperability capabilities inter-county and inter-state Fire and Emergency Medical Services (EMS) paging systems support PSAP (911 call center) applications integration capability Network features capability support⁵ Reliable and timely maintenance and issue resolution 	<ul style="list-style-type: none"> Develop solution that delivers or incorporates all land mobile radio (LMR) based services and applications as an integrated service Support communications among any and all radios and dispatch centers at all times by linking all wireless and wired services Ensure regional support and maintenance of all integrated elements through central remote monitoring and resolution by distributed staff

⁵ “Support” refers to the ability of SIRN to support agency or county specific features. These features may not be initially delivered; however, SIRN would originally be designed to accommodate them and they may be funded by agency requiring the feature.


 <p>GOVERNANCE FINANCE</p>	<ul style="list-style-type: none"> ▪ Collaborative and equitable decision process ▪ Financially and operationally sustainable ▪ Significant State funding allocation 	<ul style="list-style-type: none"> ▪ Ensure adequate local representation in network deployment and decision-making ▪ Fund the solution primarily through State initiatives
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Table 1: Technical and Financial Service Objectives

PROPOSED SIRN 20/20 FRAMEWORK

Multiple options were evaluated with a primary goal of addressing these baseline needs and objectives; and in delivering a *statewide architecture that integrates all system infrastructure, dispatch centers, end-user devices and, additionally, provides interfaces to ancillary applications and other neighboring state systems supporting regional and statewide day-to-day, mutual aid and large scale mission critical communications* (See illustration in Figure 3). The Study puts forth a holistic framework for implementing such a statewide solution that includes a detailed conceptual design and implementation plan, strategies for its acquisition and sustained funding, and recommendations for the associated management and governance including agreement templates for participation, cost-distribution and asset-sharing among the various state and local entities. As with any extensive network of this nature, implementing SIRN will not be without its challenges; the Study details various potential technical and programmatic risks and outlines possible mitigation strategies.

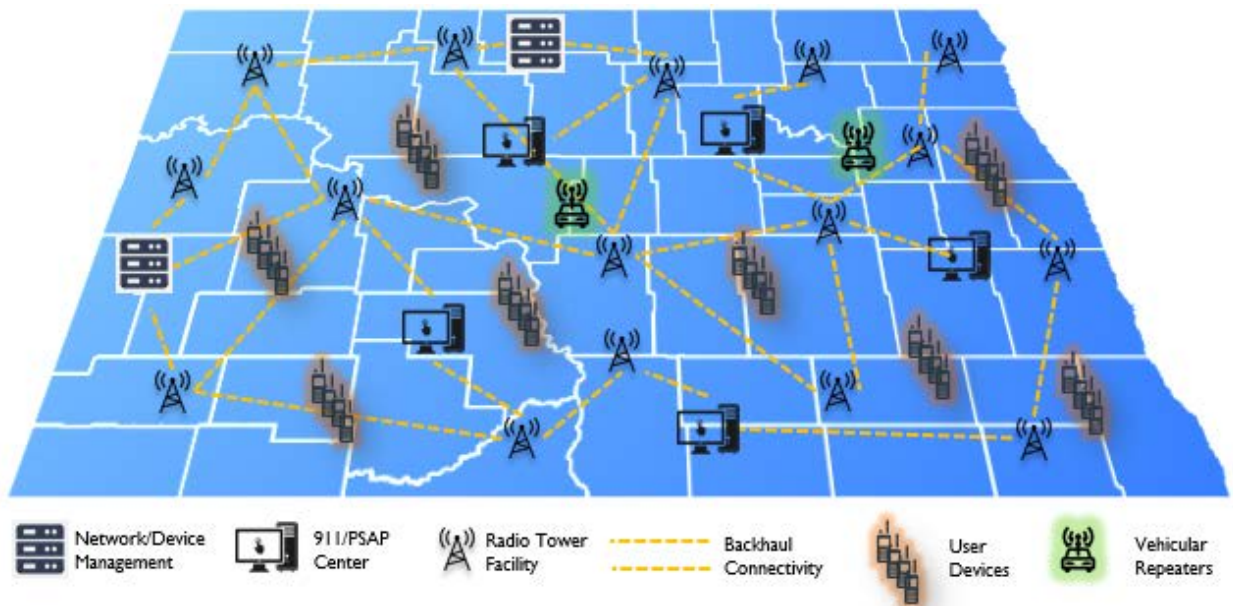


Figure 3: Conceptual Integrated SIRN Architecture

Table 2 outlines three SIRN 20/20 options, details the corresponding capital and operational costs, and presents brief evaluations against a set of criteria for *fulfilling the baseline needs, in a timely and risk-averse manner*. The estimated total capital cost of SIRN 20/20 is between \$ 170 and \$ 180 M; the ultimate cost will depend on the final architecture, leverage of existing assets, adoption rates, and acquisition strategies.

The table also enumerates annual operational expenses, and identifies currently incurred State based annual expenses that would be directly transitioned to SIRN operations.⁶

SIRN OPTIONS AND LIFECYCLE COSTS (IN MILLIONS)			
Options Description	1. Hybrid VHF⁷ Portable^[1] Network^[2] <ul style="list-style-type: none"> ▪ Network VHF mobile coverage statewide ▪ <u>Network-Based</u> VHF Portable service ▪ 800 MHz Network Portable service in “Urban Areas” 	2. Hybrid VHF Mobile Network^[2] <ul style="list-style-type: none"> ▪ Network VHF mobile coverage statewide ▪ <u>VR-Centric</u> VHF Portable service ▪ 800 MHz Network Portable service in “Urban Areas” 	3. 800 MHz Mobile Network^[3] <ul style="list-style-type: none"> ▪ Network 800 MHz mobile coverage statewide ▪ <u>VR-Centric</u> 800 MHz Portable service ▪ 800 MHz Network Portable service in “Urban Areas”
<i>Fixed Networks & Subsystems</i>	90.3	63	93
<i>Local Elements</i>	12.4	12.4	12.4
<i>Subscriber Devices</i>	74.4	90.6	80.4
Total Capital Costs	177.1	166	185.8
<i>Subscriber Upgrade [Savings]</i>	-4.9	-3.3	N/A
Estimated TOTAL with Savings	172.2	162.7	N/A
Total Annual Operational Costs	12.91	9.97	13.02
<i>“Current OpEx Transfer”</i>	3.06	2.78	3.06
<i>“New OpEx”</i>	9.85	7.19	9.96
Fulfills Baseline Requirements	ADEQUATELY	PARTIALLY	PARTIALLY
Leverage of Existing Assets	YES	YES	YES (LIMITED)
Requires Local Asset Contribution	YES – SIGNIFICANT STATE AND LOCAL ASSETS	YES – PRIMARILY STATE ASSETS	YES – LIMITED NEED
Implementation Timeline	LONG	MEDIUM	LONG
Implementation Risk	MEDIUM	LOW	LOW-MEDIUM
Ease of Operations and Sustainment	EQUIVALENT	EQUIVALENT	EQUIVALENT

⁶ Although, not represented in this Study, local jurisdictions also would incur operational and capital costs; SIRN would largely preclude other costs for land mobile radio systems at the State and Local levels.

⁷ Very High Frequency

- [1] Portable refers to a network that fulfills service levels as defined in the Baseline Requirements, and not a ubiquitous statewide on-street portable service. This option includes some VR usage to increase reliability in very remote areas.
- [2] Hybrid VHF Networks include 800 MHz Layers in Urban Areas for various performance and operational reasons.
- [3] This option comprises of 800 MHz throughout the State.

Table 2: SIRN Options and Lifecycle Costs (in Millions)

Various approaches for potential savings may be available including reusing some existing subscriber radios that are presented in Table 2 (See *Subscriber Upgrade [Savings]*). The report discusses general strategies for cost-efficiencies with the most important factor being an open procurement that fosters maximum vendor competition. While there are only a handful of companies that can provide large LMR systems, there are several firms that could provide subscriber devices, integration services, and maintenance services. SIRN procurement would be organized to maximize the market space for each of those elements allowing vendors to bid on one or all of these elements. It is recommended that the *State and Local* stakeholders plan for a budget of \$ 175 M; savings that come to bear due to variations in assumptions, most of which will be solidified within the first biennium, could be eliminated from the budget in subsequent biennia, or may be diverted to address other elements.

Implementation of a large government technology solution, particularly one that supports a mission-critical purpose for hundreds of agencies across dozens of jurisdictions, is a significant undertaking requiring a well-conceived and coordinated effort among the vendor community, the SIRN Operating Entity, the governing bodies, and the large community of first and second responders. A robust plan, coupled with the requisite funding stream and decision-making, is critical for the timely implementation of SIRN. With several current systems facing their end-of-life dates in 2018, a condensed timeline is essential for SIRN’s success, as delays could cause attrition of local support, place aging systems at risk, reduce the ability to leverage assets, and lessen the overall likelihood of a truly integrated solution. A comprehensive maintenance, operations, and sustainment plan is also essential: The SIRN Operations and Maintenance (O & M) structure would be comprised of internal or third-party staff, or a combination thereof depending on the acquisition strategy and information technology (IT) management philosophy the State pursues.

ESTIMATED ANNUAL COSTS AND POTENTIAL FUNDING SOURCES

It is recommended that the State establish a mechanism for fully funding SIRN before embarking on the project. SIRN 20/20 capital outlay may be expended per a milestone-based model or, if the State pursues a financed or bonded option, the costs may be distributed equally over the systems’ lifecycle (See Table 3).

Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Milestone-Based	11	54	49	52	42	11	11	12	12	12	13	13	13	14	14	14	15	15
Bonded or Financed	15	15	18	22	26	26	26	26	27	27	27	28	28	28	29	14	15	15

Table 3: Estimated Annual Costs (in Millions)⁸

The Study explored and analyzed various funding source options that may be available in the State of North Dakota, and that have also historically proven to be successful and viable in other states. Public safety systems are typically funded by a mixture of general funds, new self-funding initiatives (such as taxes and fees, 911 fees), or federal and state grants structured as recurring revenue sources or one-time capital infusions. Table 4 summarizes potential sources to fund SIRN 20/20, which include taxes and fees where nominal increases can produce significant annual sums, as well as other sources where current State rates

⁸ Per the Hybrid VHF Portable model excluding the existing subscribers leverage.

are substantially lower than other states in the region. By and large, the level of potential revenues across the proposed sources suggest that it is possible to fund the bulk of the projected SORN costs without unduly encumbering the constituency. The report also discusses the impact of the ever-fluctuating global crude oil costs and the implications on the State’s natural resources revenues, as well as the possibility of using the *State’s Strategic Investment & Improvement Fund* and *Political Subdivision Allocation Fund* to fund a portion of SORN.

Option	Proposed Changes and Estimated Annual Revenue	% SORN Cost ⁹
Cigarette Tax Increase	<ul style="list-style-type: none"> ▪ \$0.25 Increase Per Pack → \$14 M ▪ \$0.50 Increase Per Pack → \$28 M ▪ \$1.00 Increase Per Pack → \$56 M 	<ul style="list-style-type: none"> ▪ 70 % ▪ 145% ▪ 290%
Hotel Lodging Tax	<ul style="list-style-type: none"> ▪ \$0.50 Increase Per Night → \$1.5 - 2.0 M ▪ \$1.00 Increase Per Night → \$ 3 - 4.0 M 	<ul style="list-style-type: none"> ▪ 10% ▪ 20%
Traffic Citation Increase	<ul style="list-style-type: none"> ▪ Double → \$ 3.5 M ▪ Triple → \$7 M ▪ Quadruple → \$10.5 M 	<ul style="list-style-type: none"> ▪ 18% ▪ 35% ▪ 55%
Driver’s License Fee	<ul style="list-style-type: none"> ▪ \$10 Increase → \$5.2 M ▪ \$15 Increase → \$7.9 M 	<ul style="list-style-type: none"> ▪ 27% ▪ 42%
Vehicle Registration Fee	<ul style="list-style-type: none"> ▪ \$10 Increase → \$8.4 M ▪ \$15 Increase → \$12.7 M 	<ul style="list-style-type: none"> ▪ 45% ▪ 65%
911 Fee	<ul style="list-style-type: none"> ▪ Depends on County 	<ul style="list-style-type: none"> ▪ Variable
Gas Tax Increase	<ul style="list-style-type: none"> ▪ 2.5c Increase Per Gallon → \$12 M ▪ 5 c Increase Per Gallon → \$24 M 	<ul style="list-style-type: none"> ▪ 65 % ▪ 125%
Alcohol Tax Increase	<ul style="list-style-type: none"> ▪ 10 c Increase Per Gallon → \$3.4 M ▪ 20 c Increase per Gallon → \$6.8 M 	<ul style="list-style-type: none"> ▪ 18% ▪ 36%
Federal Grants	<ul style="list-style-type: none"> ▪ \$ 2 – \$ 3 M per annum 	<ul style="list-style-type: none"> ▪ 15%

Table 4: Potential SORN Funding Sources

STATE AND LOCAL COST-SHARING MODELS

Local stakeholders have indicated that while the State should earmark the bulk of SORN funds, counties and municipalities should have a financial stake in SORN. In order to establish a justifiable sharing model, SORN was divided into functional elements, each of which would have a different distribution of costs between the State and local entities. These functional elements and proposed cost-sharing models are illustrated below (Figure 4); in general, the State would fund 80% of the capital and operational costs of the “central elements,” while the remaining costs would be locally funded and distributed across counties by population and/or device quantities. The cost-sharing model also introduces a Support Fund to support entities, such as independent volunteer fire departments, that may not be able to afford the cost of participation, and to ensure financial barriers do not delay the implementation, potentially placing the program at risk.

⁹ As a percentage of the projected combined capital and operational costs of SORN. As illustrated in the table, several sources could be used to cover a substantial percentage of SORN; alternatively, certain proposed sources could cover the full amount.

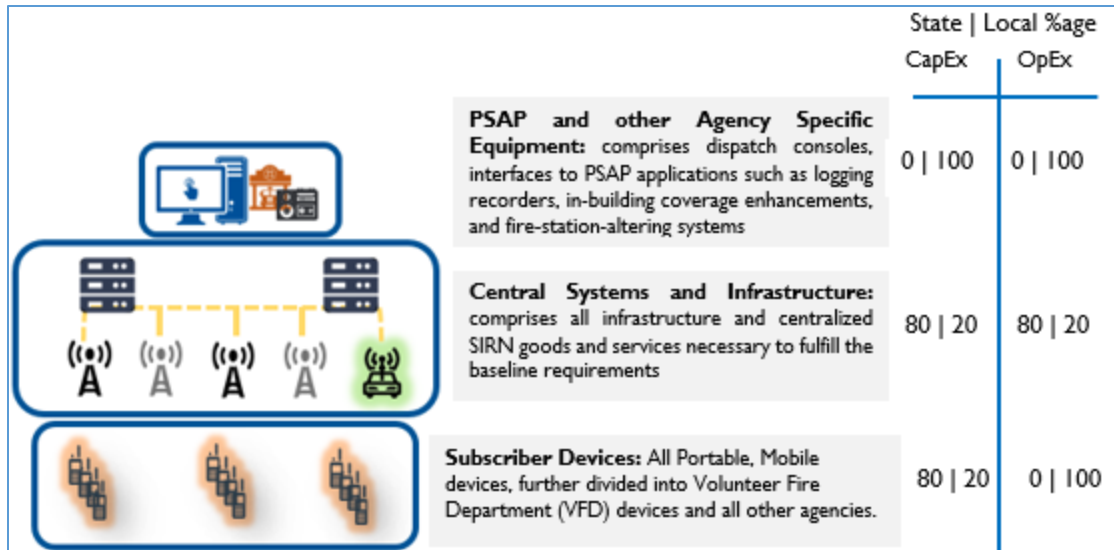


Figure 4: Proposed Cost-Sharing Models

SORN GOVERNING MODELS

Central to the success of a statewide solution is a governance framework that defines the shared ownership, decision-making, operation and sustainment at all levels of government. A consolidated radio network would require even greater collaboration and present significant opportunities for State, Local and Tribal agencies to enhance interoperability and cross agency/jurisdiction response and mutual aid. The Study recommends a number of actions to establish a successful SORN 20/20 governance structure and composition based upon interviews, primary source document research and successful approaches in other states.

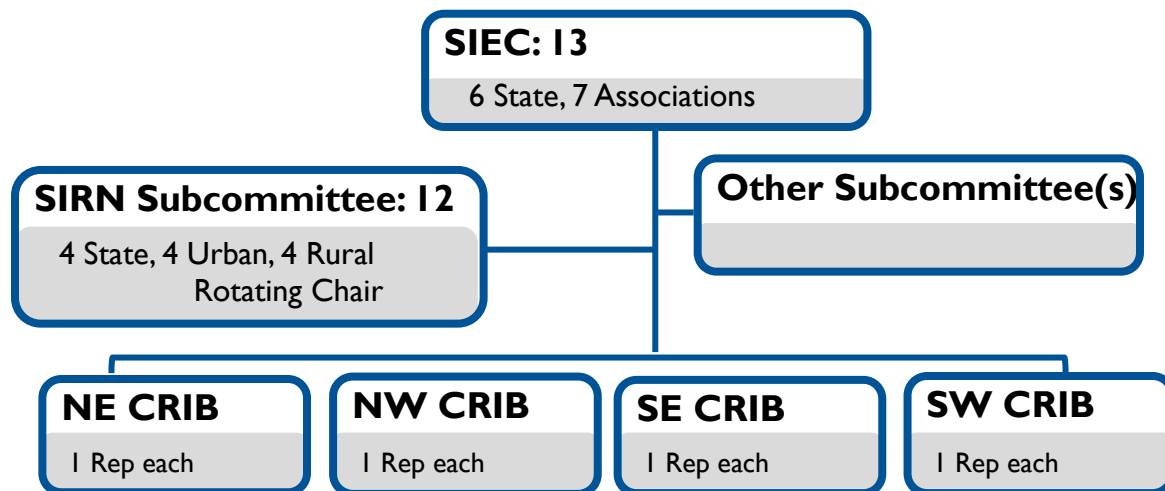


Figure 5: Recommended Structure for SORN Governance

The primary recommendations constitute certain modifications to SIEC capabilities and statutes, and specifically, the creation, within the SIEC, of a SORN 20/20 subcommittee focusing on all program matters. The SORN 20/20 subcommittee would be evenly composed of State,¹⁰ local “Urban” and local “Rural”

¹⁰ SIEC should endeavor to appoint one or more members of the SORN Subcommittee to represent tribal interests; such a member would count toward the “State” third of the SORN membership.

representatives with diversity of geography, public safety discipline, relevant professional experience, and relevant skill sets. The SIRN 20/20 subcommittee would originate all program policy measures and propose them to the SIEC, which must adopt the measure or decline with explanation; the SIEC may not adopt language unless it is submitted by the SIRN 20/20 subcommittee. The Study recommends that the SIEC gain and exercise statutory authority to engage, as the level of work requires, its own professional staff, including both a manager to perform administrative and policy tasks for the SIEC, as well as a minimum of two Regional Interoperability Coordinators (RICs) to foster and facilitate regional/local communications. Finally, as illustrated in Figure 5, the SIEC would establish four Coordinated Regional Interoperability Boards (CRIBs) as subcommittees of the SIEC that would best represent the respective regional partners.

The SIEC, in collaboration with the SIRN Subcommittee, would be responsible for developing and establishing a set of policies and procedures on daily operations, system usage, cost-sharing models, asset-sharing agreements and several SIRN initiatives.¹¹

NEAR-TERM STATE-LED/REGIONAL INITIATIVES

Communications Initiatives

There are a variety of near- and mid-term initiatives that can be implemented to advance public safety communications in the State of North Dakota. These efforts can be pursued in parallel with, and incorporate some elements of the SIRN initiative and planning process detailed in this document. These initiatives can be implemented within the SIEC or build upon the current efforts of the Department of Emergency Services (DES), which spearheads and facilitates many beneficial training and exercises support statewide. The SIEC should establish the Coordinated Regional Interoperability Board (CRIBs), and establish the necessary staff to foster a more concerted avenue for SIEC or communications activities at the regional level.

Advancing the SIRN Study

With respect to advancing the SIRN 20/20 effort, North Dakota Information Technology Department (ITD), in collaboration with the SIEC, has already begun concerted efforts to continue the outreach efforts and further evolve the structure for SIRN 20/20. Assuming SIRN 20/20 advances, a set of recommended efforts, many of which are discussed in this report, should begin shortly afterwards, including:

- Implementation of the proposed Governance Structure
- Advance the Outreach, Public Relations and Regional Efforts
- Additional field studies to document and evaluate network assets
- Establish a program office to spearhead the procurement process

¹¹ The Study provides proposed templates including asset-sharing and participation agreements.

INTRODUCTION

The State of North Dakota has experienced a population increase of 18 % over the past ten years making it the fastest growing state in the nation. While this growth has decelerated in the past two years, the *permanent* population of several counties, particularly within the fossil fuel-rich counties has significantly increased, placing a higher demand on all facets of public safety response and mitigation. Public safety entities use mission critical radio communications systems as their mission-essential lifeline communications tool to distribute and relay mission critical information. While a few select State entities have made investments in communications technologies to maintain pace with these evolving needs, mission-critical systems throughout the state are primarily comprised of disparate solutions anchored on 1970s technology, many of which will soon reach the end of their functional lifecycle and will no longer be supported by their manufacturers. Concurrently, as the State’s population increase has led to a rise in public safety incidents and activities, first-responders’ operational needs, procedures, federal regulations and overall technology expectations have also evolved to embrace more robust and modern technologies not met by their current systems.

In response to these issues, the State Interoperability Executive Committee (SIEC)¹² sponsored the North Dakota Statewide Radio Systems Assessment and Evolution Study¹³ that proposed to the 64th State Legislature in January of 2015 an integrated statewide network to consolidate and evolve the myriad of legacy public safety radio systems. The *Statewide Interoperable Radio Network* (or SIRN 20/20), as proposed within the Study, conceived a holistic and integrated evolution of the State and Local communications networks that is designed to address and mitigate key public safety communications objectives – addressing the demand from population and emergency incident growth, enhancing statewide interoperability and other prevailing first-responder safety expectations, and preventing technology obsolescence – in a cost-effective and timely manner.

The 64th State Legislature charged “the Information Technology Department, under the direction of the Statewide Interoperability Executive Committee, [to] determine the *feasibility* and *desirability* of implementing” a statewide radio interoperability network on a broad consensus-driven study and to “report to the appropriations committees of the sixty-fifth legislative assembly regarding the department's evaluation of the project ... and recommendations for proceeding with the project or discontinuing future participation.”¹⁴ The North Dakota Information Technology Department, in collaboration with the SIEC, engaged, Televate, LLC and its partner The Interoperability Group, to:

- Comprehensively determine the desirability of an integrated statewide solution, and participation of local entities, anchored on extensive engagement and evaluation of the public safety community
- Evaluate the feasibility from an array of technical, operational, financial, and programmatic perspectives
- Outline a detailed, cost-effective, sustainable and well-governed solution that meets the needs of the public safety community

This document is the Final Report of a six month-long SIRN 20/20 Feasibility Study summarizing the findings and proposed solutions. The document is generally divided into three sections:

¹² The SIEC is the governing oversight committee responsible for advancing voice and data interoperability for North Dakota and is composed of local and state executive representatives from law enforcement, fire, EMS, emergency services, 9-1-1, transportation, and other first responder disciplines.

¹³ “North Dakota Statewide Radio Systems Assessment and Evolution Study” (Dec. 15, 2014).

¹⁴ Senate Bill 2016, Section 5.

- **Need for Evolution:** Justification for the need and desirability of SIRN 20/20 based on an extensive outreach and survey effort as well as independent technical evaluation of the current state and local mission critical radio systems
- **Proposed Solutions Framework:** Detailed technical foundation outlining the technology, architecture, cost options, designs, implementation and migration plans for optimal solutions that meet stakeholder defined and verified objectives
- **Financial and Governance Framework:** Estimated SIRN 20/20 lifecycle costs and recommendations on revenue generation, cost-sharing models, and, importantly, the governance structure that fosters equitable representation of, and decision-making by all state, local and tribal interests

Several additional documents, some of which are submitted as Appendices to this Final Report, have been created over the course of the Study. These documents provide further detail on the Study activities and material summarized within this Final Report. Relevant documents include:

1. SIRN 20/20 Architecture, Implementation and Migration Plans Overview
2. SIRN 20/20 VHF Coverage Plan and Design
3. SIRN 20/20 Very High Frequency (VHF) Survey and Plan
4. SIRN 20/20 Survey and Needs Assessments Findings Summary
5. SIRN 20/20 Governance Recommendations
6. SIRN 20/20 Participation Memorandum of Understanding Template
7. SIRN 20/20 Asset-Sharing Agreement Template
8. SIRN 20/20 Cost Estimates Development and Revenue Models
9. SIRN 20/20 Study Outreach, Data Collection, Requirements Gathering Process Overview



STUDY METHODOLOGY

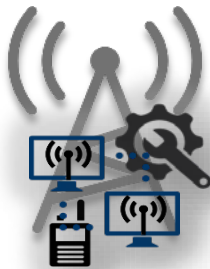
The SIRN 20/20 Feasibility Study followed a comprehensive and well-conceived methodology in performing a detailed assessment of the State's public safety systems and stakeholders, and in developing the corresponding recommendations for the SIRN 20/20 framework.



- **Stakeholder Outreach and Assessment:** Extensive outreach effort to inform, engage and obtain requirements and feedback from the public safety community regarding the SIRN 20/20 proposition. These activities included 16 conferences and workshops in eight regions; online surveys; multiple educational and informational newsletters and web material; dozens¹⁵ of individual county web-conferences, requirements gathering sessions, and interviews; governance interviews, and hundreds of electronic and telephone correspondences. Through these efforts, all 53 counties in the State were in one way or another engaged or surveyed in the process.



- **Extensive Systems Data Collection and Evaluation:** Data collection accounted for a substantial portion of the Study's effort. Through the outreach efforts noted above, and independent field surveys, data on the ecosystem of public safety communications systems and devices, was collected and analyzed. The objective was to quantify and evaluate the scope of the current systems and devices, and determine existing assets for use in future solutions.



- **Design and Recommendations Development:** Detailed solutions (technology, finances, governance) development with continued feedback from state and local stakeholders. Multiple options were developed and evaluated against how suitability and cost-effectively they met the end user needs.
- **Market Research:** Research of prevailing and emerging technologies, lessons learned from similar efforts in other states, prospective funding initiatives, relevant State legislation and bylaws.

The Study culminates in the creation of a framework for implementing a statewide solution – a detailed conceptual design and implementation plan, strategies for its acquisition and sustained funding, and recommendations for its management and governance including agreement templates for participation, cost-distribution and asset-sharing among the various state and local entities.

¹⁵ Findings from the North Dakota Statewide Radio Systems Assessment and Evolution Study are incorporated where applicable across various facets of the SIRN feasibility Study.

THE NEED FOR AN EVOLUTION

OVERVIEW AND BACKGROUND

A statewide technology initiative of SIRN 20/20's scale warrants a consensus-based process to clearly articulate the requirements of the public safety community, to define unmet gaps and limitations, and to assess the operational benefit and value of a modern, statewide solution. The Study employed a multi-pronged approach to fulfill these objectives – a technical capability and lifecycle audit of the existing state and local communications systems; thorough engagement and survey of virtually all North Dakota county public safety disciplines and representatives; and technical, operational and financial investigations of prospective solutions, against current and future operational needs.

Population Growth and Public Safety Operations Evolution

North Dakota has experienced a population increase of 18 % over the past ten years making it the fastest growing state in the nation. While this growth has decelerated in the past two years, the *permanent* population of several counties, particularly within the fossil fuel-rich counties has significantly increased, placing a higher demand on all facets of public safety emergency incident response and mitigation. As illustrated in Figure 6,¹⁶ this population growth has generated substantial increases in the crime index (12% since 2009), EMS incidents (45% since 2006), and 9-1-1 call volume (80% since 2006), all of which place a great burden on the voice and paging communications networks used by the public safety community.

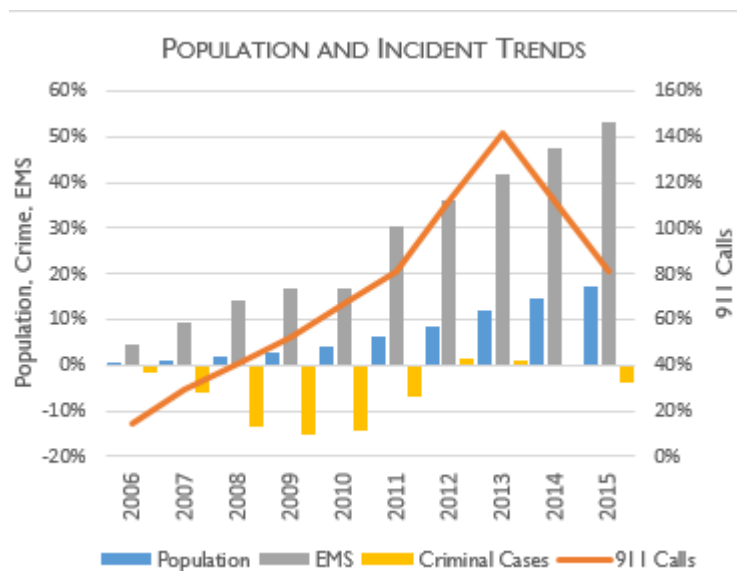


Figure 6: Population and Public Safety Incident Trends (2006 – 2015)

In addition to the overall population and incident growth, public safety response and communications procedures have evolved over this timeframe. Higher emphasis is placed on planned and well-coordinated response to small and large incidents alike, which require modern and interoperable communications systems. First responders have also come to expect the ability to use a portable (or handheld) communications device rather than the decades-old approach of “radioing in” from a vehicle-mounted mobile device.

Continued Use of Aging and Legacy Systems

While various entities within the State have made investments in communications technologies to maintain pace with these evolving needs, as detailed within this report, these mission-critical systems are primarily comprised of **disparate solutions** anchored on 1970s technology. Populous and oil-rich counties have

¹⁶ Data assembled from annual reports of (1) North Dakota Association of Counties Emergency Communications Coordinating Committee 911 Biennium reports (Note: Report including 2014 – 2015 data is in *Draft Form*); (2) North Dakota Court Systems Annual Report; (3) North Dakota State Online Annual Reporting EMS data (data available between 2006 – 2011; extrapolated linearly for 2012 – 2015) ; (4) US Census Population Estimates

independently implemented solutions in recent years to support their growing needs; however, dozens of rural counties employ legacy aging systems or the State Radio Network¹⁷ – a statewide communications network originally architected in the 1970s. Both legacy and even some recent equipment are at a critical juncture as vendors begin their planned obsolescence of these technologies, placing an even larger burden on the county-level systems. Between 2017 and 2019, thousands¹⁸ of portable and mobile radios, dozens of radio dispatch consoles, and infrastructure elements will no longer be supported by their manufacturers.

Faced with lack of vendor support and aging equipment on mission-critical equipment, many states have implemented integrated statewide radio communications systems anchored on a public safety land mobile radio (LMR) standard established in the early 1990s. In the past decade, these systems have employed APCO P25 Phase I or Phase II networks – a standardized set of large scale systems compliant with the predominant US standard for public safety systems. Established in 1989, the Association of Public Safety

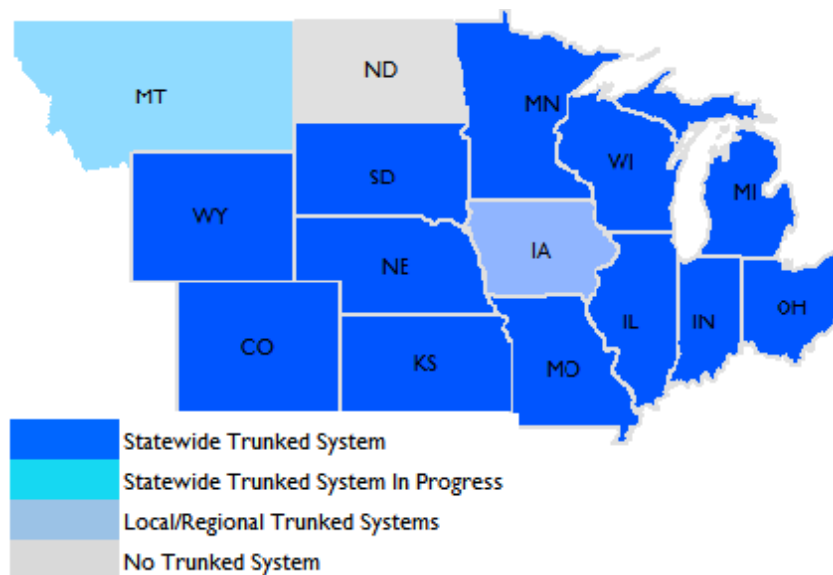


Figure 7: Mid-West and North Central Region State and Local Trunked Systems

Communications Officials Project 25 (APCO P25) is a suite of standards that has evolved over the past two decades into a mature set of technologies employed across the nation. Virtually all states in the United States with the exception of North Dakota have implemented or are currently deploying one or more trunked networks at the state, local or municipal levels. In fact, the migration to such technologies of neighboring states such as Minnesota, South Dakota and Montana have reduced the State's ability to maintain

interoperable communications with their counterparts (Migration to a standardized technology would improve cross-State interoperable communications). It is important to note that not all aspects of this standardized technology have necessarily proven to be worthwhile for all jurisdictions – given its rural geography and low population, North Dakota sustained its communications needs, and even improved interoperability, through economical investments in legacy technologies. However, as the Project 25, or P25, standard emerges as the only APCO-sanctioned standard, and LMR equipment vendors sunset old technologies, it becomes increasingly important to determine an optimal evolution for these disparate legacy systems at this juncture.

¹⁷ The Department of Emergency Services (DES), in collaboration with Department of Transportation (DOT), operates a 43-site land mobile radio system, commonly referred to as State Radio. The State Radio network, and the associated dispatch services offered by State Radio, serves as the primary mission critical voice and paging communications system for all State agencies, and twenty-four (24) North Dakota counties.

¹⁸ Nearly 5,000 radios will not be supported by their vendor by 2019, an additional 13,000 are either already past their serviceable lifespan, will face vendor support termination, or cannot be used on SIRN 20/20 technologies. (See Tower and Subscriber Databases for additional details)

The SIRN 20/20 Vision

The SIRN 20/20 solution is conceived as a holistic and integrated evolution of the State and Local communications networks that tackles the key objectives – addressing the demand from population and incident increase, enhancing interoperability and other prevailing first-responder safety expectations, and avoidance of technology obsolescence – in a cost-effective and timely manner. The following sections discuss the findings of two major Study efforts – *stakeholder feedback* on and *technical analyses* of the current systems, employed in evaluating *the desirability and the feasibility* of SIRN 20/20.

STAKEHOLDER SURVEYS AND OUTREACH

The scale of SIRN 20/20 necessitates a consensus-based process to clearly articulate the needs of the public safety community, to define unmet gaps and limitations, and to assess the operational benefit and value of a modern, statewide solution. The State Legislature specifically requested that the desirability and feasibility of SIRN 20/20 be anchored on consultation with affected stakeholders. Therefore, the Study’s conclusions and recommendations draw upon a comprehensive needs assessment and engagement of public safety stakeholders throughout the State.

Stakeholder outreach, education, and assessment accounted for a substantial effort of the Study scope with multiple activities over a four-month period. As detailed in the methodology section,¹⁹ these activities included 16 conferences and workshops in eight regions; an inclusive online survey; multiple educational and informational newsletters and web material; dozens²⁰ of individual county web-conferences, requirements gathering sessions, and interviews; and hundreds of electronic and telephone correspondences (See Table 5). Through these efforts, all 53 counties in the State were in one way or another engaged in the process; opinions within a given county may differ, however, the findings and recommendations in this report are representative, holistic, and comprehensive.

Outreach and Information Forums	Participants/Audience
Individual Meetings	38 Counties, 2 State Agencies, 1 Tribal Entity, 3 State Associations
16 Regional Conferences	46 Counties, 2 State Agencies, 151 Attendees
Monthly Newsletters & Informational Video	Distribution list of 950 Individuals
April 2016 Online Survey	All 53 Counties, 6 State Agencies, 140 Responses
October 2014 Online Survey	43 Counties, 5 State Agencies, 320 Responses
Systems Data Collection	Data collected from 42 Counties and 3 State Agencies
Statewide conferences, committees, and presentations	33 Informational presentations and discussions with 2 committees, 8 public safety associations, 8 cities, 22 public safety answering points, and 7 state agencies

Table 5: SIRN 20/20 Outreach Overview

¹⁹ See Supplemental Document 11.9 - SIRN Study Outreach, Data Collection, Requirements Gathering Overview

²⁰ Findings from the 2015 Preliminary Study (North Dakota Statewide Radio Systems Assessment and Evolution Study – 2015) are also incorporated where applicable across various facets of the SIRN feasibility Study. This preliminary study laid the groundwork for identifying communications systems issues leading up to the SIRN Feasibility Study.

The primary objectives of the outreach and assessment effort was to determine:

- **Desirability:** The extent to which SIRN 20/20 is considered a “desirable” solution across a myriad of operational attributes by the first-responder community at the State, County, and Municipal levels. The efforts identified current and future communications needs; and evaluated whether SIRN 20/20 addresses unmet mission-critical gaps, yields operational enhancements and provides overall value to the public safety community.
- **Participation and Conditions:** Broad participation by local stakeholders is a critical element to the success of SIRN 20/20, from a technical and financial perspective. The outreach effort evaluated the factors and criteria that would affect local participation, and assessed the level of local adoption and the financial and jurisdictional conditions under which they would do so.
- **Feasibility:** The extent to which SIRN 20/20 is feasible from a technical, operational, financial and governance standpoint.

SIRN 20/20 Highly Desired with Conditions²¹

North Dakota counties vary in their operational needs and financial capabilities; therefore, the SIRN 20/20 study yielded a range of opinions. However, as illustrated in Figure 8, the majority of counties acknowledge the value of, and would *participate in, an integrated statewide solution and contribute their assets* provided that it is affordable and has equitable local (urban and rural) governance representation. Stakeholders cited various reasons including aging systems, deficient coverage, lack of interoperable capabilities, and funding constraints in supporting the need for a coordinated and sustainable *statewide effort*.²²

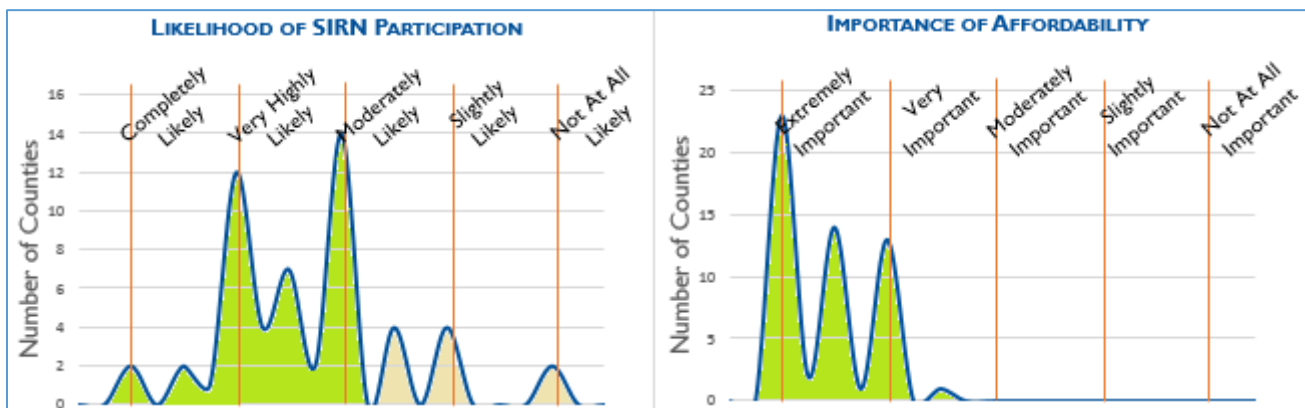
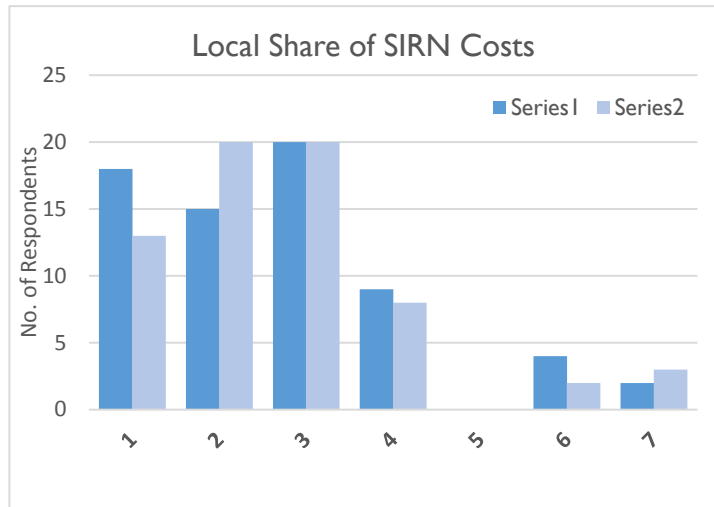


Figure 8: Likelihood of Joining SIRN 20/20 (Left); Affordability as a Barrier to Adoption (Right)

²¹ See Supplemental Document 11.4 SIRN 20/20 Survey and Needs Assessments Findings Summary


²² The 2015 Preliminary Study Report focused on the gap analysis of the current state and local systems; surveys during that Study identify gaps and operational risks with current systems, while the SIRN 2016 Feasibility surveys sought to determine whether an integrated solution was the desired approach in addressing these gaps.

Not surprisingly, cost was cited as a primary factor influencing county overall ability and desire to participate (Figure 8); historical funding constraints have been the primary reasons limiting the modernization of the local systems (Few counties noted satisfaction with their current systems for not strongly considering SIRN 20/20, indicating that given an affordable solution, they would prefer to migrate to a different system). However, all but nine counties²³ indicated that local entities should have a financial stake of up to 30% in SIRN 20/20 (See Figure, Right) that is distributed across the counties by population or radio user densities, thus representing their interests and obligations while acknowledging their financial constraints. Additionally, counties and municipalities were amenable to leveraging and contributing their assets – including access to civil infrastructure such as radio tower space, backup generators, equipment, shelter space) under the right conditions. These assets have considerable value and cast savings consideration to the SIRN 20/20 recommendation.




Baseline Operational Needs

In addition to determining the participation factors above, these stakeholder engagement activities were the basis for collectively outlining and examining various SIRN 20/20 technical and operational attributes that maximize broad adoption, fulfill first-responder needs, and are necessary for SIRN 20/20 to serve as a replacement of all current and planned county and municipal systems. The outcome of these activities is the set of “Baseline Operational Needs” illustrated below. These requirements present the technical and financial factors integral to the analysis of successful SIRN 20/20 solutions, and drive the development of the SIRN 20/20 solutions framework detailed in this report.

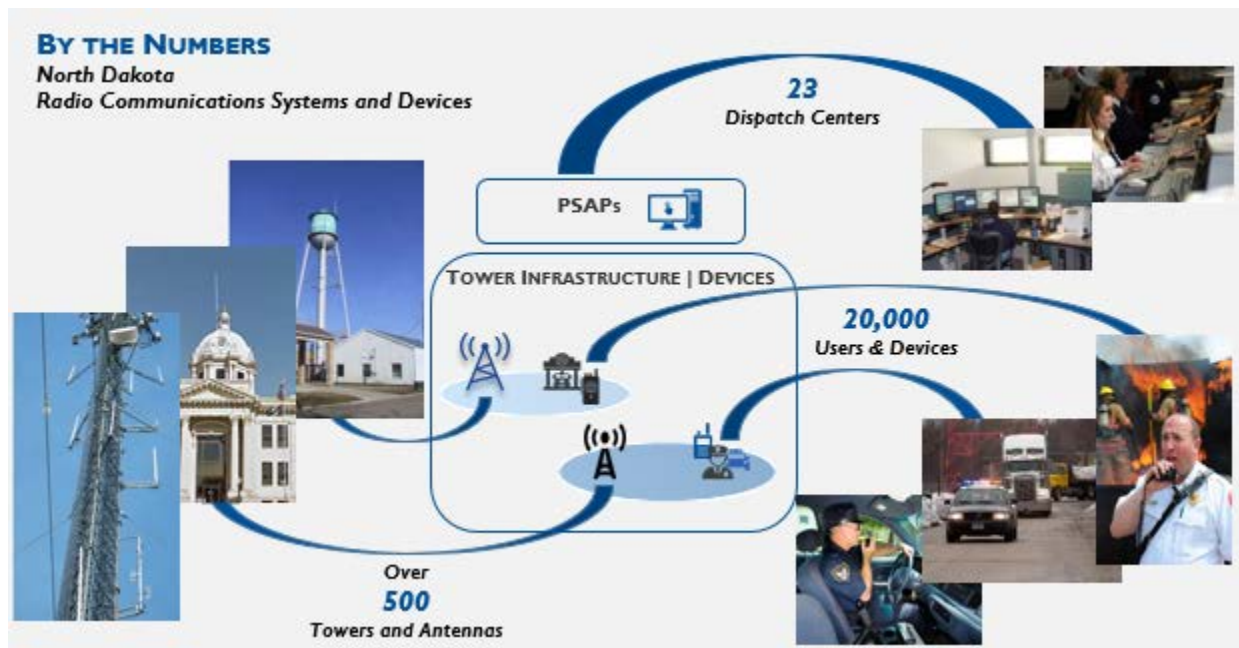
ATTRIBUTE	BASELINE OPERATIONAL NEEDS
 <p>RADIO COVERAGE</p>	<ul style="list-style-type: none"> ▪ Equal or Better overall coverage than current systems (“Coverage Equivalence”) ▪ 95% Mobile Radio coverage in each county ▪ Portable Radio service along roadways and in populated areas ▪ Reliable in-building coverage in dense areas of the State
 <p>FEATURES MAINTENANCE</p>	<ul style="list-style-type: none"> ▪ Capacity and individual agency communications enhancements ▪ Interoperability capabilities inter-county and inter-state ▪ Fire and Emergency Medical Services (EMS) paging systems support ▪ PSAP (9-1-1 call center) applications integration capability

²³ These counties were also less likely to support the concept of SIRN.

	<ul style="list-style-type: none"> ▪ Network features capability support²⁴ ▪ Reliable and timely maintenance and issue resolution
 <p>GOVERNANCE FINANCE</p>	<ul style="list-style-type: none"> ▪ Collaborative and equitable decision process ▪ Financially and operationally sustainable ▪ Significant State funding allocation

COMMUNICATIONS SYSTEMS OVERVIEW AND CONSTRAINTS

Approximately 85% of the County and Municipal public safety and public service entities²⁵ in the State of North Dakota operate **myriad independent, localized land mobile radio systems and dispatch centers** as their primary solution for mission critical voice and paging communications. The State Radio system – a statewide system managed and operated by DES and DOT – serves as the primary solution for the remaining State and local agencies, and provides as a secondary interoperable solution for multi-county response requirements. Collectively, these systems are essential communications tools for 130 law enforcement agencies, 175 public and private EMS departments, 385 volunteer fire departments, and dozens of public works and highways departments across the State, supporting almost 20,000 devices. Most networks are additionally interfaced to multiple supplementary applications such as computer-aided dispatch (CAD) systems, fire station alerting systems and over 4,500 two-way paging devices.²⁶



²⁴ “Support” refers to the ability of SIRN 20/20 to latently support agency or county specific features. These features may not be initially delivered; however, SIRN 20/20 would originally be designed to accommodate them and they may be funded by agency requiring the feature.

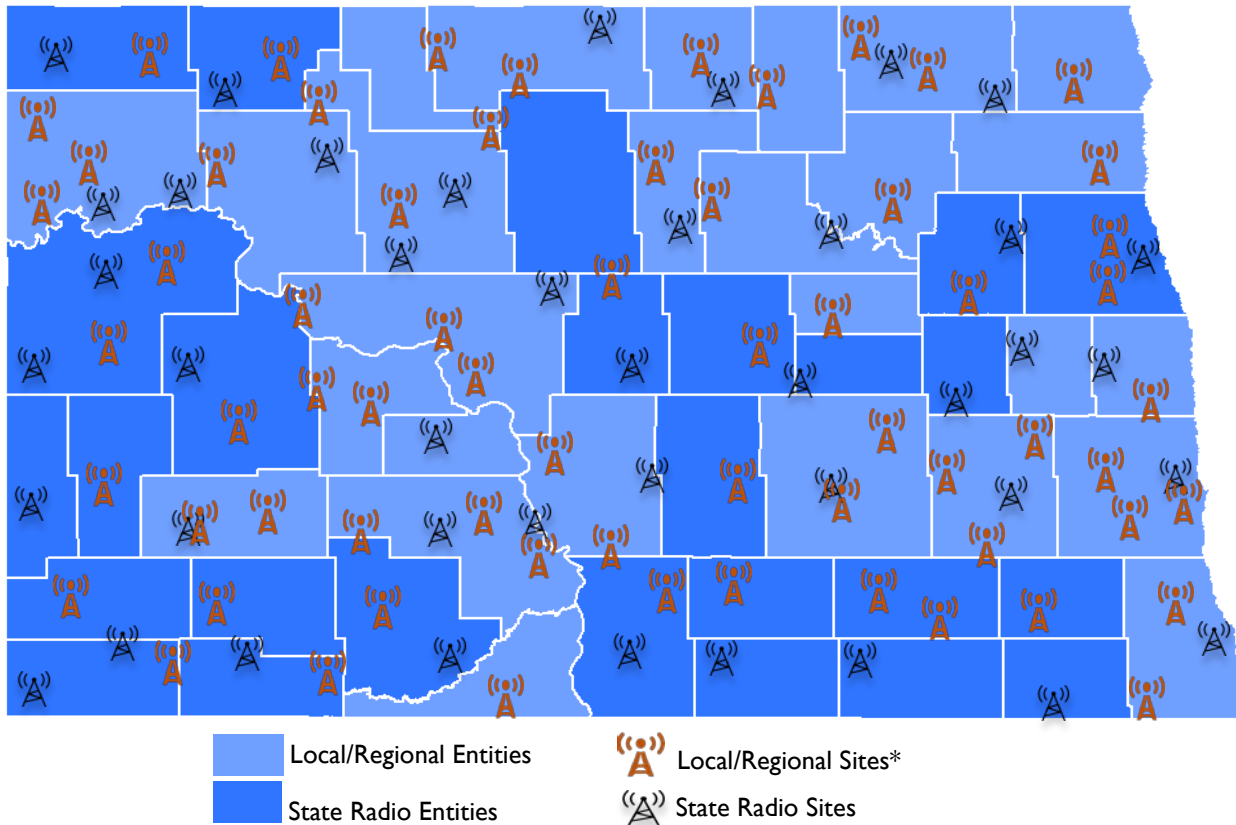
²⁵ Public service agencies including public works, transportation departments, and public schools many of which play critical functions in the overall incident response and mitigation structure

²⁶ See Tower, Subscriber and Miscellaneous Equipment Databases and corresponding Current System Assessment for further details on the status of current state and local systems.

Limitations and Constraints

This section details key constraints, limitations and inefficiencies of existing state and local systems based on direct stakeholder input as well as independent technical analyses anchored on an extensive data collection and site survey effort. In general, the systems data collection effort was an integral component of the Study – essential in quantifying the totality of systems in the State, assessing their current strengths and weaknesses, and identifying suitable assets in the design of SORN 20/20.

Abundance and Duplication of Systems: While there has been general guidance from the state on standards and technologies, most local entities – counties and municipalities – have independently deployed a large ecosystem of disparate systems and equipment to meet their unique geographic and operational needs. Over a period of 40 years, this extensive ecosystem of local disparate systems has grown to comprise hundreds of public and private infrastructure elements. Within some counties, the county sheriff, incorporated cities, fire departments, schools and public works agencies may all operate small localized independent networks comprised of a single or several base station towers. Collectively, these networks likely provide the requisite level of radio coverage in most of the State; however, a given agency typically only has access to their subset of sites which may not be sufficient.²⁷



*Illustration of local sites; actual quantity exceeds 450 transmit locations

Figure 9: Conceptual Illustration of State and Local Towers

This practice has been perpetuated for many reasons, including varied funding streams and constraints and establishment of appropriate policies and procedures. It is worth noting that many of these small networks have also been cost-effective; they are less expensive from an individual agency’s perspective than the

²⁷ See *North Dakota Statewide Radio Systems Assessment and Evolution Study (2015)* and Supplemental Document 11.4 *SORN 20/20 Survey and Needs Assessments Findings Summary* for further discussion on coverage gaps.

modern technologies being proposed under SIRN 20/20. However, while potentially cost-effective individually, this approach has led to a proliferation of numerous small networks which, in many cases, duplicate services potentially at great overall cost, and importantly, adds a layer of operational complexity in supporting seamless communications, sustainment and interoperability.

An illustration of this ecosystem of sites is depicted in Figure 9. Creating an efficient and integrated system is a key attribute of SIRN 20/20; as discussed later in this report, the total number of “radio sites”, and the associated capital and operational costs, would be significantly reduced under the SIRN 20/20 architecture. These systems are the basis for the future – SIRN 20/20 would be largely anchored on existing infrastructure, thereby leveraging past investments and enabling an accelerated deployment.

Systems’ End of Life: The age and sophistication of these systems varies based upon the counties’ population, operational needs and funding capabilities. However, as previously noted, a majority of these systems are anchored on legacy technologies and are thus facing vendor obsolescence. Independent replacement of these disparate networks at the local level with new but similar legacy technologies, while possible, limits the efficiencies and operational benefits of an evolutionary migration.²⁸

Inefficient Frequency Use: The abundance of disparate systems requires a significant number of radio channels or frequencies – a scarce public resource – to support the communications needs of hundreds of agencies. Some counties do share radio channels among different disciplines satisfactorily; however, in many cases such shared channels cause nuisance communications in which different agencies with varying functions have to listen to each other’s communications.

Intensive Manual Operations: The legacy technologies underlying all existing systems lack basic modern capabilities such as user registration and mobility management. To overcome these limitations, both dispatch personnel and first-responders have to constantly be aware of and announce their location with respect to a communications tower, changing channels as they move about their jurisdiction (or from tower to tower). This approach, in conjunction with the abundance of disparate systems, can compromise safety.

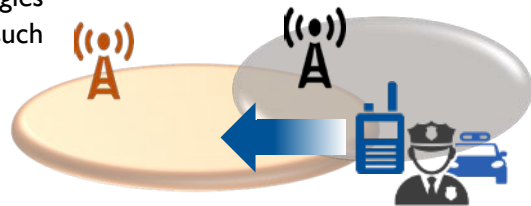


Figure 10: Lack of Mobility Management

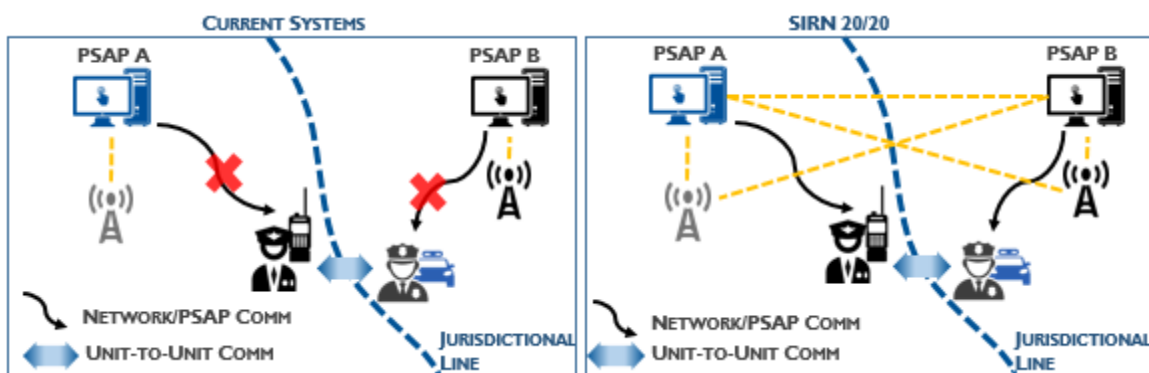


Figure 11: Current Disparate Systems in comparison to SIRN 20/20

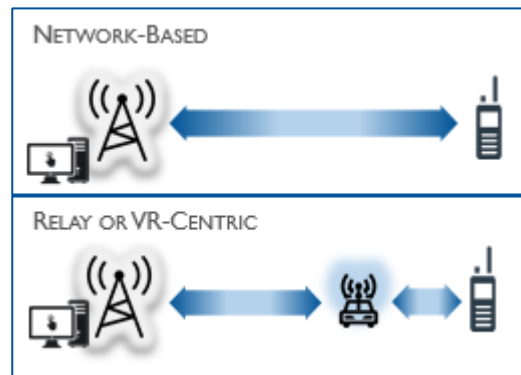
Interoperable Communications Constraints: Because the current ecosystem of disparate systems is not networked and lacks mobility management, mutual aid communications among users from different systems is challenging. Mutual aid communications are typically conducted via a single repeated or a set of

²⁸ As previously noted, the market for these legacy technology systems is also diminishing.

“off-network” or “unit-to-unit” channels (referred to as Bank 5²⁹); under this configuration, first responders in the field lose access to their home PSAP or dispatchers. PSAPs are a critical element of the overall first response structure; dispatchers are responsible for overseeing field personnel, managing and distributing critical resources and information. Loss of contact with a home PSAP puts first responders in the field at risk, particularly if an emergency arises, and support personnel need to be dispatched. Under the proposed SIRN 20/20 solution, all users in the field as well as PSAPs would be connected and be able to maintain communications among all personnel (See Figure 11).

Disparate Conventional Systems: Existing State and Local systems are based on conventional technologies, which require dedicated frequencies to support two-way communications. This legacy technology, coupled with the scenario depicted in Figure 11, limits the ability to exploit all available radio sites due to restricted access or radio programming limitations and impedes communications.

Coverage Issues and Reliance on Vehicular Repeaters: Coverage is the most important attribute of a radio system. Despite the large number of radio towers, because a given user group only has access to their agency’s subset of the overall infrastructure, many field users experience coverage gaps in the State. Vehicle mounted relays – commonly referred to as Vehicular Repeaters (VR) – are widely used to extend the range of networks for portable device communications. While a cost effective means of filling network gaps, overreliance on VRs has many technical and operational constraints, namely, it does not extend all system features to the portable, and requires the users to be within the vicinity of the vehicle (See figure). As first responders come to expect the ability to use a portable (or handheld) communications device freely rather than the decades-old approach of “radioing in” from a vehicle-mounted mobile device, it becomes important to deliver service directly from the network, rather than relying on local area VR extensions. Many surveyed stakeholders noted their dissatisfaction with overreliance on VRs.



Voice and Paging User Devices: Subscriber devices consist of nearly 20,000 land mobile radios and some 4,500 pagers that have a range of capabilities and ages as varied as the networks on which they operate. Ironically, because radios were acquired *reactively* in compliance to federal directives, thousands of devices were purchased at list prices, at times with technologies or features that were beyond the capabilities of the operating legacy networks. The integrated and holistic approach envisioned by SIRN 20/20 aims to leverage a portion of these radios³⁰, but also is intended to use a more *proactive* approach that exploits the marketplace and aligns device capabilities with that of the network.

WHY TACKLE THIS ISSUE NOW?

A confluence of several events and circumstances have resulted in an earnest consideration of a holistic land mobile radio systems evolution in North Dakota at this juncture in time. As detailed above, the large ecosystem of disparate systems assembled over the past few decades are based on legacy technologies that provide limited functionality, at diminishing serviceable lifespans, many of which will no longer be supported by their manufacturers. Concurrently, over this timeframe, as the state’s population increase has led to a rise in public safety incidents and activities, first-responders operational needs, procedures,

²⁹ Bank 5 are a set of radio-to-radio frequencies used on a regional or statewide basis for multi-jurisdictional use.

³⁰ About 2,000 of the most recently purchased radios can be upgraded for use on SIRN; some portion of an additional 4,900 devices could operate on SIRN via an upgrade but are already reaching their serviceable lifespans.

federal regulations and overall technology expectations have also evolved to embrace more robust and modern technologies. Further, federal government grants upon which many North Dakota counties have relied over the past decade have also begun to dwindle. Over the past decade, there has been general recognition by the radio network users that the current radio networks are not delivering the required level of reliability, performance and interoperability. In response to these issues, the State Interoperability Executive Committee (SIEC)³¹ sponsored the North Dakota Statewide Radio Systems Assessment and Evolution Study³² that proposed to the 64th State Legislature a conceptual statewide network to consolidate and evolve the myriad of legacy public safety radio systems.

The SIRN 20/20 solution is conceived as a holistic and integrated evolution of the State and Local communications radio networks that tackles the key objectives – addressing the demand from population and emergency incident increase, enhancing interoperability and other prevailing first-responder safety expectations, and avoidance of technology obsolescence – in a cost-effective and timely manner. Delays in pursuing SIRN 20/20 will likely sustain the status quo of independent and/or incremental improvements primarily by populous cities and counties that are facing *urgent end-of-life issues* and have been awaiting State guidance. Such an approach will likely not be cost-effective, could reduce participation, and perpetuate the patchwork of networks, which in turn limits operational interoperability and the prospect of well-conceived and sustainable solutions with long-term benefits.



³¹ The SIEC is the governing oversight committee responsible for advancing voice and data interoperability for North Dakota and is composed of local and state executive representatives from law enforcement, fire, EMS, emergency services, 9-1-1, transportation, and other first responder disciplines.

³² “North Dakota Statewide Radio Systems Assessment and Evolution Study” (Dec. 15, 2014).

PROPOSED SOLUTIONS FRAMEWORK/OVERVIEW

The 64th State Legislature charged the North Dakota Information Technology Department (ITD) in collaboration with the SIEC to assess the “feasibility and desirability” of implementing a modern, statewide, interoperable mission-critical voice communications capability. A comprehensive feasibility assessment of an integrated statewide solution entails a range of technical, financial, and programmatic elements, each of which have to be carefully considered in outlining a feasible program. Based upon input from the public safety stakeholder community and a study of similar statewide programs, a comprehensive set of SIRN 20/20 recommendations covering the following major areas are provided in this Study:

SIRN 20/20 Technology and Implementation Plans: The proposed SIRN 20/20 solutions, from a technology standpoint, are designed to serve as the primary means of mission-critical voice and paging communications for all state, local, tribal and municipal agencies. To ensure maximum adoption and an efficient communications ecosystem, SIRN 20/20 aims to address the Baseline Needs put forth by the stakeholder community, provide a centralized management system, and integrate current and future radio systems while enabling federated control of local resources. Additionally, SIRN 20/20 is substantially anchored on existing public (State and Local) infrastructure to leverage all suitable investments in the future solution. This architecture requires local adopters who are willing to contribute their respective radio assets.³³ Multiple technical options are discussed and assessed against adoption and cost. Finally, prospective migration strategies and risks are presented.

SIRN 20/20 Costs and Funding Models: Estimated costs for SIRN 20/20 are presented. Sustainable funds to implement and operate SIRN 20/20 over its complete lifecycle of 12 – 15 years are essential for its durability and continued adoption. A variety of feasible capital and operational funding models and sources, and potential state and local cost-sharing structures are proposed for the State’s consideration. Additionally, a well-researched set of potential revenue sources and funding initiatives are presented.

SIRN 20/20 Governance and Operations: A governance structure that is inclusive and representative of all state, urban, rural and tribal jurisdictions with adequate authority to facilitate decision-making is proposed. The governance structure, similar to the technical architecture, is designed to generate and maintain both active participation and broad support for SIRN 20/20. These proposed recommendations, additionally, present a structure for SIRN 20/20 to create processes and policies that govern SIRN 20/20 deployment, operations, and sustainment.

The balance of this document provides the background and analysis, and proposes the corresponding framework for a successful SIRN 20/20.

SIRN 20/20 SYSTEM ARCHITECTURE SOLUTIONS AND OPTIONS

Systems Architecture Overview

As illustrated in Figure 12, SIRN 20/20 solutions are predicated on a statewide architecture that integrates all system infrastructure, dispatch centers, end-users devices and provides interfaces to supporting applications and other state systems into a **single** network of systems with a **common** core supporting regional and statewide day-to-day, mutual aid and large scale public safety and **mission critical**

³³ Prospective State-Local participation and asset sharing agreement templates have been tailored as part of this Study. Developed for use by the SIRN Operating Entity, these documents outlining the terms and conditions for mutually balanced state and local governments partnerships.

communications. Multiple solutions based on the APCO P25 Phase I standards and different frequency bands were evaluated against how suitably and cost-effectively they fulfill the underlying Baseline Needs.³⁴

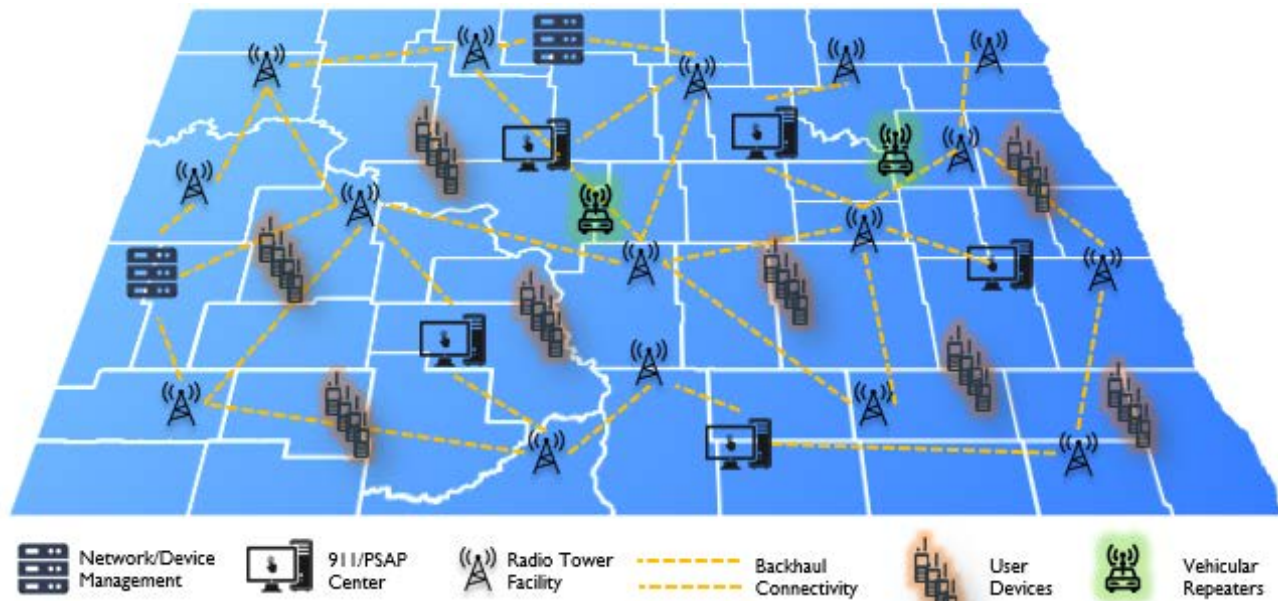


Figure 12: SIRN 20/20 Functional Elements

From an operational perspective, APCO P25 trunked systems which employ redundant controllers or systems management cores interfaced with all radio sites and dispatch centers (Figure 13) deliver have several key additional capabilities including caller ID display, automated radio mobility management, user prioritization, wide area roaming, enhanced interoperability, dispatching features. These elements enhance the user experience, increase network reliability, improve radio communications quality, and ultimately create a safer emergency communications and response environment for the responder and the supported public community. The proposed SIRN 20/20 architecture provides the following benefits to the State's public safety community:

- Supports multi-agency, multi-jurisdiction interoperable communications anywhere within the state for all mutual aid network end users
- Enables efficient shared use of the VHF spectrum while providing dedicated “talkpaths” to user agencies
- Facilitates, through centralized system switching, effective federated operation and local control of channel resources, while eliminating the need for human intervention and potential human error
- Enables the shared use of radio towers across jurisdictional lines based upon mutually established priority access schemes, thereby, significantly reducing the requirement, and associated costs of operating dozens of disparate radio networks
- Supports the ability for any approved user to access any PSAP statewide enabling redundant dispatching capabilities
- Supports automated mobility management of field users and dispatchers alike enabling them to roam over a wide area without the need to change frequencies
- Simplifies management of radio users profiles, device provisioning and network operations

³⁴ See Supplemental Document 11.1 SIRN 20/20 Architecture, Implementation and Migration Plans Overview for further description on architectures, underlying objectives and system benefits.

- Supports preset or spontaneous multi-function or group calls to address the mutual aid response at hand
- Automatically registers and monitors end user devices providing network operators, dispatchers and managers information on who is utilizing the network
- Supports interoperable connectivity and roaming capability with other neighboring states' systems
- Increases system reliability by assigning any available channel to any approved user in the event of partial equipment failure
- Supports the ability to centralize or create redundant systems for other PSAP functions such as CAD, logging recorders, call taking systems

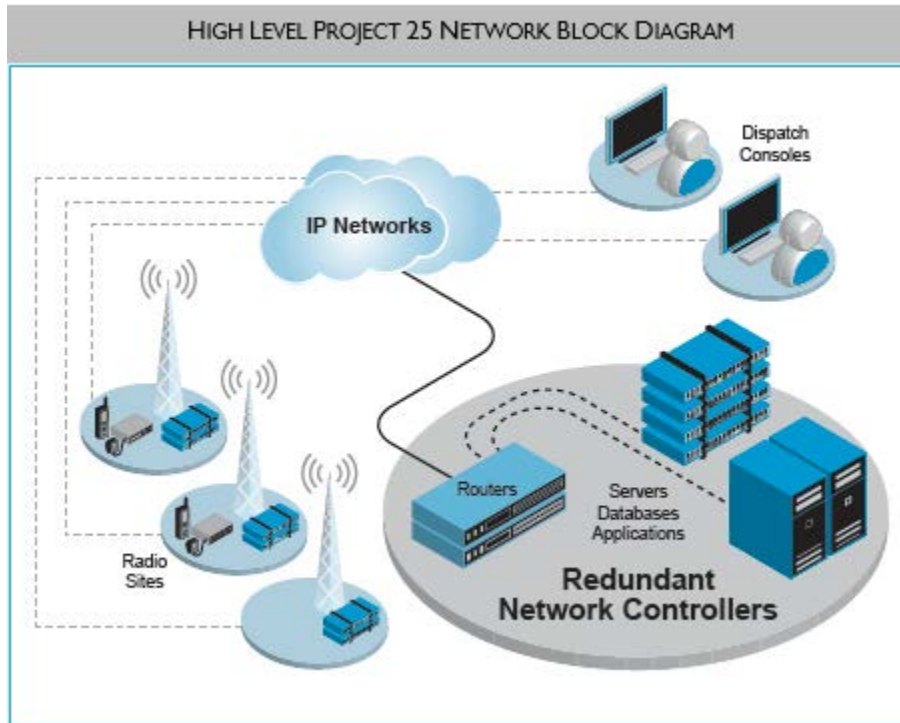


Figure 13: High Level Architectural Block Diagram

This report discusses three options each of which address the Baseline Needs to varying degrees. Other solutions found to be prohibitively expensive or substantially failed to meet the Baseline Needs are not presented.

A key technical difference between these options is whether they employ Network Based or Relay Centric Service Delivery models in meeting the Coverage Equivalence Requirement. Coverage equivalence – a SIRM 20/20 baseline need that at a minimum maintains the service area of the dozens of disparate local radio systems – is a principal baseline requirement driving SIRM 20/20 design and architecture development. In addition to maintaining the composite service level delivered by the large ecosystem of existing transmitters, these requirements also aim to provide sufficient portable service in populated areas and along roadways, as well as in-door service in dense areas. These requirements could be met by either providing sufficient network-based service in which portable devices

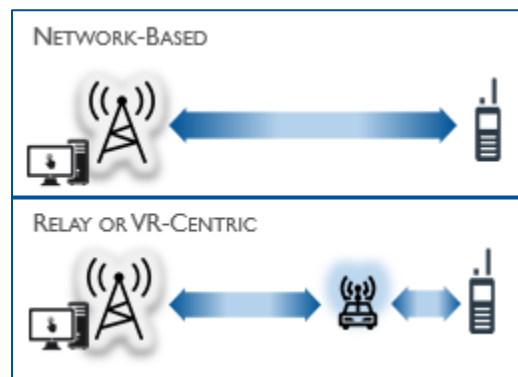


Figure 14: Network Based or Relay Centric Service

access the network and dispatch centers directly, or provide *basic* network service with portable devices primarily relying on vehicle-mounted relays to access the radio network and associated dispatch centers (see Figure 14).³⁵

While the vehicular relay-centric options could in effect address the coverage equivalence and portable service requirements, overreliance on vehicular repeaters does not provide a seamless, graceful and full-featured solution, and importantly, would not be a holistic and integrated solution. Namely, VR-Centric models access require proximity to a vehicle and have limited capabilities particularly during large incidents. Such architectures would, additionally, be similar to State Radio’s current system in that they supply baseline mobile radio service and would likely require the continued use of local networks required to provide paging and other network-based service needs. Most populous counties already would have better overall service from their local networks, many of which deliver service to portable radios over the network, and will likely opt to retain their current systems, even though these networks have other performance gaps and limitations.

SIRN 20/20 OPTIONS OVERVIEW			
Options Description	1. Hybrid VHF Portable* Network**	2. Hybrid VHF Mobile Network**	3. 800 MHz Mobile Network
	<ul style="list-style-type: none"> Network VHF mobile coverage statewide <u>Network-Based</u> VHF Portable service³⁶ 800 MHz Network Portable service in “Urban Areas” 	<ul style="list-style-type: none"> Network VHF mobile coverage statewide VR-Centric VHF Portable service 800 MHz Network Portable service in “Urban Areas” 	<ul style="list-style-type: none"> Network 800 MHz mobile coverage statewide <u>VR-Centric</u> 800 MHz Portable service 800 MHz Network Portable service in “Urban Areas”
Fixed Infrastructure Cost	HIGH	LOW	HIGH
Vehicular Repeater Cost	LOW	HIGH	HIGH
Subscriber Device Cost	MEDIUM	HIGHEST	HIGH
Overall Cost*	EQUIVALENT	EQUIVALENT	EQUIVALENT
Fulfills Baseline Requirements	ADEQUATELY	PARTIALLY	PARTIALLY
Leverage of Existing Assets	YES	YES	SOME
Requires Local Asset Contribution	YES – SIGNIFICANT STATE AND LOCAL ASSETS	YES – PRIMARILY STATE ASSETS	LIMITED
Implementation Timeline	LONG	MEDIUM	LONG
Implementation Risk	MEDIUM	LOW	LOW-MEDIUM
Ease of Operations and Sustainment	EQUIVALENT	EQUIVALENT	EQUIVALENT

³⁵ For instance when a law enforcement officer leaves a vehicle to respond to a traffic stop.

³⁶ This proposed SIRN architecture does include some VR usage to increase overall network reliability in very remote areas of the State.

*Portable refers to a network that fulfills service levels as defined in the Baseline Requirements, and not a ubiquitous statewide on-street portable service

**Hybrid VHF Networks include 800 MHz Layers in Urban Areas.

Table 6: SIRN 20/20 Solutions Options Evaluation Matrix

Table 6 summarizes these options and provides corresponding analyses. Based on the discussion above and the assessment in Table 6, Network-Based VHF System (Option 1) is considered the most optimal solution that fulfills the Baseline Requirements. From a financial perspective, the variance of the overall costs among these options are within 10% making the other options less favorable.³⁷ In fact, the costs within each option alone can have a range of more than 10% depending on the final architecture, leverage of existing assets, adoption rates, and acquisition strategies. Moreover, it is likely that some counties would need to maintain certain local network enhancements for paging and other needs, possibly making the overall cost of the VR-Centric Solutions higher.

Hybrid Spectrum - Urban Area 800 MHz Layers

Typically, the use of a consistent frequency band across the entire geography of the state is more financially and operationally favorable; however, 800 MHz spectrum is proposed in six Urban Areas under each of these options for the following reasons³⁸:

- Delivers critical in-building portable coverage to major urban areas
- Supports better interoperability with their counterparts for cities along the Minnesota border
- Vacates a portion of the VHF frequencies for incorporation into the VHF SIRN 20/20 layer
- Provides upgradeable VHF radios to be provisioned for use by Rural/County users
- Supports a pilot phase as the legacy VHF networks and 800 MHz networks can co-exist to further validate SIRN 20/20

User Base Options – Public Service Agencies

A more notable consideration with prominent financial implications is the extent to which local public service agencies³⁹ are included in the SIRN 20/20 solution. Of the estimated 20,000 devices that can operate on SIRN 20/20, 6,500 are distributed across public service agencies including public works, transportation departments, and public schools. While the proposed SIRN 20/20 infrastructure itself could support the added capacity with limited incremental changes, a significant portion of the 6,400 public service radios would have to be replaced to operate on SIRN 20/20. Many of these public service agencies are recognized by the surveyed North Dakota public safety stakeholders, as well as by the Federal Emergency Management Agency and other incident response and mitigation organizations, as directly or indirectly serving key emergency service functions (ESF). Transportation infrastructure recovery, repair, restoration, and safety; disaster housing, human services, mass casualty response; hazardous material clean and environmental safety are all integral elements of the incident response and management structure. Similarly, school facilities and school buses, for various reasons, can be considered as part of this structure.

³⁷ Overall costs represent ALL fixed and mobile elements of SIRN. While these costs are within 10%, there is greater variation when considering individual elements. These SIRN element-specific cost variations may be perceived differently depending on which entity (State or Local) the cost-sharing decisions identify as responsible for funding a given element of SIRN.

³⁸ A hybrid solution requires the use of more costly “dual band” radios by some entities to maintain interoperability. The Study considered a statewide portable 800 MHz option which was one of the options eliminated early due to substantially higher overall cost.

³⁹ Note: DOT devices – totaling 1,000 – are grouped with public safety agency quantities.

Category	Function	Mobile	Portable
County and Municipalities	Fire/EMS	2,738	5,099
	Law Enforcement	1,320	2,260
	Other Public Safety Agencies	273	436
	Public Service Agencies	5,258	1,075
County and Municipalities Total		9,589	8,870
State	Law Enforcement	258	270
	Transportation	800	150
State Agencies Total		1,058	420
Grand Total		10,647	9,290

Table 7: Estimated SIRN 20/20 Radio Quantities⁴⁰

The Study focused mainly on public safety agencies; however, many of the public service agencies, particularly in rural areas where they essentially rely on, or share the public safety frequencies, will naturally have to migrate with their first responder counterparts. They additionally have assets that could be contributed, or needed, in SIRN 20/20. A widely-adopted solution is ultimately more cost-efficient for the community as whole; inclusion of individual agencies can be gradual and be based on a similar feasibility study of these agencies. It should be noted that some portion of the 4,900 aging, but SIRN 20/20 capable radios, could be upgraded for use for public service agencies, further reducing their cost of inclusion.

SIRN 20/20 Coverage and Infrastructure Plan

The proposed SIRN 20/20 coverage plan underlies multiple technical and operational Baseline Requirements⁴¹ established by the stakeholder community as critical for adoption and sustaining mission-critical service. These objectives were established through extensive outreach and individual or group working sessions with over 45 counties. To achieve these objectives cost-effectively, the design process examined solutions that maintain or improve user experience, addresses critical coverage gaps, and provide sufficient portable coverage in large municipalities, while maximizing the leverage of existing assets and consolidating duplicative services.^{42,43} Figure 15 illustrates the predicted SIRN 20/20 VHF portable level service in the State anchored on existing radio and water towers, 85% of which are currently owned or leased by public safety and related government entities.

⁴⁰ Over 13,000 devices were directly documented through the data collection efforts; the values presented include device projections for non-surveyed or unresponsive agencies. Projections were based on a variety of factors including general populations, agency sizes, and government employee census data.

⁴¹ See Baseline Operational Requirements for coverage design requirements.

⁴²The Coverage Plan is based on an extensive data collection and site selection process used to categorize and evaluate assets using myriad technical and financial factors such availability of tower space, generators, equipment shelters, fiber optic cable,

⁴³ See Supplemental Document 11.2 SIRN 20/20 VHF Coverage Plan and Design for a complete discussion.

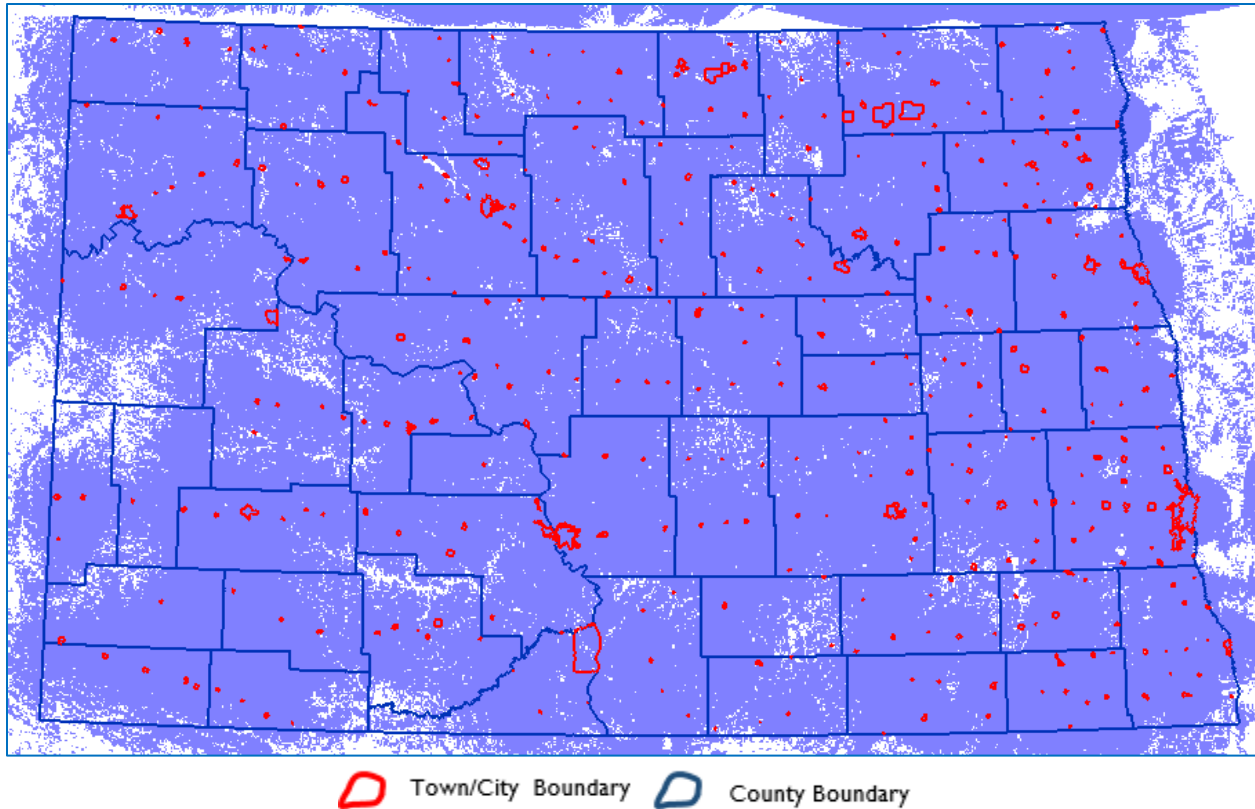


Figure 15: Predicted On-Street VHF Portable Service

Although the extent of SIRN 20/20 coverage is a key factor influencing county-level adoption, it is also a significant contributor to overall deployment costs. Therefore, the design methodology⁴⁴ followed a conservative, yet meticulous process, to strike a balance between ensuring a satisfactory and highly adopted network, and delivering a cost-efficient solution. Further refinement of the SIRN 20/20 coverage plan could be achieved through additional consultation with local stakeholders and modifying certain technical configurations. *However, it is recommended that the proposed network costs are budgeted under the current Baseline Requirements to ensure the overall objectives can be met.*

Very High Frequency (VHF) Spectrum Availability, Risks and Opportunities

The SIRN 20/20 coverage plan is anchored on the VHF spectrum to deliver a cost-effective⁴⁵ solution that maximizes the reuse of suitable legacy investments on VHF equipment; however, ensuring the availability of adequate radio spectrum – a challenging task – is of significant importance to the success of SIRN 20/20. A comprehensive frequency survey and planning process was undertaken to evaluate the viability of a VHF SIRN 20/20 solution during this Study culminating in a preliminary frequency strategy⁴⁶ for the proposed SIRN 20/20 constellation of radio sites. VHF frequency planning is an inherently iterative process subject to various “known” and “possible” technical and regulatory variables. Additionally, because the VHF

⁴⁴ See Supplemental Document 11.2 SIRN Coverage Design and Plan for a complete discussion.

⁴⁵ Radio signals in the VHF spectrum have superior range in the absence of obstructions making them ideal for flat rural geographies.

⁴⁶ The frequency plan includes an average of five frequency pairs per site to support the projected capacity. See Supplemental Document SIRN 20/20 Very High Frequency (VHF) Survey and Plan for the preliminary VHF by Site assignment plan and further discussion.

spectrum is currently in widespread use by public safety entities, a well-conceived transition process that considers their daily operational needs is required. The proposed frequency plan, therefore, accounts for these “known” variables and outlines several strategies for addressing various possible scenarios.

Listed below are key considerations, and risks, and a list of mitigation strategies that could be pursued.

- On-Site Incumbent Transmitters:** SIRN 20/20, across various aspects, is predicated on *broad and cooperative participation* by local entities that contribute some of their assets, including radio frequencies. SIRN 20/20, as proposed, would be deployed at existing towers and hence has to attempt to coexist with incumbent frequencies. While the proposed SIRN 20/20 Frequency Plan prioritizes the use of non-incumbent frequencies, due to radio interference, at many sites *some portion* of local frequencies will either have to be incorporated into SIRN 20/20 or redeployed elsewhere.⁴⁷ Freeing up these VHF frequencies was a key reason for migrating the Urban Areas to a different spectrum (800 MHz). It should be noted, assuming SIRN 20/20 is fully deployed and adopted within a given jurisdiction, there is limited need for incumbent frequencies at that location. Therefore, on-site transmitters pose a challenge during the transition period; some user groups may have to share a channel or operate at reduced capacity during this period to accommodate the proposed build-out phases. Figure 16 illustrates possible scenarios for co-existence with incumbent and SIRN 20/20 channels during the transitional and final stages of SIRN 20/20.

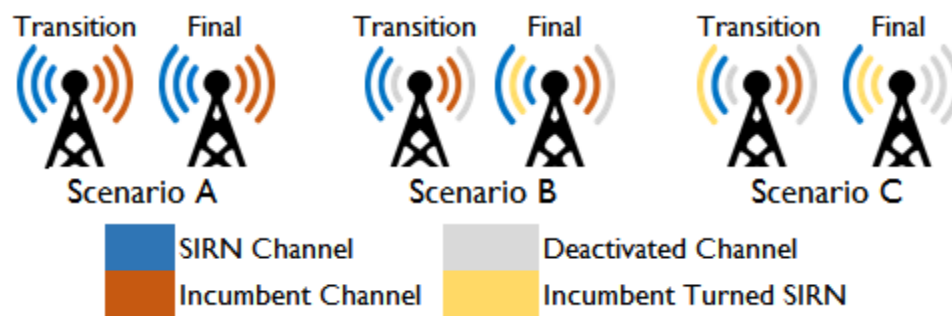


Figure 16: Transitional and Final VHF Channel Examples

- Coordination with Canada and other entities:** Licensing radio frequencies requires coordination with multiple organizations including public and private sector entities, within the State, neighboring States and, importantly, with Canada. While the proposed plan accounts for many of the pertinent factors, other variables may surface during subsequent iterations of frequency plans or the licensing process. Notably, the pool of frequencies used by Canadian federal authorities is currently not known and can only be addressed just prior to SIRN 20/20 build out.

Various summarizes potential strategies summarized below (Table 8) are available to overcome challenges that may be encountered in deploying a VHF based SIRN 20/20 solution.

⁴⁷ Preliminary frequency plan accommodates for co-existence with all State Radio Frequencies at all State Radio sites, while other sites may require incorporation or elimination of incumbent channels as illustrated in Figure 15.

Possible VHF Spectrum Mitigation Strategies and Next Steps

- Consult with locals on migration strategies and operational/capacity constraints
- Reduce channel counts at sites within low population counties (3 voice/paging sufficient)
- Enumerate public safety pool VHF channels to be vacated by 800 MHz Urban Areas
- Configure some SIRN 20/20 sites as Receive Only
- Use nearby private tower in lieu of government tower to avoid on-site transmitters
- Prioritize Canadian commercial frequencies (not federal) and incumbent North Dakota licenses within Line A⁴⁸
- Use 7.5 kHz channels possible*
- Expand use of Industrial and Business channels (allocate contingency for purchasing frequencies)*

*Additional Costs/Coordination Efforts

Table 8: Possible VHF Spectrum Mitigation Strategies and Next Steps

Other Ancillary and Neighboring State Systems

As illustrated in Figure 17, SIRN 20/20 would be interfaced to, or would incorporate, several key dispatch center systems and applications to achieve a truly interoperable and integrated statewide solution. Eventually, SIRN 20/20 may also be integrated with neighboring states standardized systems to advance inter-State communications.

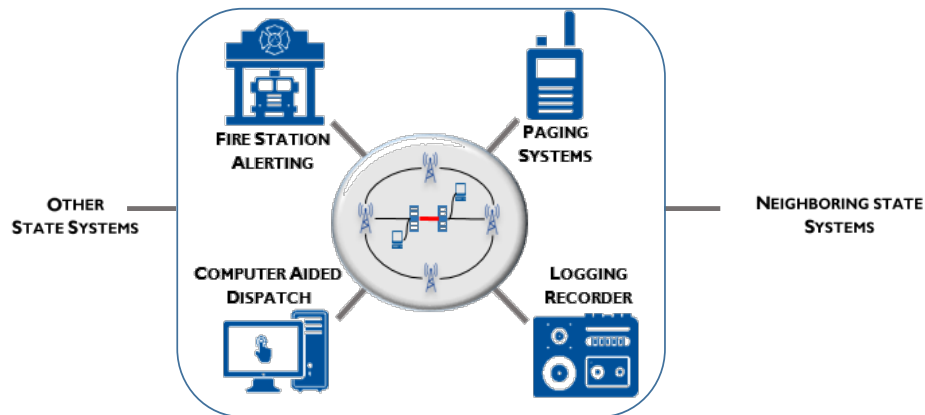


Figure 17: Ancillary SIRN 20/20 Systems

SIRN 20/20 IMPLEMENTATION & MIGRATION APPROACHES

SIRN 20/20 Program Development

Implementation of statewide public safety systems are a significant undertaking requiring a well-conceived and coordinated effort among the vendor community, the SIRN 20/20 Operating Entity, the governing

⁴⁸ Line A is 70-mile band from the US-Canada Border; licensing frequencies within this band requires a lengthy coordination process with Canadian Authorities.

bodies, and the large community of first and second responders.⁴⁹ A robust plan, coupled with the requisite funding stream and *responsible decision-making*, is critical for the timely implementation of SIRN 20/20. With several current systems facing their end-of-life dates in 2018, a condensed timeline is essential for SIRN 20/20's success, as delays could cause attrition of local support, place aging systems at risk, reduce the ability to leverage assets, and lessen the overall likelihood of a truly integrated solution.

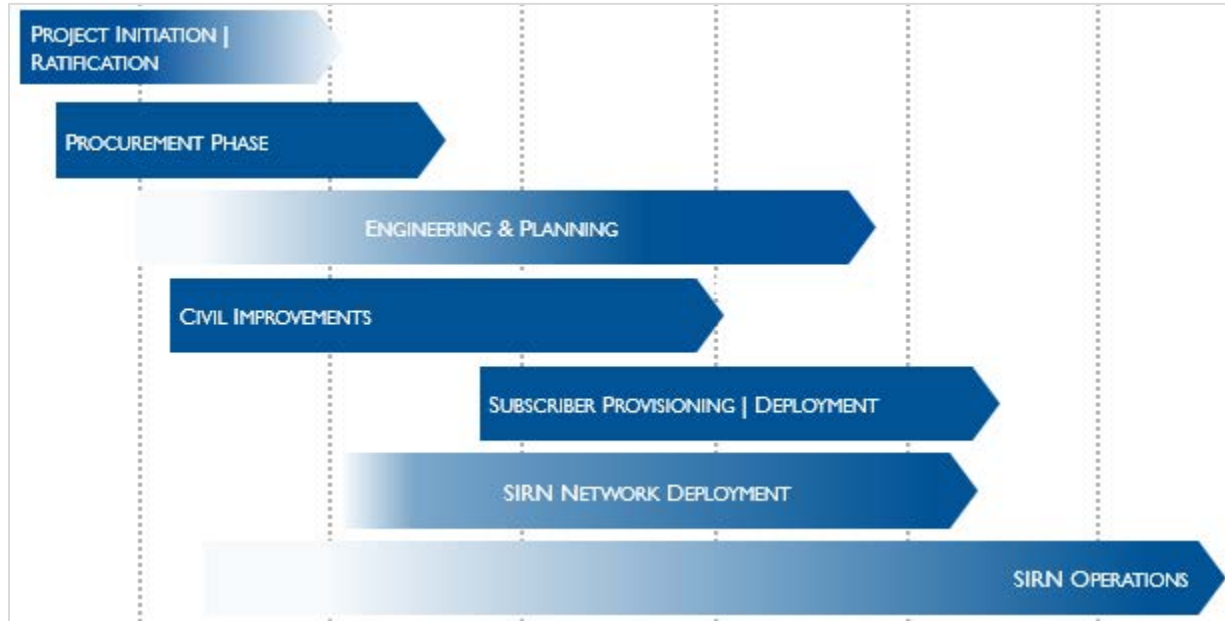


Figure 18: Proposed SIRN 20/20 Implementation Timeline and Phases

A proposed set of programmatic and logical steps are illustrated Figure 18 based on a five year SIRN 20/20 implementation plan; actual schedules depend on the outcome of the 65th State Legislature.⁵⁰ If the State elects to pursue SIRN 20/20, a concerted *program development and initiation* effort that builds on the activities performed under this Study is essential in the immediate term. These efforts would include formalizing the SIRN 20/20 governance, SIRN 20/20 operating entity and a corresponding program office tasked with establishing direction for the ensuing program phases and advancing outreach efforts and requirements development.

Migration Plans

Various technical and operational attributes influence SIRN 20/20 deployment and prospective user agency migrations. A possible sequence of activities which considers aging PSAP equipment and frees up technical resources is depicted below. At a high level, and as illustrated in Figure 19, the proposed process includes the following sequence: (1) replacement of all PSAP equipment, (2) deployment of 800 MHz layers in urban areas, followed by (3) regional deployments of the SIRN 20/20 VHF layer. Replacement of legacy radio consoles averts the risk of operating mission-critical PSAP equipment that will no longer be supported by their manufacturers, while migrating the urban areas to 800 MHz first is essential for freeing up the VHF frequencies and *User Radios* for use in SIRN 20/20.

⁴⁹ See Supplemental Document 11.5 SIRN 20/20 Governance Recommendations for further discussion on the SIRN Operating or Managing Entity.

⁵⁰ The State may elect to do certain preparatory activities such as civil site assessments in parallel or prior to the procurement process in order to reduce the overall deployment timeline.

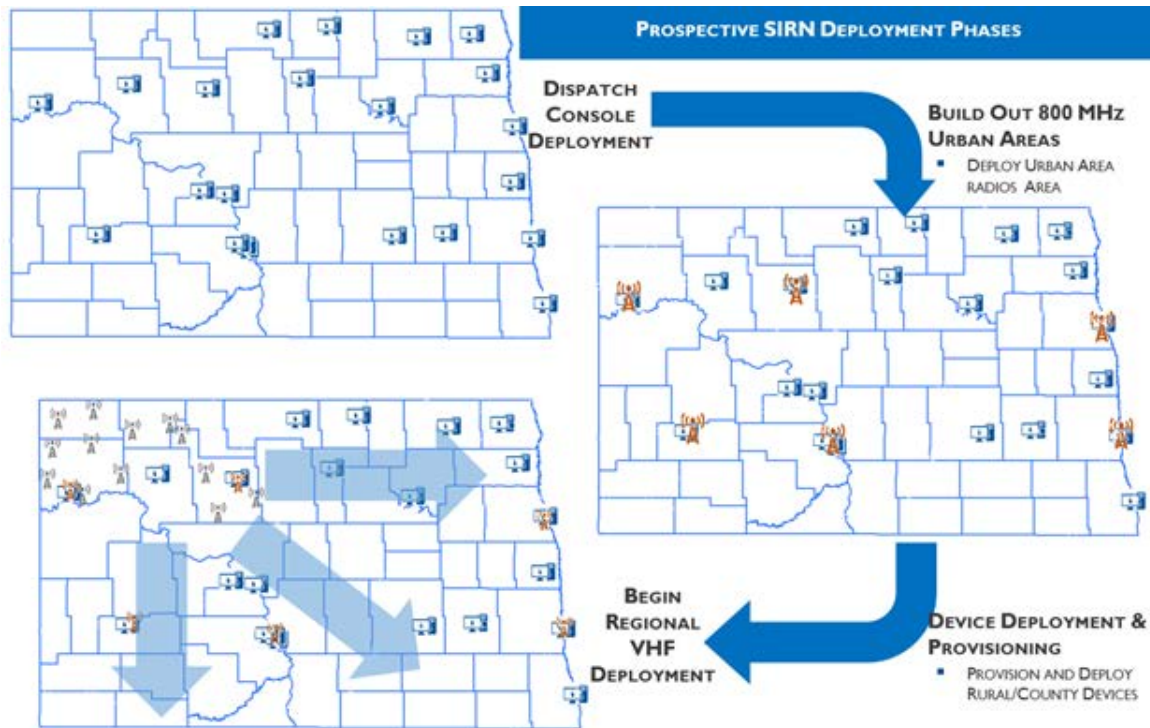


Figure 19: SIRN 20/20 Legacy Radio Network Migration Strategy

With over 900 public safety and public service agencies, and comprising 20,000 user devices planned for SIRN 20/20, a device migration plan that considers the daily and tactical needs of the user community will require a concerted effort by all affected stakeholders. During the transition, end-user devices have to be provisioned to support legacy and new networks, while maintaining interoperable communications during the migration to SIRN 20/20. Ensuring that radios can communicate over both networks during this period may require multiple rounds of radio programming. Migration on such a scale is challenging and may be disruptive to the end user community; however, a concerted and transparent effort, coupled with a well-structured plan, can yield a seamless transition.

Operations and Sustainment

A comprehensive maintenance, operations, and sustainment plan is essential for a large government technology solution, particularly one that supports a mission-critical purpose for dozens of jurisdictions. The SIRN 20/20 Operations and Maintenance (O & M) structure would be comprised of internal or third-party staff, or a combination thereof depending on the acquisition strategy and IT management philosophy the State pursues. The O & M structure (See Figure 20) would be comprised of the different functions below under the leadership of the overall SIRN 20/20 governance and operation structure *discussed in this report*. Because both user base and infrastructure are spread across an area of 70,000 square miles, the SIRN 20/20 O & M would require regional distribution of staff and resources. The O & M plan could build upon the current ecosystem of radio service vendors, as well as, various State agencies, such as DES, DOT and ITD which already have the resources and operational expertise in providing PSAP, IT and Maintenance services to the State Radio system.⁵¹ As identified in the timeline (above), this structure may be implemented gradually, but has to be finalized prior to complete transition to SIRN 20/20. Finally, in

⁵¹ Estimated annual operational costs presented in this report include a combination of insourced and outsourced rates.

In addition to staff, the sustainment of SIRN 20/20 also includes the requisite vendor support, technology refresh and software licensing fees to sustain the network.

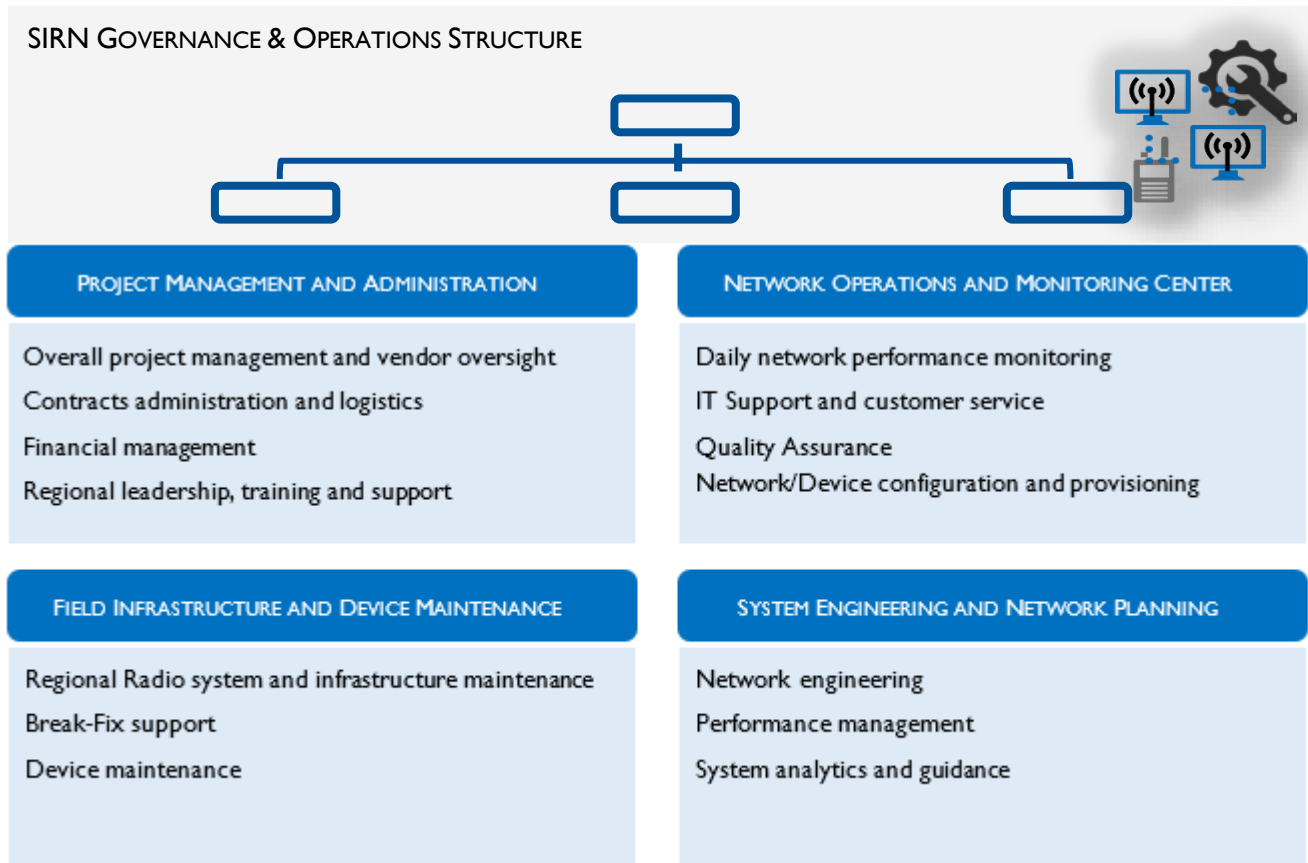


Figure 20: Management and Operations Organization Staff

SIRN 20/20 ACQUISITION STRATEGIES

The acquisition of SIRN 20/20 goods and services should follow a broad and modular competitive approach that exploits the market space for each of the SIRN 20/20 elements. Table 9 illustrates the various capital and operational SIRN 20/20 elements, each of which have a different market space. While there are only a handful of companies that can provide large LMR systems, there are several firms that could provide subscriber devices, integration services, and maintenance services. SIRN 20/20 procurement would be organized to maximize the market space for each of those elements allowing vendors to bid on one or all of these elements. While the larger market space for subscriber devices is expected to generate greater competition, a single vendor may be incentivized to offer significant discounts for collectively providing all goods and services. Upon receipt of vendor information, the State could also elect to insource some aspects of SIRN 20/20 for which such an approach is feasible and cost-effective.⁵² SIRN 20/20 may also enter into an Indefinite Delivery Indefinite Quantity (IDIQ) supply schedule with approved vendors and equipment to facilitate the long term individual entity procurement needs of local governments that may have varying subscriber device requirements.

⁵² Estimated annual operational costs assume a combination of insourced and outsourced rates; ITD, DES and DOT all have the personnel and capabilities on which to build an O & M structure.

CAPITAL	OPERATIONAL
<ul style="list-style-type: none"> ▪ State and Overall Program Management ▪ Land Mobile Radio Network and Systems ▪ Subscriber - Mobiles, Portables, Vehicular Repeaters ▪ Civil Infrastructure & Services ▪ PSAP Centers Equipment and Interfaces ▪ Professional Engineering and Design Services 	<ul style="list-style-type: none"> ▪ Network Operations/Monitoring Center ▪ Vendor Management & Administration ▪ Engineering and Management ▪ Software Maintenance & Licensing ▪ Tower and Site Services ▪ Mobile Radio Network Field Maintenance ▪ Subscriber Device Maintenance

Table 9: Capital and operational SIRN 20/20 Goods and Services



SIRN 20/20 FINANCIAL OVERVIEW

A detailed financial analysis was conducted as part of the SIRN 20/20 Feasibility Study including:

- **Estimated capital and operational costs:** Comprehensive evaluation of the overall costs for the deployment and sustainment of SIRN 20/20 over its expected lifecycle based on a variety of factors such as implementation timeline, ability to leverage existing assets, inclusiveness of local entities, and acquisition strategies.
- **Funding Sources:** Comprehensive research of potential funding sources and revenue streams focusing on sources that have had success for adoption in other states for similar public safety initiatives.
- **Cost-Sharing Models:** Proposal for potential State and local cost-sharing models for different functional elements of SIRN 20/20 based on stakeholder input and research on other state models.

ESTIMATED CAPITAL AND OPERATIONAL COSTS

A variety of architectural and operational models were evaluated in developing the total lifecycle cost of a SIRN 20/20 solution that addressed the key objectives outlined by the stakeholder community. As previously noted, the core objective is a holistic solution that integrates all system infrastructure, dispatch centers, end-users devices and, additionally, provides interfaces to supporting applications and other state systems with the goal of replacing all governmental land mobile radio systems in the State. Table 10 summarizes the estimated capital and operational costs for the prospective solutions that address this objective. These estimates are based upon extensive market research, detailed assessment of existing state and local assets, and incorporate a variety of prudent assumptions on the suitability of these existing assets, level of adoption or inclusiveness, the competitiveness of the market place.

Total lifecycle capital and operational expenditures (CapEx and OpEx) for each of the three network options⁵³ presented in *Systems Architecture Overview* were itemized to include the components illustrated below.

CAPITAL	OPERATIONAL
<ul style="list-style-type: none"> ▪ Program Initiation and State Management Costs ▪ Land Mobile Radio Network and Systems ▪ Subscriber Costs – Mobiles, Portables, Vehicular Repeaters ▪ Civil Infrastructure & Services ▪ PSAP Centers Equipment and Interfaces ▪ Professional Services – Engineering, Design, Optimization 	<ul style="list-style-type: none"> ▪ Software Maintenance & Licensing ▪ Tower and Site Services ▪ Mobile Radio Network Field Maintenance ▪ Subscriber Device Maintenance ▪ Engineering and Management ▪ Network Operations/Monitoring Center ▪ Project/Vendor Management & Administration ▪ Annual Recurring Expenses

⁵³ See Supplemental Document 11.8 SIRN 20/20 Cost Estimates Development and Revenue Models for complete discussion on the SIRN cost development.

Capital costs estimates depict ranges identifying:

- **Subscriber Upgrade Savings:** Potential savings from upgrading recently purchased radios⁵⁴
- **Public Service Inclusiveness:** Spectrum of costs contingent on the level of adoption by public service entities (w/PSER – with all public service agencies, w/o PSER – without any of the State’s public service agencies)

Further, the operational cost estimates separately identify annual costs currently incurred by various State agencies for the operation of existing State Radio and related systems. Under the proposed SIRN 20/20 plan, these funds could be redirected to the operation and sustainment of SIRN 20/20. It should be noted that counties and municipalities are also currently devoting funds and resources to sustain their respective systems; the costs for these have not been estimated, however, because the proposed SIRN 20/20 plan would serve all local needs, these funds could be incorporated into SIRN 20/20 operations.

SIRN 20/20 ESTIMATED LIFECYCLE OWNERSHIP COSTS (IN MILLIONS)						
Options Description	1. Hybrid VHF Portable* Network		2. Hybrid VHF Mobile Network		3. 800 MHz Mobile Network	
	w/ PSER	w/o PSER	w/ PSER	w/o PSER	w/ PSER	w/o PSER
Fixed Networks/ Subsystems	90.3	87.0	63.0	60.6	93.0	89.6
Local Elements – PSAPs, FSA, BDA ⁵⁵	12.4	12.4	12.4	12.4	12.4	12.4
Infrastructure Total	102.7	99.4	75.4	73.0	105.4	102.0
Subscriber Devices Total	74.4	57.2	90.6	74.2	80.4	64.6
Subscriber Upgrade (Savings)	(4.9)	(4.4)	(3.3)	(2.6)	N/A	N/A ⁵⁶
TOTAL w/ All New Subscribers	177.1	156.6	166.0	147.2	185.8	166.6
TOTAL Subscriber Upgrade Savings	172.2	152.1	162.7	144.6	N/A	N/A
Total OpEx	12.91	12.29	9.97	9.60	13.02	12.37
“Current OpEx Transfer”	3.06	3.06	2.78	2.76	3.06	3.06
“New OpEx”	9.85	9.23	7.19	6.85	9.96	9.31

Table 10: SIRN 20/20 20/20 Estimated Lifecycle Ownership Costs

⁵⁴ As noted earlier (User Base Options – Public Service Agencies), some portion of the 4,900 aging but SIRN capable radios could be upgraded for use for certain public service agencies yielding an additional saving of \$ 3 - \$ 5 M.

⁵⁵ It is expected Under Options 2 and 3 that additional investments at the local level for network relays and in-building solutions may be required to support paging and enhanced portable service where a VR is not present.

⁵⁶ All subscriber devices have to be replaced under these options.

Operational costs represent total, or “all in” estimated costs for the operations and maintenance (O & M) of all fixed infrastructure and subscriber devices. Two elements are itemized:

- **Current OpEx Transfer:** Costs currently incurred include operational costs by DES, DOT, and ITD on State Radio and other State elements, which would be incorporated into or transferred directly to SORN 20/20 operations.
- **New OpEx:** Identifies estimated additional OpEx beyond current State agency expenditures on radio communications. It should be noted that local entities have annual expenditures that are not enumerated; therefore, from a holistic, statewide perspective, some portion of these estimates may also fall under “Current OpEx Transfer”

As previously discussed in *SORN 20/20 Systems Architecture and Options*, a network-based hybrid VHF-800 MHz SORN 20/20 that includes all public safety and public service entities is recommended as the optimal solution. The estimated capital outlay for this solution, depicted as *Option 1*, ranges from \$ 152 – 177 M depending on the savings from upgraded radios and the level of adoption by public service agencies. It is recommended that the State and local stakeholders plan for this holistic budget of \$ 175 M; savings that come to bear due to variations in assumptions, most of which will be solidified within the first biennium, could be eliminated from the budget in subsequent biennia, or may be diverted to address other elements.

Finally, Land Mobile Radio subscribers may range in cost from \$1,500 to over \$ 8,000; a variety of assumptions were made in selecting device tiers commensurate with a given agency’s operational needs.

Annual Capital Phase Outlay

Ensuring a funding allocation stream that aligns with the proposed implementation plan is essential to a successful program. It is recommended that the State establish a mechanism for fully funding SORN 20/20 before embarking on the project to prevent costly delays and attrition at the local level. SORN 20/20 Capital outlay may be expended per a milestone-based model or, if the State pursues a financed or bonded option, the costs may be distributed equally over the systems lifecycle. Potential annual capital and lifecycle outlays, based upon the Hybrid VHF Portable Model (All New Subscribers), are provided below to support the State and its partners in developing annual funding streams to fund SORN 20/20.

POTENTIAL MILESTONE-BASED ANNUAL OUTLAYS (IN MILLIONS)						
	2017	2018	2019	2020	2021	2022
Annual Capital Outlay	11.4	52.7	43.4	41.7	28.0	
Annual Capital Outlay (With 2.5% Inflation)	11.4	54.0	45.6	44.9	30.9	
Operational Cost Ramp Up* (With 2.5% Inflation)			3.4	7.0	10.8	
Annual 2017 - 2021 Combined Outlay (With Inflation)	11.4	54.0	49.0	52.0	41.7	
Post 2021 Operational Costs						11.1

* Inflation adjusted value of the \$9.8 M in “New” operational estimated costs. The table depicts an equal ramp up of operational capabilities over a three year period starting in Year 3, resulting in a fully staffed and funded O & M structure by Year 5.

Table 11: Potential Milestone-Based Annual Outlays

After complete deployment,⁵⁷ the expected lifecycle of SIRN 20/20 is approximately 12 – 15 years. Therefore, including the implementation the overall lifecycle of the system is approximately 18 years. Assuming a financed or bonded capital outlay, over a 15 year period at 3%, the following total capital and operational costs are estimated.

Financed or Bonded Annual CapEx and OpEx (in Millions)			
	Capital Cost	Operational Cost	TOTAL Per Annum
2017	\$14.84		\$14.84
2018	\$14.84		\$14.84
2019	\$14.84	\$3.43	\$18.27
2020	\$14.84	\$7.04	\$21.87
2021	\$14.84	\$10.82	\$25.65
2022	\$14.84	\$11.09	\$25.92
2023	\$14.84	\$11.36	\$26.20
2024	\$14.84	\$11.65	\$26.48
2025	\$14.84	\$11.94	\$26.78
2026	\$14.84	\$12.24	\$27.07
2027	\$14.84	\$12.54	\$27.38
2028	\$14.84	\$12.86	\$27.69
2029	\$14.84	\$13.18	\$28.01
2030	\$14.84	\$13.51	\$28.34
2031	\$14.84	\$13.85	\$28.68
2032		\$14.19	\$14.19
2033		\$14.55	\$14.55
2034		\$14.91	\$14.91

Table 12: Financed or Bonded Annual CapEx and OpEx (in Millions)

FUNDING SOURCES AND REVENUE MODELS

Securing and sustaining the required resources to fund an IT infrastructure program of this scope and size is no easy feat – even for a system that serves a vital lifeline for the preservation of life and property. The Study explored and analyzed various funding source options that may be available in the State of North Dakota, and that have also historically proven to be successful and viable in other states. This section

⁵⁷ It should be noted that the SIRN 20/20 would be deployed and activated in phases; therefore certain regions would begin using the system during the estimated five-year deployment timeline.

proposes potential revenue sources, discusses the prospects of gaining support for these sources at the State and local levels, and estimates annual funds that each could generate. While the discussion centers on sources available to the State, certain strategies may also be used by local entities depending on the final state and local cost-sharing models discussed within this report.

What Have Other States Done?

Public safety systems are typically funded by a mixture of general funds, new self-funding initiatives such as taxes and fees, 911 fees, or federal and state grants structured as recurring revenue sources or one-time capital infusions. As with any large infrastructure project, governments may employ financing options⁵⁸ or municipal bonds to remunerate the one-time cash infusion. A detailed account of state expenditures is challenging because published values typically do not consider the totality of costs as they are spreads over multiple government levels and decades. Nonetheless, over the past two decades, most states have expended hundreds of millions to over a billion dollars to fund their public safety systems and devices. A few examples of strategies other states have pursued are summarized below.

State	State Funds	Federal Grants	User Fees	911 Fees	PPP ⁵⁹	Motor Vehicle	Bonds	Criminal Offense
Connecticut	✓	✓		✓				
Florida					✓	✓		✓
Illinois			✓		✓			
Indiana						✓		
Iowa				✓	✓			
Kansas	✓		✓					
Minnesota				✓			✓	
Mississippi	✓							✓
Ohio		✓	✓				✓	
Oklahoma	✓	✓				✓		
South Carolina			✓		✓			
West Virginia	✓			✓				

Table 13: Funding Strategies Used by Other States

Potential Self-Funded Sources

The Study explored various new funding initiatives focusing on taxes, fees and fines where:

- nominal increases could generate significant monies and face limited constituent opposition
- current State rates are significantly lower than comparable states in the nation
- no increases have been assessed for a long periods (e.g., 1993 for tobacco taxes)
- the intended source is specifically related to a public safety function (e.g., 911 fees, traffic citations)

⁵⁸ All major LMR system vendors contacted as part of this study offer vendor financing plans up to \$ 500 M with interest rates for credit worthy municipalities would be between 2.5-3.0%.

⁵⁹ Typically, public/private partnership between state government, local governments, power utilities, and a prime radio system vendor(s) which may build, operate and manage the infrastructure, generating fees directly from the users.

- the affected persons are typically tourists and other transient population, not North Dakotans (e.g., hotel fees)

Table 14 summarizes these sources and proposes potential rate changes based on comparative analysis of other states in the region. The expected annual revenue as a percentage of the amortized annual lifecycle costs of the proposed SORN 20/20 solution is also depicted; the State may elect to combine one or more of these areas or focus on a single area to fund the majority of SORN 20/20. As illustrated in the table, nominal increases in certain excise and sales taxes can produce large annual sums and perhaps even be raised further to supplement health initiatives. Tobacco taxes, for instance, rank 48th in the nation and have not been raised since 1993. Additionally, many law enforcement agencies have noted that the current traffic violation fees do not deter violators due to their extremely low levels.

Option	Proposed Changes and Estimated Annual Revenue	% SORN 20/20 Cost ⁶⁰	Comments	Probability
Cigarette Tax Increase	<ul style="list-style-type: none"> \$0.25 Per Pack → \$14 M \$0.50 Per Pack → \$28 M \$1.00 Per Pack → \$56 M 	<ul style="list-style-type: none"> 70 % 145% 290% 	<ul style="list-style-type: none"> ND tax is \$0.44 per pack; 48th highest in US Tax rate not increased since 1993 	Medium/High
Hotel Lodging Tax	<ul style="list-style-type: none"> \$0.50 Per Night → \$1.5 - 2.0 M \$1.00 Per Night → \$ 3 - 4.0 M 	<ul style="list-style-type: none"> 10% 20% 	<ul style="list-style-type: none"> Assumes no future increase in rooms 	Low/Medium
Traffic citation Increase	<ul style="list-style-type: none"> Double → \$ 3.5 M Triple → \$7 M Quadruple → \$10.5 M 	<ul style="list-style-type: none"> 18% 35% 55% 	<ul style="list-style-type: none"> ND citations average 2 to 10 times lower than neighboring states for most traffic violations 2015 Citation revenues \$3.5 M 	Medium
Driver's License Fee	<ul style="list-style-type: none"> \$10 Increase → \$5.2 M \$15 Increase → \$7.9 M 	<ul style="list-style-type: none"> 27% 42% 	<ul style="list-style-type: none"> 527, 541 licensed ND drivers in 2015 	Low
Vehicle Registration Fee	<ul style="list-style-type: none"> \$10 Increase → \$8.4 M \$15 Increase → \$12.7 M 	<ul style="list-style-type: none"> 45% 65% 	<ul style="list-style-type: none"> 845,109 vehicles registered in 2015 	Medium
911 Fee	<ul style="list-style-type: none"> Depends on County 	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> Collected at the county level; capped at \$ 1.50/line Allocate to Dispatch Equipment 	Medium (for PSAP Only)
Gas Tax Increase	<ul style="list-style-type: none"> 2.5c Per Gallon → \$12 M 5 c Per Gallon → \$24 M 	<ul style="list-style-type: none"> 65 % 125% 	<ul style="list-style-type: none"> 468,720,000 gallons of gasoline/diesel in 2014 \$0.23 tax per gallon of gas 32nd highest in the US 	Low/Medium
Alcohol Tax Increase	<ul style="list-style-type: none"> 10 c Per Gallon → \$3.4 M 20 c per Gallon → \$6.8 M 	<ul style="list-style-type: none"> 18% 36% 	<ul style="list-style-type: none"> Beer tax is \$0.39 per gallon; 16th highest in US Wine tax is \$1.06 per gallon; 18th highest in US 	Low/Medium

⁶⁰ As a percentage of the projected combined capital and operational costs of SORN 20/20. As illustrated in the table, several sources could be used to cover a substantial percentage of SORN 20/20; alternatively, certain proposed sources could cover the full amount.

			▪ Liquor tax is \$4.66 per gallon; 30th highest in US	
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Table 14: Potential Funding Sources and Estimated Annual Revenue

Federal Grants

While federal grants have been declining, the State has received an annual average of \$ 3.5 M in State Homeland Security Programs over the past five years. These funds are allocated throughout the State for several public safety communications and emergency management purposes; however, with the consolidation of all state and local systems under the SIRN 20/20 plan, there may be an opportunity to allocate a portion of the SHSP funds to elements of SIRN 20/20 such as PSAP equipment.

911 Funds

North Dakota counties collect between \$ 1.00 and \$ 1.50 monthly per telephone line; some of these “911 fees” are used to fund dispatch center equipment and staff. The twenty four counties without 911 call-taking centers direct \$ 0.44 to the State DES, which provides these services to those counties. While the study does not specifically propose the use of 911 fees to fund SIRN 20/20, as noted within the cost-sharing models, 911 center equipment is recommended to be funded at the local level. The 911 fees, at the current levels, or with minimal increases, could be used to cover the cost of some or all of the dispatch center equipment needed for SIRN 20/20 integration.

Natural Resources Revenue Outlook

The State’s recent economic boom has been directly tied to the substantial increase in natural resources revenue. While there has been a notable decline over the past two years, as indicated in Table 15, the natural resources revenue over this “bust” time frame still exceed historical levels by a factor of five times. Due to this significant boom, the *State’s Strategic Investment & Improvement Fund* and *Political Subdivision Allocation Fund* have allocations of \$ 316 M and \$ 92 M over the 2015 – 2017 biennium.⁶¹ The State may elect to use a small fraction of these oil tax allocations to fund an important public safety cause in the near term.

Total Oil & Gas Tax Revenue (Biennial)					
'05-'07	'07-'09	'09-'11	'11-'13	'13-'15	'15-'17
\$ 352 M	\$ 799M	\$ 1,500M	\$ 4,680M	\$ 6,430 M	\$ 3,430 M

Table 15: Total Oil & Gas Tax Revenue (Biennial)

Gradually, as the cost of oil stabilizes, so too will the State’s natural sources revenues and economic activity, in general. Crude oil costs have increased by two-fold in the first half of 2016; World Bank data projects average per barrel sustained costs of \$ 60 by 2020, \$ 85 by 2025.⁶² As the economy begins to improve, other initiatives outlined in Table 14 such as hotel fees and gas taxes will yield higher revenues and may also be viable targets for increased rates. By and large, the level of potential revenues across the proposed sources suggest that it is possible to fund the bulk of the projected SIRN 20/20 costs without additionally encumbering the constituency. As discussed next, local entities also expect to have a stake in SIRN 20/20 and intend to allocate funds in accordance with their funding ability.

⁶¹ State of North Dakota 2015-2017 Biennium Executive Budget

⁶² World Bank Commodities Price Forecast (nominal US dollars), Released: January 20, 2016
http://www.worldbank.org/content/dam/Worldbank/GEP/GEP2015a/Price_Forecast.pdf

COST-SHARING MODELS

Local stakeholders have indicated that while the State should earmark the bulk of SIRN 20/20 funds, counties and municipalities should have a financial stake in SIRN 20/20. Cost has been identified as the most important barrier to adopting SIRN 20/20; in fact, many states have faced challenges in expanding their state systems into rural counties due to the higher cost of adoption. This slow adoption rate, among other reasons, has led to the perpetuation of disparate systems despite the existence of a statewide system. This section proposes possible state and local cost-sharing models that are based on survey feedback, are commensurate with local revenue stream, and are expected to gain support from local entities.

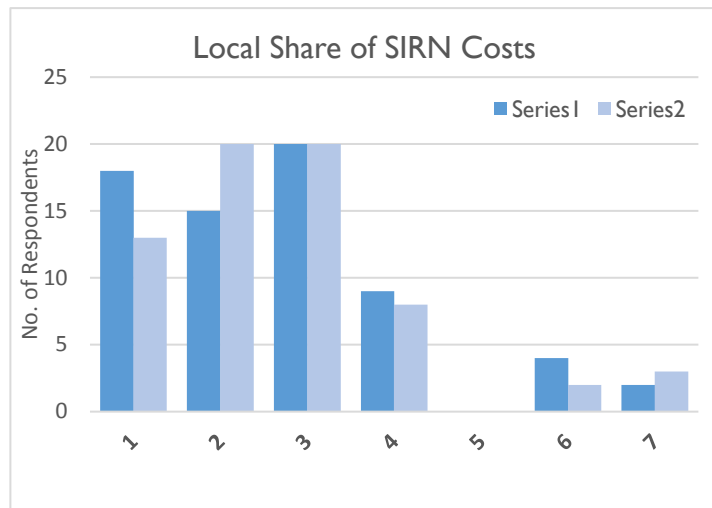
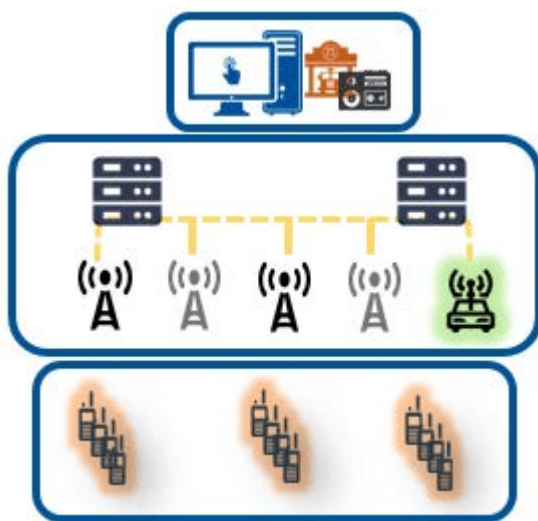


Figure 21: Local Share of SIRN Costs – County Survey

In order to establish a justifiable sharing model, SIRN 20/20 was divided into functional elements each of which would have a different distribution of costs between the State and local entities. These functional elements include:



PSAP and other Agency Specific Equipment: comprises dispatch consoles, interfaces to PSAP applications such as logging recorders, and SIRN expansion elements such as in-building coverage enhancements in Courthouses, and fire-station-altering systems

Central Systems and Infrastructure: comprises all infrastructure and centralized SIRN goods and services necessary to fulfill the baseline requirements

Subscriber Devices: All Portable, Mobile devices, further divided into Volunteer Fire Department (VFD) devices and all other agencies.

In general, the proposed cost-sharing models, summarized in Table 16, recommend that the State fund 80% of the capital and operational costs of the “central elements” and subscriber devices, and 100% of volunteer fire departments devices, while the remaining 20% of the costs are distributed across counties by population or device quantities. Under this approach, county governments would primarily cover 20% of the overall network and devices for law enforcement entities, career-based fire departments, and public service agencies, while volunteer agencies which typically are not associated with county government structure and have limited funds are fully funded by the State. Using a mixture of *population* and *device* quantities attempts to counter disproportionate subsidization of rural counties by urban entities while balancing an overall equitable structure. The ultimate cost distribution model would be structured by the SIRN 20/20 Governance discussed within this report.

SYSTEM ELEMENTS	PROPOSED SHARE	ESTIMATED COST	COUNTY SHARE RANGE
Central Network Elements, Vehicular Repeaters	80% State 20% Local <i>By County Pop.</i>	\$ 90.3 M	\$ 20 k - \$ 4 M
PSAP and Other Agency/Jurisdiction Specific Equipment	100% Agency/Jurisdiction	\$ 12.4 M	Depends By PSAP or County*
Subscriber Devices <i>Volunteer Fire Departments</i>	100 % State	\$ 23.5 M	
Subscriber Devices <i>All other agencies</i>	80% State 20% Local <i>By Device Quantity.*</i>	\$44.7 M*	\$ 28 k - \$ 1.2 M*
Central Network Elements – OpEx***	80% State 20% Local <i>By Device Quantity</i>	\$8.85 M / year	\$ 7.7 k - \$ 240 k / year
Subscriber Devices – OpEx***	100% Agency/Jurisdiction	\$1.0 M / year	
* Use of Support Fund where needed ** Includes DES PSAP Equipment (a State agency) *** Depicts only “New OpEx” Costs			

Table 16: Potential Cost-Sharing Models

Other Cost-Sharing Considerations

- Local 911 fees:** Most surveyed entities stated that diverting 911 revenue to SIRN 20/20 would be a challenge as they’re already earmarked for other functions. The cost-sharing model recommends that current 911 fees be used to cover the PSAP equipment at the 24 PSAPs currently using State Radio. Independent PSAPs are typically in more populous jurisdictions, many of which have already been planning to replace their consoles. Additionally, as previously noted, there is a potential to raise the 911 fees up to the currently maximum levels of \$ 1.50 per telephone line.
- Support Fund:** The cost-sharing model additionally introduces the concept of a Support Fund to support very sparsely populated areas with high per-capita radio quantities or other areas that may generally not be able to afford the cost of participation. This Fund may be administered as through grant funding or similar avenue.
- Shared Asset Evaluation:** SIRN 20/20 is predicated on the contribution of assets from counties and municipalities. Some local entities, within higher than average in-kind or hardware contributed assets may want to adjust their financial contribution (e.g., lower than 20%) contingent on the

value of their assets being contributed; however, such an approach could over-complicate the overall cost-sharing models and should be addressed on a case-by-case basis.⁶³

- **State Revenue Stream and SIRN 20/20 Timeline:** The previous section detailed various potential sources available to the State, some of which may yield sufficient funds to cover a higher proportion of the proposed State share. Based on further evaluations, the proposed governance body or the SIEC may elect to pursue different models that increase the State's share. In general, it is recommended that the State attempt to ease the funding burden, particularly on local entities. Financial barriers could delay the implementation of SIRN 20/20 jeopardizing the success of the program. The State (via the SIRN 20/20 Operating Entity) may elect to pay in advance for some counties and use a loan program.



⁶³ The Study has a comprehensive repository of these assets and could estimate the savings to SIRN these assets bring to bear.

SIRN 20/20 GOVERNANCE

CONSIDERATIONS AND RECOMMENDATIONS OVERVIEW

Central to the success of a statewide network is a governance framework that defines the shared ownership, operation and sustainment at all levels of government. A consolidated radio network would require even greater collaboration and present significant opportunities for State, Local and Tribal agencies to enhance interoperability and cross agency/jurisdiction response and mutual aid. The governance and decision-making structure underlie the consensus-based approach essential for all aspects of SIRN 20/20. This section summarizes the considerations in creating an equitable SIRN 20/20 governance and proposes a recommended composition and structure.⁶⁴ The recommendations draw on primary source document research as well as in-depth interviews with a wide variety of individuals with knowledge of and experience in public safety communications governance in North Dakota. The recommendations also draw on experience and knowledge of governance structures in other states.

The research and interviews produced a number of findings that led to the recommendations in the report. The major findings include:

Key Governance Interview Findings

- SIRN 20/20 will rely heavily on local jurisdictions for infrastructure as well as subscribers, so it will require deep and broad local support and buy-in.
- Achieving and maintaining such buy-in will require a SIRN 20/20 governance structure that is authoritative, balanced, and independent.
- Pronounced sensitivity exists in the North Dakota public safety communications community to differences between state- and local-level interests, as well as urban and rural interests.
- The SIEC is an existing statutory and generally well-received governance body for statewide public safety communications, but it possesses only advisory authority and lacks structural mechanisms to ensure both SIEC independence and an urban-rural balance in SIEC membership.
- To successfully address public safety communications interoperability in North Dakota, SIRN 20/20 must also drive interoperability at the local and regional levels, but the state possesses no governance mechanism to do so.

In light of these findings, the report recommends a number of actions to establish a successful governance structure for SIRN 20/20. The recommendations are forward-looking – although they were developed while the feasibility and desirability of deploying SIRN 20/20 was still under consideration (and thus the need for SIRN 20/20 governance was not yet confirmed), they are drafted as though the State has made the decision to proceed with the SIRN 20/20 initiative, including establishment of a SIRN 20/20 governance structure. The primary recommendations constitute modifications to SIEC capabilities and statutes, and specifically, the creation, within the SIEC, of a SIRN 20/20 sub-committee focusing on all SIRN 20/20 matters.

⁶⁴ See Supplemental Document 11.5 SIRN 20/20 Governance Recommendations for complete discussion on the proposed SIRN governance, authority, policies and procedures.

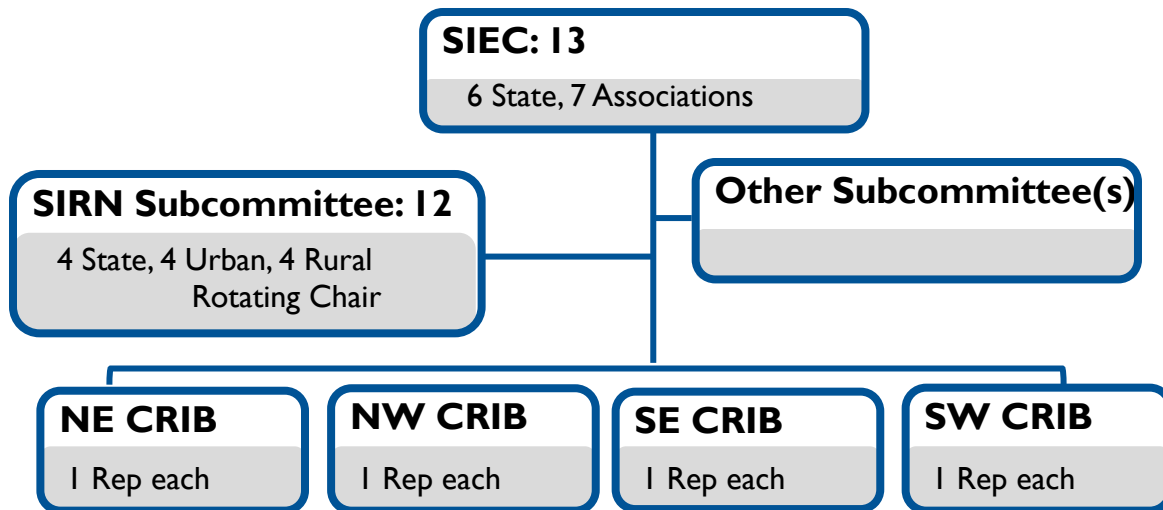


Figure 22: Recommended Structure for SIRN 20/20 Governance

An overview of the governance structure is illustrated above with a brief discussion of the major recommendations on the function and authority of each in Table 17.

Governance Groups and Responsibilities	
SIEC Adjustments	<ul style="list-style-type: none"> ▪ SIRN 20/20 governance should be within the SIEC. ▪ The SIEC Chair should be independent of any entity that manages a major system that the SIEC oversees. ▪ The SIEC should gain statutory authority to make SIRN 20/20 policy that is binding upon the entity that manages the SIRN 20/20 system. ▪ The SIEC should gain and exercise statutory authority to engage as the level of work requires its own professional staff (whether as employees or contractors) are accountable to the SIEC, including both a manager to perform administrative and policy tasks for the SIEC, as well as a minimum of two Regional Interoperability Coordinators (RICs) to foster regional and local interoperability and facilitate regional/local communication with the SIEC. ▪ <i>State agencies represented on the SIEC should endeavor to appoint one or more members of the SIRN 20/20 Subcommittee to represent tribal interests; such a member would count toward the “state” third of the SIRN 20/20 membership</i>
Coordinated Regional Interoperability Boards (CRIBs)	<ul style="list-style-type: none"> ▪ The SIEC should establish four Coordinated Regional Interoperability Boards (CRIBs) as subcommittees of the SIEC. ▪ The four CRIBs correspond geographically to the four regions defined by the Department of Emergency Services for regional emergency response. ▪ Each county appoints one member to its CRIB.

	<ul style="list-style-type: none"> ▪ The CRIB Chair serves for one year, alternating between “urban” and “rural” members.⁶⁵
<p>SIRN 20/20 Subcommittee</p>	<ul style="list-style-type: none"> ▪ The SIEC should create a SIRN 20/20 Subcommittee. ▪ Twelve members evenly divided in thirds among state/tribal, urban, and rural representatives, serving two-year terms. <ul style="list-style-type: none"> ○ Each CRIB appoints one member. ○ Each of the seven associations represented on the SIEC may nominate a rural member and an urban member; the SIEC appoints four of the nominees, maintaining the requisite urban/rural balance. ○ The SIEC appoints four state/tribal members from among nominees provided by the six state agencies represented on the SIEC. ○ Nominating and appointing entities are urged to coordinate to ensure membership possesses diversity of geography, public safety discipline, relevant professional experience, and relevant skill sets. ○ At least two but no more than four SIRN 20/20 Subcommittee members must also be SIEC members. ▪ Subcommittee originates all SIRN 20/20 policy measures and proposes them to the SIEC, which must adopt the measure or decline with explanation; the SIEC may not adopt language unless it is submitted by the SIRN 20/20 Subcommittee. ▪ Chair position rotates annually among “state,” “urban,” and “rural” groups. ▪ Subcommittee leadership must be independent of the entity that manages SIRN 20/20.

Table 17: Governance Groups and Responsibilities

Finally, it is also recommended that the SIEC take three specific actions immediately in order to meet the Legislative Assembly’s request for input to its consideration of the SIRN 20/20 initiative.

- The SIEC should establish the SIRN 20/20 Subcommittee now under its own authority; it may re-establish the Subcommittee under new statutory authority at a later time if appropriate.
- The SIRN 20/20 Subcommittee should propose and the SIEC should **adopt a measure identifying an entity to manage the SIRN 20/20 network.**
- The SIRN 20/20 Subcommittee should propose and the SIEC should adopt a cost-sharing plan to support the SIRN 20/20 initiative.

⁶⁵ Urban: Loosely defined, A SIRN Subcommittee member is an “urban” member represents a city or town with a population of over 10,000

SIRN 20/20 USAGE AND PARTICIPATION FRAMEWORK

The SIEC, in collaboration with the SIRN 20/20 Subcommittee, would be responsible for developing and establishing a set of policies and procedures on daily operations, system usage, cost-sharing models, asset-sharing agreements and several SIRN 20/20 initiatives.

Participation Agreements: The SIRN 20/20 Operating Entity would likely enter into agreements with county and/or municipal governments structured as memorandums of understanding (MOU) that outline the terms and conditions of the agreement and mutual expectations. The Study, among several other deliverables, has drafted potential MOUs for use, if SIRN 20/20 is to move forward.

Asset-Sharing Agreements: Similarly, the SIRN 20/20 program would also enter into asset sharing or leasing agreements with local entities for the use of existing assets such as radio towers. Upon consultation with a small group of state and local government asset owners, a plain-language agreement template to facilitate the sharing of government assets has been developed. The template, when filled in with appropriate information on specific parties and assets, can be used to memorialize the terms of the agreement between the network operator and the asset owner or controller to share the asset for use in the network.

NEXT STEPS AND OTHER NEAR-TERM STATE-LED/REGIONAL COMMUNICATIONS INITIATIVES

COMMUNICATIONS INITIATIVES

There are a variety of near and mid-term initiatives that can be implemented to advance public safety communications in the State of North Dakota. These efforts can be pursued in parallel with, and incorporate some elements of the SIRN 20/20 initiative and planning process detailed in this document. These initiatives build upon the current efforts of the Department of Emergency Services, which spearheads and facilitates many beneficial training and exercises support statewide.

The SIEC should establish the Coordinated Regional Interoperability Board (CRIBs), and establish the necessary staff to support these efforts at the regional level. While the SIEC, and virtually all public safety disciplines, organize discipline-specific regional events, the CRIBs would foster a more concerted avenue for SIEC or communications activities at the regional level. The Regional Conferences conducted during the Study were widely acknowledged by participants as a valuable forum to exchange ideas and lessons learned, specifically on communications efforts.

ADVANCING THE SIRN 20/20 STUDY

With respect to advancing the SIRN 20/20 effort itself, ITD, in collaboration with the SIEC, continues to conduct outreach efforts and further evolve the structure for SIRN 20/20. Assuming SIRN 20/20 advances, a set of recommended efforts, many of which are discussed in this report, should begin shortly thereafter, including:

- Implementation of the proposed Governance Structure
- Advance the Outreach, Public Relations and Regional Efforts
- Additional field studies to document and evaluate network assets
- Establish a program office to spearhead the procurement process

CONCLUSION

A confluence of several circumstances have led to the State's public safety agencies' growing and pressing need for upgrades to their radio communications systems. Many of the state and local systems are based on legacy technologies that provide limited functionality, have diminishing serviceable lifespans and will no longer be supported by their manufacturers. These systems have also not kept pace with the State's population increase and the corresponding rise in public safety incidents and activities, and the evolution of first-responders operational needs, procedures, federal regulations and overall expectations for performance, reliability and interoperability.

To determine the desirability and feasibility of a *Statewide Interoperable Radio Network (or SIRN 20/20)*, a rigorous and multi-pronged approach Study was undertaken employing a technical capability and lifecycle audit of the existing state and local communications systems; thorough engagement and survey of virtually all North Dakota county public safety disciplines and representatives; and detailed technical, operational and financial investigations of prospective solutions. Based on this thorough approach, the Study concluded that SIRN 20/20—a holistic evolution of the State and Local communications networks into a single integrated statewide solution—is a solution that is *desired* and is *feasible*. As with any network of this nature however, SIRN 20/20 will not be without its challenges – SIRN 20/20 has to be an adequate and affordable replacement for local networks, begin deployment in a timely manner to ensure broad participation, and employ sustainable funding streams and proper governance that provides transparency and responsiveness to local partners.

SUPPLEMENTAL DOCUMENTS

The following documents were developed in conjunction with the SIRN 20/20 Feasibility Study Final Report providing further background and discussion on various topics within the final report, and can be provided upon request.

- I.1 SIRN 20/20 Architecture, Implementation and Migration Plans Overview
- I.2 SIRN 20/20 VHF Coverage Plan and Design
- I.3 SIRN 20/20 Very High Frequency (VHF) Survey and Plan
- I.4 SIRN 20/20 Survey and Needs Assessments Findings Summary
- I.5 SIRN 20/20 Governance Recommendations
- I.6 SIRN 20/20 Participation Memorandum of Understanding Template
- I.7 SIRN 20/20 Asset-Sharing Agreement Template
- I.8 SIRN 20/20 Cost Estimates Development and Revenue Models
- I.9 SIRN 20/20 Study Outreach, Data Collection, Requirements Gathering Process Overview