Site Selection for Medical Marijuana Facilities in Fargo, North Dakota

Final Project Report, GEOG 574

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Abstract

We designed a database that allows a potential regulatory authority, (North Dakota Department of Health, NDDoH, or local planning commission) or potential applicant for a medical marijuana facility to examine the best possible placement of a dispensary or grow facility given certain environmental or zoning conditions.

The database tested the feasibility of location selection in Fargo because it is the largest population center in North Dakota and the possibility of a growing facility and dispensary to be located in Fargo are likely. This database could be a model for site optimization for other population centers throughout North Dakota, as they try to find acceptable locations for medical marijuana growing and dispensary facilities.

Introduction

The goal of our database is to assist government entities as well as potential owners and operators by compiling data that would provide a first pass for site optimization. The selection for growing and dispensary facilities, otherwise called "compassion centers" in North Dakota, based on the requirements in both the North Dakota Century Code and the North Dakota Department of Health's Administrative Rules.

Effective April 18, 2017, North Dakota Century Code (NDCC) chapter 19-24.1 required the NDDoH to establish and implement a medical marijuana program.[6] North Dakota became one of 30 states that have allowed the manufacture, distribution, sale and use of medical marijuana. The measure allows the state to establish growing facilities, that is "an entity registered by the department as a compassion center authorized to produce and process and to sell usable marijuana to a dispensary."[6] The NDDoH has established administrative rules and is now at the point where applications for growing facilities have been submitted and will be selected by a review panel.

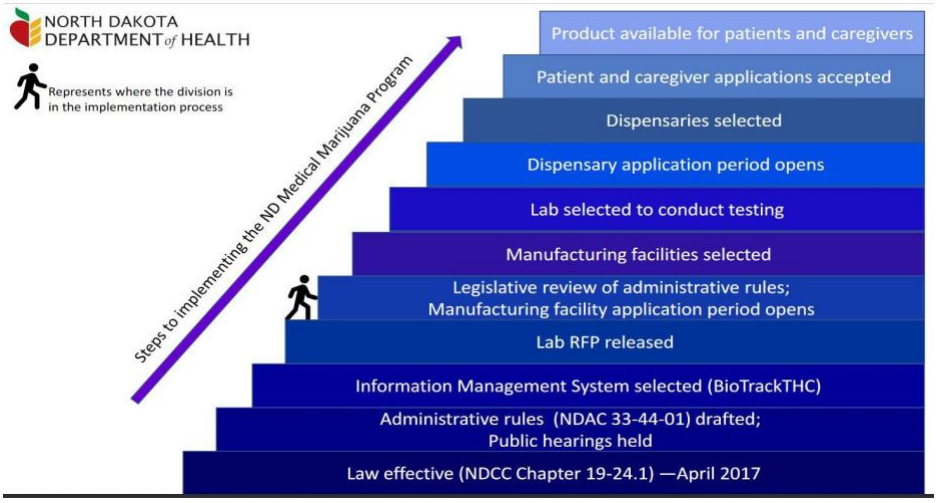

Figure 1. Steps to implementing the medical marijuana program in North Dakota.

The NDDoH has indicated in the application information for compassion centers that site selection will be based in part, on where the majority of potential patient population are located. Fargo, on the eastern border of the state, is

the largest city in North Dakota and presumably where one of the growing facilities and at least one dispensary will be located. Because of that, the scope of our project was limited to the City of Fargo.

The administrative rules state that a potential growing or dispensary facility applicant must not only comply with the state's administrative rules, but also comply with local zoning laws and all applicable building permits. As a result, the most populous cities and counties in North Dakota have recommended appropriate zoning for location of compassion centers within their jurisdiction. Even with zoning ordinances in place to guide site selection of compassion centers, the location of the facilities is a highly contentious issue for neighboring residents. Days before the April 23 application deadline for example, the zoning board in Morton County, located in the central North Dakota and across the Missouri River from the capital city of Bismarck, voted to not approve a proposed medical marijuana facility within their jurisdiction due to opposition from neighbors of the proposed facility.[5]

In addition to zoning, there are also waste disposal considerations with the location of any medical marijuana manufacturing facility. The growth of medical marijuana is known to produce both solid and liquid wastes that could potentially harm the environment. If a growing facility discharges wastes to nearby surface waters it could create potential additional treatment measures for public water intakes that use that same surface water.[1]

Our thought is that if there spatially enabled database that has the information needed to quickly analyze potential site selection, as well as have constraints identified in the ND Century Code and Administrative Rules, it can help both potential business owners and regulators determine the appropriateness of a proposed compassion center's location.

Background

North Dakota joined the bandwagon of states that legalized marijuana use, in some form, by passing an initiated medical marijuana measure during its 2016 legislative session. Senate Bill 2344 allowed for the use of medical marijuana for qualifying medical conditions.[6,4] All medical marijuana must be grown, processed and dispensed within the state borders because marijuana is still illegal at the federal level and it could be a criminal offense to transport it across state lines. This means that compassion center locations must be selected for growing and dispensing completely within North Dakota.

North Dakota wishes to avoid environmental degradation by defining not only requirements for cultivation, but also disposal of any waste products. According to NDCC 19-24.1, "medical marijuana waste" is defined as unused, surplus, returned, or out-of-date usable marijuana; recalled usable marijuana; unused marijuana; or plant debris of the plant of the genus cannabis, including dead plants and all unused plant parts and roots.[6] Marijuana manufacturing wastes can be considered both hazardous and non-hazardous. Non-hazardous wastes include, but

are not limited to, raw plant, trim, leaf, stem, soil and grow medium, expired products containing THC and cannabis extracts, displays, or edible byproducts. Hazardous wastes could include extraction byproducts including butane, carbon dioxide or ethanol. The department is not allowing the use of any pesticides in growing marijuana.

We have included watercourses (streams, rivers, legal drains and ditches) and water bodies (lakes and reservoirs) in our database design because North Dakota considers all waters of the state deserving of protection. North Dakota also has a very broad definition of pollution. Pollution is defined in North Dakota Administrative Rules 33-16-02.1-04 as follows:

"Pollution" means such contamination, or other alteration of the physical, chemical, or biological properties, of any waters of the state, including change in temperature, taste, color, turbidity, or odor. Pollution includes discharge of any liquid, gaseous, solid, radioactive, or other substance into **any waters of the state** that will or is likely to create a nuisance or render such waters harmful, detrimental, or injurious to public health, safety, or welfare; domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses; or livestock, wild animals, birds, fish, or other aquatic biota.[3]

The Federal Clean Water Act contains several sections that require states to report on the quality of the waters and develop plans to improve water quality for those waters that are impaired. Section 303(d) of the Clean Water Act requires states to list waters that are quality impaired and in need of a total maximum daily load plan, or TMDL. Plans are to be submitted to the U.S. Environmental Protection Agency every other year. Discharge of hazardous waste to streams requiring a TMDL could be problematic for the business owner; the state may require additional monitoring of discharge.

Medical marijuana grow and dispensary facilities not only have to be concerned with where to dispose of wastes, but also the location of the facility. North Dakota law specifically states that preference will be given to compassion centers that are in close proximity to population centers that would have the majority of the potential patients.[6] It also states that grow and dispensary facilities are to be located at least 1,000 feet from a public and private schools, day care centers and higher education institutions. In addition, the larger cities in North Dakota, such as the state capital of Bismarck and the state's largest city Fargo have clarified zoning to allowing medical marijuana growing and dispensary facilities only in certain commercial, agricultural special use or industrial zones.[2] Fargo city planners have allowed grow facilities and dispensaries within city limits by right, that is, no conditional use permit or similar entitlement is required.[3]

Goals and Objectives

The goal of our project is to design a database that allows a potential regulatory authority (ie. the NDDoH or local planning commission) or a potential applicant for a medical marijuana facility to examine the best possible placement of a compassion center given certain environmental or zoning ordinances. Our database tests the

feasibility of location selection in Fargo because of its high population density and likelihood of a growth and dispensary facility to be established within the City of Fargo and future growth areas. We intend the database to be portable; the parcel dataset containing zoning codes for a particular area would have to be updated in the database to make it applicable to that location.

Datasets and Database Design Process

Our design for the database compiles into one dataset the data necessary for optimizing site selection for compassion centers using requirements specified in NDCC and Administrative Rules. Fargo is located in Cass County, North Dakota; statewide datasets have been clipped to the county border. Our database contains the following datasets:

1. Parcels from City of Fargo
    a. City of Fargo allows growing facilities by right in parcels zoned GI: general industrial and LI: limited industrial zones;
    b. At this time, City of Fargo will allow dispensaries by right in parcels zoned GC: general commercial and LC: limited commercial zones.[2]
2. School locations from City of Fargo
    a. Elementary, Middle, Secondary, and Collegiate campuses and associated buildings are within scope, https://gishubdata.nd.gov/dataset/k-12-school-locations https://gishubdata.nd.gov/dataset/higher-education-school-locations
3. Assessed rivers and streams from North Dakota Department of Health, Division of Water Quality
    a. 303(d) assessed
    b. https://gishubdata.nd.gov/dataset/assessed-rivers-and-streams
4. Assessed lakes and reservoirs from North Dakota Department of Health, Division of Water Quality
    a. 303(d) assessed
    b. https://gishubdata.nd.gov/dataset/assessed-lakes-and-reservoirs
5. Solid waste disposal and compost facilities near Fargo, North Dakota – from City of Fargo; locations verified with North Dakota Department of Health, Division of Waste Management

Our entity relationship diagram (Figure 2) shows the relationships of the entities to one another. The administrative rules specify that all grow facilities and dispensaries comply with local zoning laws. Zoning is a local issue based on information contained in a municipality's parcel data. We designed the database with the intention that we could input a different city or county parcel data into the database and re-run the queries based on new parcel information.

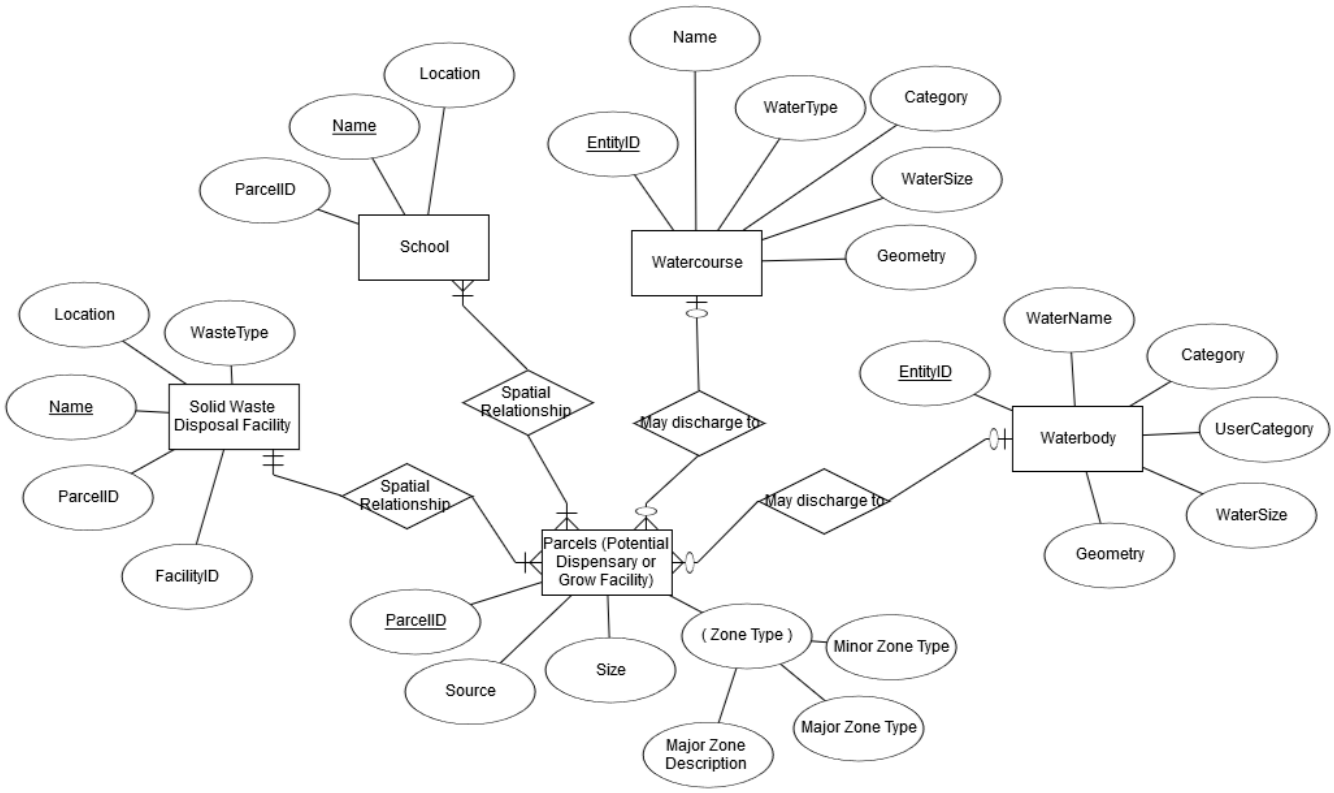

Figure 2. Entity-relationship diagram for potential compassion care facilities.

NDCC 19-24.1-14 specifies that an applicant must present evidence that the physical address of a compassion center is not located within 1,000 feet of a public and or private schools, day care centers and higher education institutions and evidence of approval from local officials that the proposed compassion center complies with local zoning ordinances. Potential grow facilities may (or may not) discharge to either a surface water stream or water body; water used in the facility may also be recycled or disposed of in a different manner than direct discharge to a surface water body. We limited our project scope to consider potential direct discharge to a surface water source to see if that water may have an existing TMDL.

The school, solid waste disposal and parcel tables are related by parcel identification number, or PIN. The relationship between parcels and the watercourse or waterbody optional; if present it is spatial ('distance to' and 'category of' receiving waters).

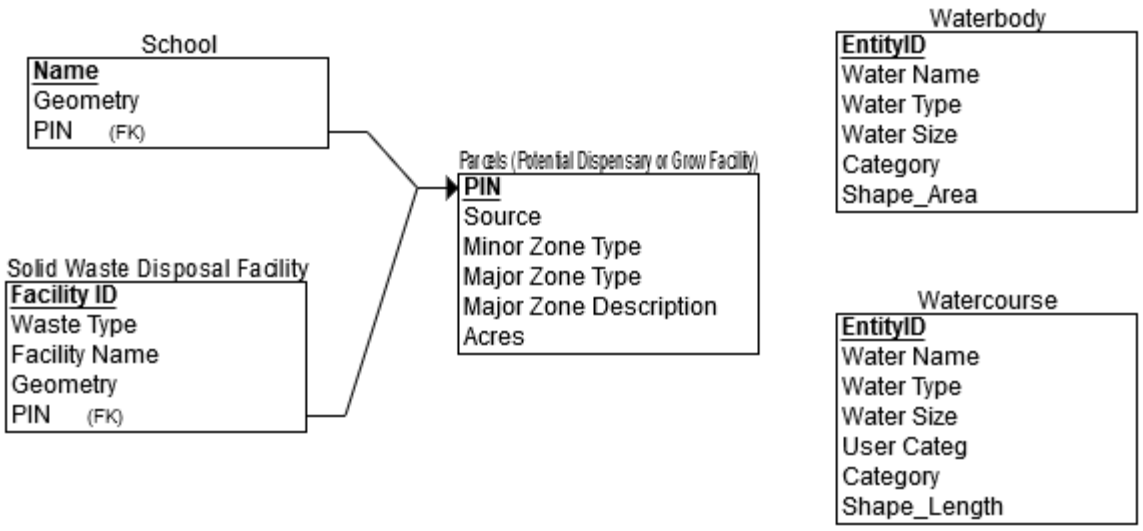

Figure 3. Logical schema for database.

Physical Schema

The NDCC and Administrative Rules are the drivers for the queries that will be made on this site optimization database and the parcels are the primary source data. Parcels contain the zoning information that determines all land use for the urban and extra-territorial area, or ETA. The ETA zone extends four miles beyond city limits and is designed by Fargo city planners to both contain sprawl and plan for future urban expansion. Tables below are the physical schema for the database, domains (if present), constraints and description of the data.

Parcels

FIELD NAME	TYPE	CONSTRAINTS	Domain	Description
ParcelID / PIN	Text	Primary key		Parcel ID number; unique identifier of parcel, the minimum land-use planning unit for the city
Source	text		FGO, FargoET	City of Fargo, or Fargo extra territorial area.
MinorZone	text	Null values allowed		Specific use descriptions; can indicates ownership or use- type (City of Fargo, church, single family home, etc.).
MajorZone	text	No null values	AG, DMU, GC, GI, GO, LC, LI, MHP, MR, NC, NO, NoRec, P/I, SR, UMU	Major zoning categories for all parcels within the city of Fargo and ETA
MajorZoneD	text	No null values	Agricultural, Downtown mixed use, general commercial, general industrial, general office, limited commercial, limited industrial, mobile home park, multiple dwelling, neighborhood commercial, neighborhood office, unsure, public institutional, single dwelling, university mixed use	Text description of MajorZone
Acres	Double	No null values		Acres of parcels.
geometry	polygon	Must not have gaps, must not overlap		

School

The NDDoH interprets the definition of schools as an entity included on the ND Department of Public Instruction's "Approved Schools By City" list, an entity included on ND DPI's Head Start Sites, or any public or private institution of higher learning or career and technical institution[9]. NDCC also specifies that the 1,000 foot distance from a school is from the property border, so parcel polygons are an appropriate representation of this entity.

FIELD NAME	TYPE	CONSTRAINTS	Domain	Description
PIN	Text	foreign key	Enforces referential integrity with parcel table	Parcel ID number; unique identifier of parcel, the minimum land-use planning unit for the city
Name	text	Primary Key		Name of school
geometry	point			Parcel geometry of area zoned or identified as containing a school.

Solid Waste Disposal Facilities

FIELD NAME	TYPE	CONSTRAINTS	Domain	Description
PIN	Text	foreign key	Enforces referential integrity with parcel table	Parcel ID number; unique identifier of parcel, the minimum land-use planning unit for the city
FacilityName	text	Primary Key		Name of solid waste facility
Waste_Type	text	No null values	Inert, infectious/medical, municipal, mercury	Type of waste accepted at this facility. Note: composting is available at municipal landfill in City of Fargo.
geometry	point	Must not overlap, must not have gaps		

Waterbodies[10]

FIELD NAME	TYPE	CONSTRAINTS	Domain	Description
Entity_ID	Text	Primary key		Unique identifier for the assessment unit; state assigned. Sometimes also called Assessment_ID
Water_Name	text			Name of water body
water_type	text		<blank>, lake, pond, reservoir	Type of water body
water_size	double			Size, in acres of water body.
Category	text		<blank>, 1, 2, 3, 4, 4a, 4b, 4c, 5a	Overall assessment category and meaning. <blank> = unclassified 1 – All beneficial uses attained 2 – Some beneficial uses attained 3 – insufficient information available 4A – TMDL Approved, still impaired 4B – impaired, but no TMDL required because other pollution control measures are present 4C – impaired, but impairment is not due to pollutant 5 – on 303(d) list, impaired and needing a TMDL
geometry	polygon			

Watercourse[10]

FIELD NAME	TYPE	CONSTRAINTS	Domain	Description
Entity_ID	Text	Primary key		Unique identifier for the assessment unit; state assigned. Sometimes also called Assessment_ID
water_name	text			Name of water body
water_type	text		<blank>, river	Type of water body
water_size	double			Size, in acres of water body.
user_categ	text		5A	Waterbodies on 303(d) list but are targeted for additional monitoring and assessment the next two to four years
Category	text		1, 2, 3, 4, 4a, 4b, 4c, 5	Overall assessment category and meaning. <blank> = unclassified 1 – All beneficial uses attained 2 – Some beneficial uses attained 3 – insufficient information available 4A – TMDL Approved, still impaired 4B – impaired, but no TMDL required because other pollution control measures are present 4C – impaired, but impairment is not due to pollutant 5 – at least one beneficial use not attained, impaired and needing a TMDL
geometry	polyline			

Results

We created views to hold the potential parcels suitable for building or setting up a growing facility or dispensary that meets the City of Fargo requirements and North Dakota requirements of being greater than 1,000 feet from a school. The best potential parcels for growing are zoned vacant or as a warehouse or office:

```
CREATE VIEW ptnlGrowPlots AS (
SELECT DISTINCT parcels.gid AS ptnlGrowPlots,
parcels.geom AS geom
FROM parcels, school
WHERE minorzone IN ( 'Vacant Land', 'Warehouse & Office')
AND majorzone IN ('GI', 'LI')
AND parcels.gid NOT IN (
        SELECT parcels.gid
        FROM parcels, school
        WHERE ST_DWithin(parcels.geom, school.geom, 1000)))
```

And for dispensaries, the best potential parcels are selected with the following query:

```
CREATE VIEW ptnlDispPlots AS (
SELECT DISTINCT parcels.gid AS ptnlDispPlots,
parcels.geom AS geom
FROM parcels, school
WHERE minorzone IN ( 'Vacant Land', 'Warehouse & Office')
AND majorzone IN ('GC', 'LC')
AND parcels.gid NOT IN (
        SELECT parcels.gid
        FROM parcels, school
        WHERE ST_DWithin(parcels.geom, school.geom, 1000)))
```

Once we have views of potential parcels, we can run queries on the solid waste disposal facilities and surface water tables to get an estimate of some of the potential environmental costs, such as transportation to disposal facility and if there are any potential restrictions on discharge of liquid wastes to surface waters. The following query determines the distance to the solid waste disposal facility, so the facility's owners can estimate potential transportation costs for disposal of solid waste from a particular parcel:

```
SELECT DISTINCT ON(pgp.ptnlgrowplots)
Pgp.ptnlgrowplots,
swdf.facility_n AS "Nearest SWDF",
ST_Distance(swdf.geom, pgp.geom) AS "SWDF Distance (ft)"
FROM solidwastedisposalfacility AS swdf, ptnlgrowplots AS pgp
WHERE swdf.waste_type = 'Municipal'
ORDER BY pgp.ptnlgrowplots,
ST_Distance(swdf.geom, pgp.geom) ASC
```

If the compassion center will be discharging to surface waters, that is watercourses or waterbodies, they will need to know if any of the potential receiving streams are currently listed on the state's 303(d) list of streams that are impaired. Impairment status of is indicated by a category of 5 in the stream_cassco and lakes_cassco data tables:
Streams:

```
SELECT DISTINCT ON(pgp.ptnlgrowplots)pgp.ptnlgrowplots,
wc.entity_id AS "WC ID",
wc.water_name AS "WC Name",
wc.category AS "WC Category",
ST_Distance(wc.geom, pgp.geom) AS "Stream Distance (ft)"
```

```
FROM stream_cassco AS wc, ptnlgrowplots AS pgp
WHERE wc.category IN (‘2’, '5')
ORDER BY pgp.ptnlgrowplots, ST_Distance(wc.geom, pgp.geom) ASC
```

Lakes:

```
SELECT DISTINCT ON(pgp.ptnlgrowplots)pgp.ptnlgrowplots,
wb.entity_id AS "WB ID",
wb.water_name AS "WB Name",
wb.category AS "WB Category",
ST_Distance(wb.geom, pgp.geom) AS "Waterbody Distance (ft)"
FROM lakes_cassco AS wb, ptnlgrowplots AS pgp
WHERE wb.category IN (‘2’,'5')
ORDER BY pgp.ptnlgrowplots, ST_Distance(wb.geom, pgp.geom) ASC
```

Figures 4 through 7 show the results of the queries and locations of selected parcels. There are 400 potential parcels that meet the criteria for a dispensary (Figure 4). There are a total of 624 parcels in Fargo that meet the minimum criteria for a grow facility (Figure 5). Parcel 17086 is furthest from the municipal land at 10,031 ft. Parcel 19709 is closest at 9,937 ft (Figure 6).

Future Work

The state’s definition of schools does not match the available geospatial data for schools, and could be updated so that there is data consistency. Additionally, available geospatial data for schools is not as inclusive or as comprehensive as the state is requiring of potential applicants. Consequently, improvements can be made to the state’s geospatial dataset of schools to include the facilities that the NDDoH has defined as schools.

Summary

Considering the emerging market of marijuana and the unique elements of its product lifecycle, our database captured necessary information to plan and prepare for effective site selection and waste management of marijuana by-products that can be used by regulatory bodies and commercials entities. It also alerted facility owners and operators of potential environmental costs of doing business: transportation costs of waste disposal and awareness of proximity of impaired waterbodies.

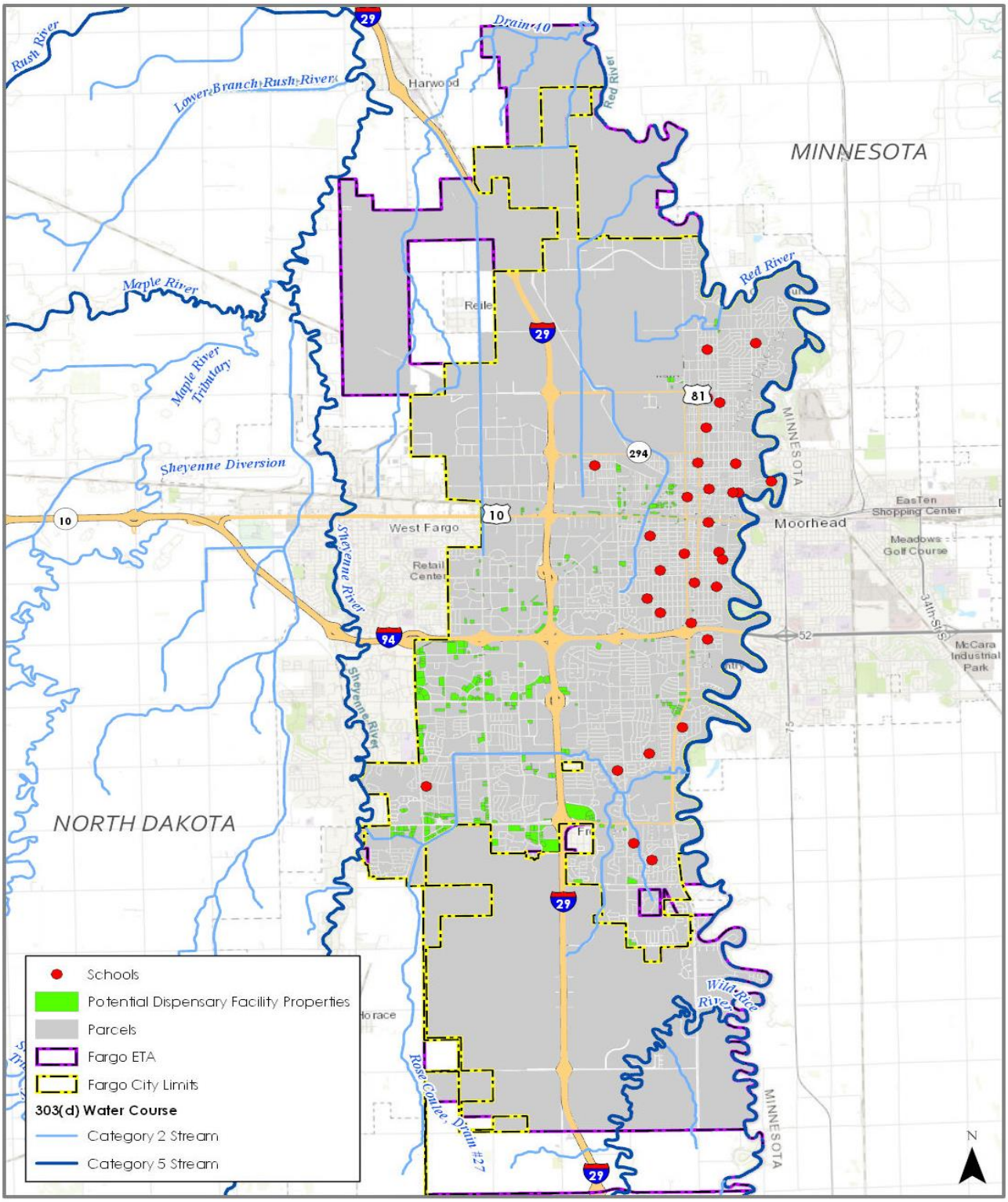

Figure 4. Potential dispensary parcels.

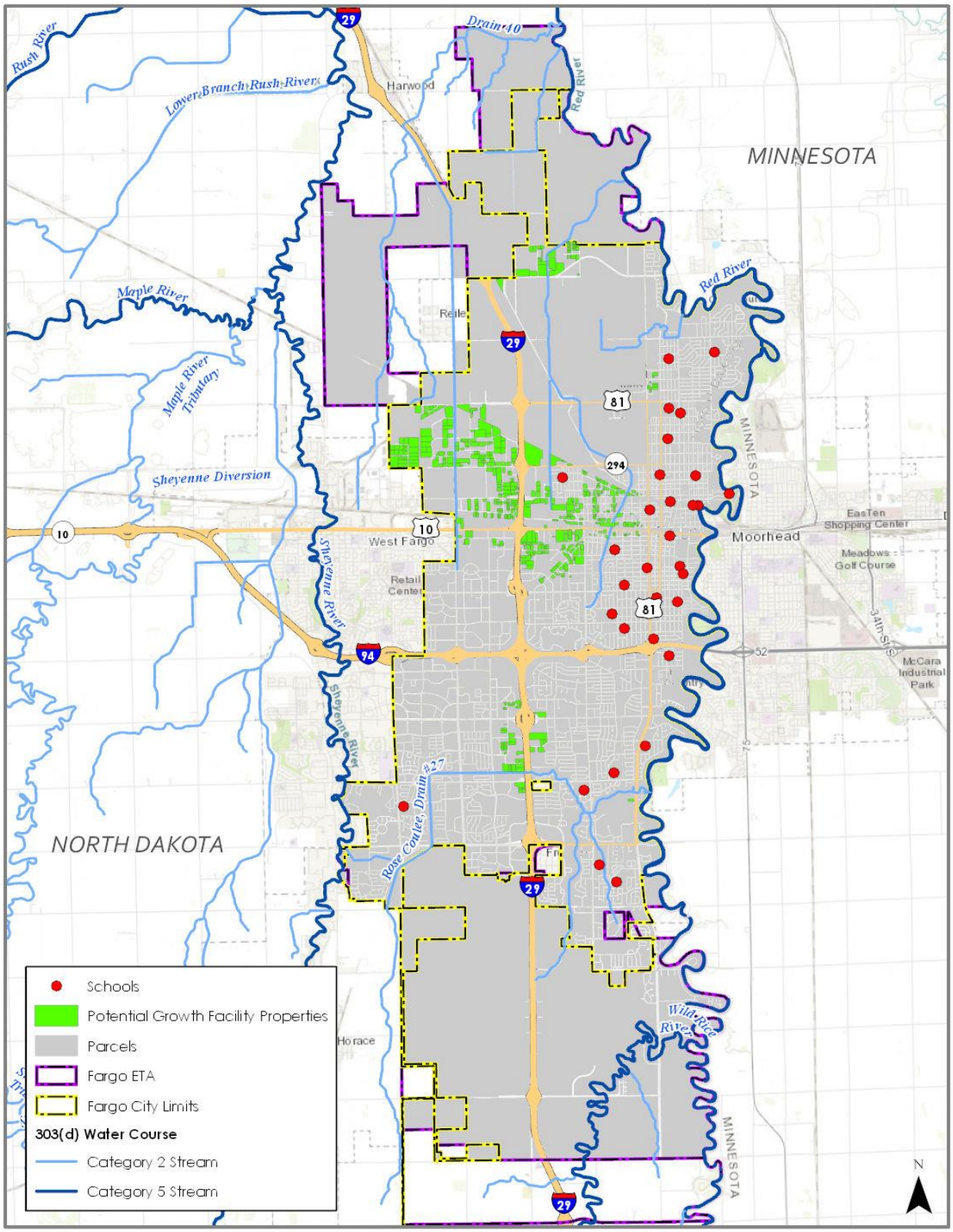

Figure 5. Potential parcels that meet the minimum requirements for growing facilities.

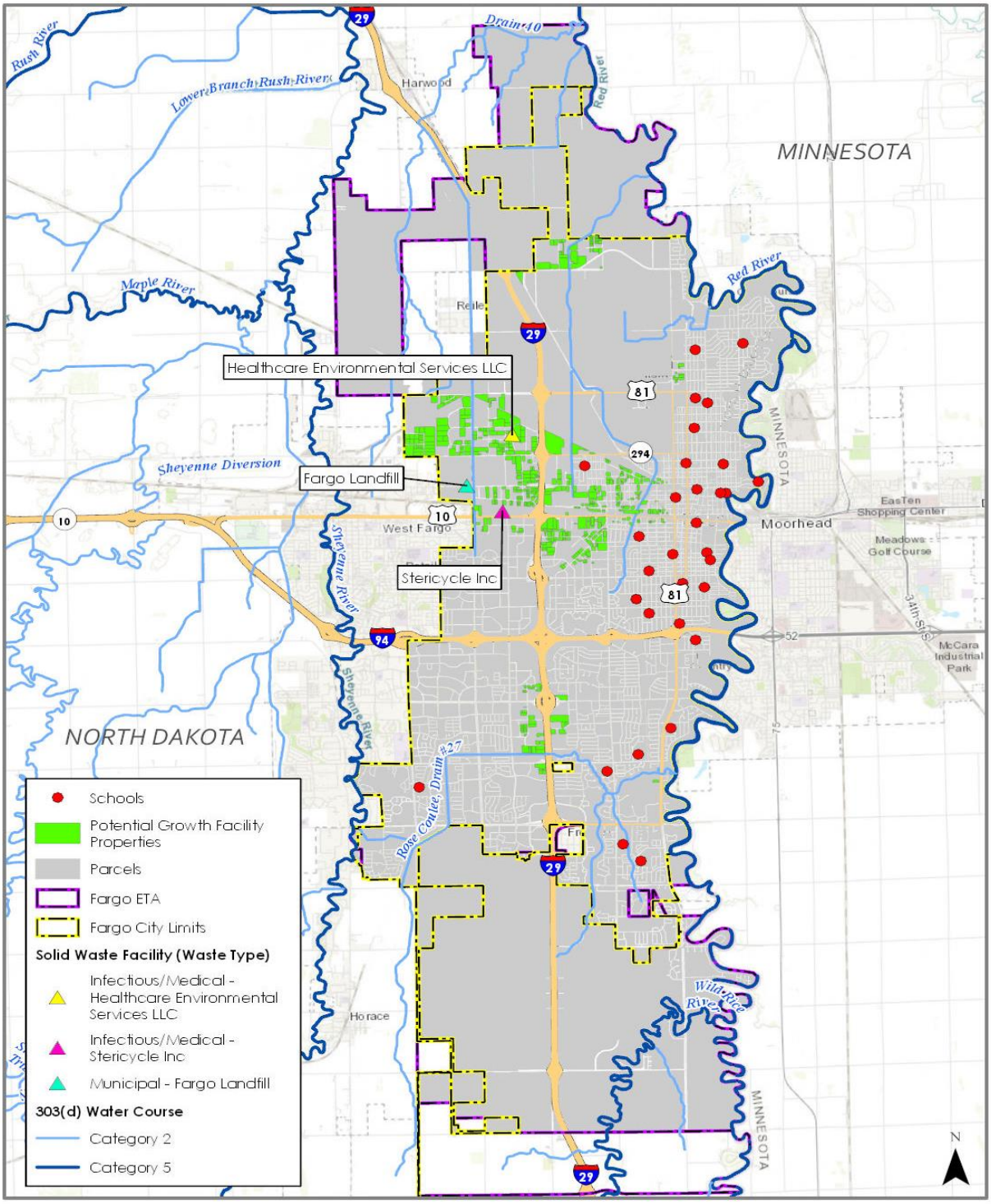

Figure 6. Landfills and potential growing facility parcels.

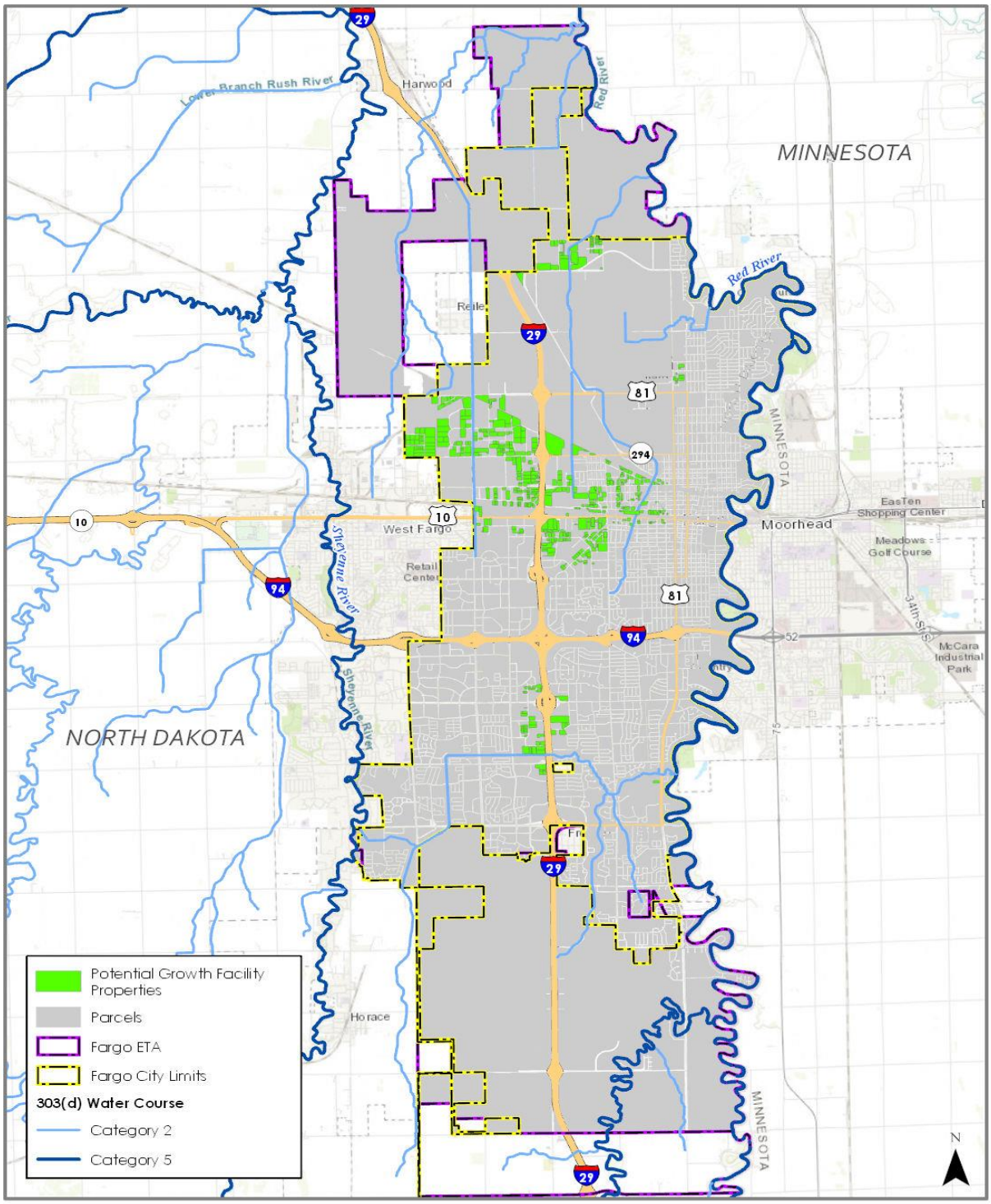

Figure 7. 303(d) listed streams and potential grow facility parcels.

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